Academic Rules and Regulations

2020 (Revision 1.0)

(Applicable for the students admitted during 2021 – 2022 and 2022 – 2023 only from the upcoming semester from the date of approval)

Undergraduate Programs

Choice Based Credit System (CBCS)

Nadimpalli Satyanarayana Raju Institute of Technology (NSRIT)
Sontyam, Andhra Pradesh 531173
(An Autonomous Institute, Affiliated to JNTU - Gurajada, Vizianagaram, AP)
Accredited by NAAC with 'A' Grade

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531173.

Contents

Revision	1.0
Year of introduction	2023
Approved	VI Academic Council
Date of approval	

Sign and Seal of the Chairman (ACM)

The Vision

To promote societal empowerment and become an institution of excellence in the field of engineering education and research

The Mission

- To develop the students into outstanding professionals through innovative Teaching - Learning process
- To uphold research through long term Academia - Industry interaction
- To inculcate ethical standards and moral values

Academic Regulations for B. Tech. (Regular, Honors and Minor with Specialization) Program

(For all the candidates admitted from the Academic Year 2020 – 2021 onwards)

B. Tech. (Regular: 160 Credits | Lateral Entry: 121) | B. Tech. (Honors/Minor - Regular: 180 Credits | Lateral Entry: 141)

1. Preliminary Definitions and Nomenclature

In this regulation, unless the context otherwise requires:

a. **Degree**:The academic award conferred upon a student on successful completion of a programme designed to achieve the defined attributes. It is referred to as Under-Graduate (UG) Degree, that is B.Tech. degree

b. **Program**: The cohesive arrangement of courses, co-curricular and extracurricular activities to accomplish predetermined objectives leading to the awarding of a degree. It also means specialization or discipline of B.Tech.

c. **Course**:Theory, Practical or Theory-cum-Practical subject studied in a semester, like Engineering Mathematics, Physics, etc.

d. "**University**" means Jawaharla Nehru Technological University – Gurajada, Vizianagaram (JNTU – GV)

e. "**Institute**" means Nadimpalli Satyanarayana Raju Insitutute of Technology (NSRIT)

2. Eligibility for Admission

2.1. Admission to the B. Tech. (Regular, Honors and Minor with Specialization) shall be made subject to the eligibility and qualifications as prescribed by Andhra Pradesh State Council for Higher Education (APSCHE), Government of Andhra Pradesh. The total number of seats as per the approved annual intake is categorized into two categories viz. Convenor Quota (Cat. – A) and Management Quota (Cat. – B) with a ratio of 70:30 (G. O. No. 52). The admission under Cat. – A shall be done based on the merit score secured through state-wise common state commone entrance test i.e., AP Engineering Agricultural, Pharmacy Common Entrance Test (AP – EAPCET). The allotment pertaining to Cat. – B admission, the merit list based on 10+2 shall be taken as a benchmark in compliance with the norms issued by APSCHE

2.2. With regard to the students admitted through Lateral Entry Scheme, the students shall be admitted directly into semester III of the second year of B. Tech. programs. Under this scheme 10% seats of the sanctioned intake will be available in each program of study as supernumerary seats. Admissions to this 3 year B. Tech. lateral entry Programme will be through Andhra Pradesh Engineering Common Eligibility Test (ECET). The maximum period to complete B. Tech. under lateral entry scheme is 6 consecutive academic years from the date of joining

3. Duration and Medium of Instruction of the Program

The program duration for the award of degree in B. Tech. (Regular, Honors and Minor with specialization) will be of 4 academic years and each academic year will have two semesters. In case, if the student is unable to complete the program in the above said stipulated duration, he/she shall be permitted to complete the program of study within 8 consecutive academic years from the year of admission into B. Tech. program. For the students admitted through lateral entry scheme the duration of the program is 3 years and 6 years if the student fails to complete the program of study in the

stiupulated duration of 3 years. The student who fails to meet the requirements for the award of B. Tech. program during the above said extended duration shall forfeit the degree in B. Tech. program of study. The medium of instruction during the program of study is English.

Academic Calendar: As already mentioned, each academic year will have two semesters. Each academic year, an academic calendar will be issued by the Office of the Controller of Examinations (CoE) indicating the duration of instruction period, mid-term tests, semester-end examinations, practical examinations and eventually evaluation. Normally each semester will have fifteen weeks of instruction, one week of practical examinations and two to three weeks for descriptive examinations. In total, each semester will span for a maximum duration of 15 – 19 weeks.

4. Programs of Study

NSRIT offers seven programs of four year duration leading to Bachelor's Degree in Engineering and Technology (B. Tech.) as follows

i. Civil Engineering
ii. Computer Science and Engineering (CSE)
iii. Computer Science and Engineering (Artificial Intelligence and Machine Learning)
iv. Computer Science and Engineering (Data Science)
v. Electronics and Communication Engineering (ECE)
vi. Electrical and Electronics Engineering (EEE)
vii. Mechanical Engineering

5. Structure of Programs

5.1. Categorization of Courses

Each program shall have a common curriculum framework with well defined educational objectives, program outcomes and courses outcomes as per the philosophy of Outcome Based Education (OBE) in line with the Vision and Mission of the department offering the program and in turn in accordance with the Vision and Mission of the Institute. The program structure comprise of theoretical courses, practical courses, theory-cum-practical courses, MOOCs, summer and full semester internship, skill oriented courses, project work, seminars and other relevant courses meeting industry requirements. As the curriculum is framed with Choice Based Credit System (CBCS), the students have the flexibility in opting the courses of their choice under the category of electives. The courses of a particular program are categorized as follows

a. Foundation Courses
    i. Humanities and Social Science including Management (HS)
    ii. Basic Science (BS)
    iii. Engineering Science (ES)
b. Professional Core Courses relevant to the chosen program of study
c. Electives
    i. Professional Electives (PE) relevant to the chosen program of study
    ii. Open Electives (OE) relevant to other programs of study
d. Project, Seminar and Internship
e. Skill Oriented Courses (SOC) and Industry Connect Courses (ICC)
f. Mandatory Courses (MC) as prescribed by AICTE / UGC

5.2. Nomenclature of Credit Distribution

No.	Nature of Course	Credit	Nomenclarture
1	Theory Course / Elective Course (per Hour)	1.0	1 hour / credit
2	Practical / Drawing Course (per Hour)	0.5	0.5 hour / credit
3	Summer Internship (2nd Year | 3rd Year)	1.5 | 3.0	-
4	Full Semester Internship	6.0	-
5	Capstone Project	6.0	-
6	Moocs (Per Hour)	1.0	1 hour / credit
7	Skill Advanced / Soft Skill Course (per Hour)	2.0	0.5 hour / credit
8	Mandatory Course	-	-
9	Counseling/Mentoring	-	-
10	Sports/Hobby Clubs/Activities	-	-

5.3. Structure of Curriculum

Sem	No. of Theory Courses	No. of Lab Courses, Internship, Term Paper, Project	Total Credits
I	5 Theory	3 + Sports/Hobby Clubs/Activities	19.5
II	6 (5 Theory + 1 MC)	3 + Sports/Hobby Clubs/Activities	19.5
III	7 (5 Theory + 1 SOC + 1 MC)	3 + Sports/Hobby Clubs/Activities	21.5
IV	6 (5 Theory + 1 SOC)	3 + Sports/Hobby Clubs/Activities	21.5
V	7 (3 Theory + 1 PE + 1 OE + 1 SOC + 1 MC)	2 + Sports/Hobby Clubs/Activities + Summer Internship #1	21.5
VI	7 (3 Theory + 1 PE +1 OE + 1 SOC + 1 MC)	3 + Sports/Hobby Clubs/Activities	21.5
VII	7 (3 PE + 2 OE (MOOCs) + 1 Elective (HS) + 1 SOC)	Summer Internship #2	23
VIII	Project	Full Semester Internship	12
		Total Credits	**160**

5.4. Credit Distribution for each Category

No.	Category	Credits	
		Regular	Lateral
1	**Foundation Courses**	**55.5**	**13.5**
	Humanities and Social Science including Management (HS)	10.5	06.0
	Basic Science (BS)	21.0[1]	06.0[1]
	Engineering Science (ES)	24.0[1]	04.5[1]
2	**Professional Core Courses**	**51.0[1]**	**51.0[1]**
3	**Electives**	**27.0**	**27.0**
	Professional Electives	15.0	15.0
	Open Electives	12.0	12.0
4	**Project, Seminar and Internship**	**16.5**	**16.5**
5	**Skill Oriented Courses**	**10.0**	**10.0**
6	**Mandatory Courses**as prescribed by AICTE and UGC (Not to be accounted for CGPA)	-	-
7	**Audit Course**	-	-
Minimum credits to be earned for the award of the B. Tech. (Regular) degree		**160**	**121**

[1]The total number of credits may have marginal variation from one program to other program based on the requirement to accomadate few eseential courses related to the program of study

5.5. Assessment Pattern for the Courses

With the true spirit of implementing Outcome Based Education (OBE), each course is designed with customized assessment pattern addressing the various cognitive levels of Revised Bloom's Taxonomy (RBT) with appropriate proportion covering the breadth and depth of the courses. The Assessment Instrument or QPs shall be designed with a combination of question responses with short answer, long answer, higher order thinking skills through critical thinking and creativityand MCQ that fits best to the assessment of the intended learning outcomes. The course instructor can also take the liberty of setting their own customized question papers along with the distribution of marks leveraging the status of autonomous promoting higher order thinking skills and creativity through case studies or questions related to problems solving skills through open book examinations other than that of the one prescribed in the academic regulation 2023. This shall be deployed by taking necessary approval from the respective Chairman, Board of Studies and the Head of the Institution as well before the commencement of the course while preparing the course plan along with the rubircs indicating the criteria and scale/metirc for assessment. With regard to the assessment pattern for the skill oriented courses, appropriate assessment instrument shall be developed by the respective course facilitator that suits to assess the skills that are expected from the courses by taking approval from the respective Chairman, Board of Studies and the Head of the Institution as well before deploying for assessment. Incase of video based grading, suitable rubrics shall be developed for mearing the course outcomes or intended learning outcomes. In all the cases other than the assessment pattern being prescribed in the academic regulation 2023, the pattern of customized assessment pattern shall be submitted to the office of the Controller of Examinations before the commencement of the course.

5.6. Internship / Community Service Projects (CSP)

As per the guidelines specified in these regulations, each student is expected to undergo community service projects (CSP),internship in the form of summer and full semester internship (FSI) during the program of study and it is mandate for all the students. The curriculum offers two summer internships i.e., one at the end of second year and the other one is at the end of third year of study; each one spans for a duration of four to eights weeks. The CSP shall be taken at the level of second year as an alternate option to summer internship (Phase I) as per the standard operating procedure prescribed by the institution and the allotment is purely at the discretion of the Industry – Institute Engagement cell based on the requirement and availability of internship offers. With regard to the FSI, the curriculum provides flexibility at two different slots during VII and VIII semesters with a span of 12 weeks – 16 weeks. The students who are opting FSI either during semester VII or VIII shall register for the course during the semester V through the Head of the department and the same shall be forwarded to the Office of Controller of Examination (CoE) and Internship Cell. To ensure effective implementation of FSI, the Institute shall depute ~50% of the interns during semester VII and the rest during semester VIII. Accordingly, the courses pertaining to the semesters shall be inter-changed. The students who are opting for FSI in semester VIII shall be permitted to take up the capstone projectat the industries along with the FSI in the same industry,if he/she is interested and submit a separate report along with internship/training report.

Students will be evaluated by a panel of internal and external subject matter experts (SMEs) nominated by the Office of the CoE. It is mandate for all the learners going either for internship / CSPs to capture a video demonstrating the self reflection on the learning outcomes for grading by the course supervisor/guide.

5.7. Project Work

Each student is expected to carryout one capstone project relevant to his/her program of study or interdisciplinary of nature leading to design, development of solutions, and fabrication of system component or a product. On successful completion of the project work, the students are expected to submit a detailed project report along with the working models, if any for evaluation. The office of the CoE shall nominate a team of experts to assess the quality and evaluate the project as per the evaluation guidelines prescribed in the academic regulation. Incase, if any student is interested in doing industry oriented project (Individual) atthe industries or research organization, he/she shall take up the project duly approved by the Head of the Department, CoE and the Head of the Institution well before the commencement of the course. In such cases, the students should inform the respective department well in advance, preferably during semester VII. The students who opted FSI in the semester VII shall take up the courses as prescirbed in the curriculum during semester VIII along with the capstone project.

5.8. Statutory Mandatory Courses and Audit Courses

Mandatory courses are those courses which are designed inline with the requirement of AICTE. These courses do not carry any credits and are not accounted for the calculation of CGPA.The students shall register for the courses in the respective semester as specified in the curriculum. All the students (regular and lateral entry students) shall complete the mandatory course by taking two assessment in the form of multiple choice questions during the continuous assessment. A minimum of 40% of marks (average of two continuous assessment) is required to complete the course and the status of completion will be indicated in the grade memo and an online certification is also mandatory for a duration of 30 hours in the relevant area as specified in the curriculum. In addition to the above, the curriculum provides flexibility to nurture employability skills through audit courses and it is mandatory for all students to complete the audit courses for the award of the degree and it will not be counted for the calculation of CGPA. The academic regulation permits autonomous learning with mandatory courses promoting self learning ability among the learners.

5.9. MOOCs and Autonomous Learning

The curriculum provides adequate flexibility for the students to take up MOOCs through self-study mode enabling them to learn the courses on independent/autonomous mode with minimal guidance of faculty mentor to earn necessary credits for the award of the degree B. Tech. (Regular) and B. Tech. (Honors & Minor with Specialization) and the attendance is not mandatory. The courses shall be opted from MOOCs platform viz. NPTEL, SWAYAM or any other platforms as approved by the respective Chairman, Board of Studies (BoS). Incase of MOOCs through NPTEL, SWAYAM, the credits shall be directly transferred without conducting any further examination from the institution. For all other platforms, the assessment pattern for such courses which are part of the curriculum for the B. Tech. (Regular) degree shall be carried out as similar to

other regular theory and skill-oriented courses. And for B. Tech. (Honors) and B. Tech. (Minor with Specialization) shall be inline with the agencies or the platforms offering these courses. Further, if the grade is not specified by the particular agency or platform, the office of CoE shall follow the institutional SOP for the award of the grade and take necessary approval from the Academic Council through circulation. MOOCs shall be identified by the respective department taking necessary approval from the BoS/Chairman (BoS) and shall be intimated well in advance to the students. Futher, in case, if the student is preferred to undergo Semester Away Programme as per Clause 5.11 during semester VII, the credits earned through self-study courses shall be compensated for the calculation of CGPA. The curriculum provides flexibility to the students to select the semester VII on self-study mode to facilitate the Semester Away Program. Incase of notification of On-Job Training (OJT) by the institute industry-institute engagement cell during semester VI through VIII, the academic regulations 2023 provides flexibility enabling the students to opt self learning in the respective semester and can appear for continuous assessment and semester end examinations as per the examinations schedule and fulfill the credit requirement for the award of the B. Tech. program. In such cases, the attendance at the industries/research organization shall be taken for promotion from one semester to subsequent higher semesters for a duration of 15 weeks.

5.10. **Industry Supported Courses**

a. Students can opt for one-credit courses, offered by experts from industry/research organizations which are approved by academic council. Students can register such coursesfrom his/her second year of study as and when these courses are conducted by various departments. A student is also permitted to register for the courses of other departments, provided the student has fulfilled the necessary pre-requisites of the course being offered andsubject to the approval of both the Heads of Departments. There is no limit to the number of 1-credit or 2-credit courses a student can register during the programme of study. However, a student can register for only one course in a semester. These courses are evaluated by the respective course coordinator of the programme. The maximum number of credits that can be earned from industry supported courses is limited to four
b. If a student does not successfully complete the registered industry supported 1-credit or 2-credit courses in a semester, the registration of that course will be considered as cancelled. Further, it will not be treated as arrear and no supplementary examination will be conducted; alternatively, if he/she wishes, he/she can re-register for the same course in the ensuing semesters and successfully complete it as and when it is offered subsequently
c. The credits earned through these courses will be treated over and above the credit requirement for the award of the B. Tech. (Regular, Honours and Minor with specialization) programs

5.11. **Semester Away Programme (SAP) to Promote Multi-disciplinary Skills (Choice Based Semester System):** The interested students can have the option of undergoing Semester Away Programme leveraging Choice Based Semester System during semester VII with Higher Learning Institutions at Foreign Countries or Institutions of National Repute or Research Organizations in India, by earning necessary equivalent credits in the semester VII through course study, projects or whatever terms and conditions as prescribed by the respective organization.In addition to the above, the students can opt a combination of 1-, 2-, 3-, 4-credit

courses to compensate the credits required for semester VII on self study mode in case of shortage of credits.The students who are interested to opt for SAP shall register to the office of CoE during the beginning of semester III and initiate self-study mode for futuristic compensation of credits. The registration for this SAP is valid as long as the students maintain 8.0 CGPA in all semesters with no history of arrears. Incase, if the student fails to register during the above said period, he/she may register for the same by taking prior permission from the respective Head of the Department. Further, the students are encouraged to opt inter-disciplinary courses of their interest (need not be in the area of the program of study). The Controller of Examinations shall ensure that necessary approvals are taken from the Academic Council well before the time period of their SAP. In case of any uncertain circumstances, if the student fails to complete SAP, the registration will be cancelled automatically and he/she can earn the credits required for that particular semester through self-study mode.

5.12. **Procedure for Awarding Marks for Continuous Assessment**

Theory(Internal: 30 Marks | External 70 Marks)

Continuous Internal Assessment #1 (First two and half units with a duration of 90 Minutes)

Descriptive Examination	: 20 Marks
Assignment	: 05 Marks

Continuous Internal Assessment #2 (Next two and half units with a duration of 90 Minutes)

Descriptive Examination	: 20 Marks
Assignment	: 05 Marks

Comprehensive Quiz (50 Multiple Choice Questions each carries 01 mark and scaled down to 05 Marks)

The final internal marks will be awarded by considering equal proportion for both the CIA which shall be scaled down to 25 marks and 05 marks from comprehensive quiz.

Laboratory Courses (Internal: 30 Marks | External: 70)

Total Internal Marks	**: 30 Marks**
Distribution for Continuous Evaluation	
Continuous Assessment	: 10 Marks
Record	: 10 Marks
Internal Test	: 10 Marks
Total External Marks	**: 70 Marks**
Experiment & Viva - Voce	: 50 Marks
Video assessment (Learning outcome)	: 20 Marks (One video shall be uploaded by the student demonstrating the self reflection on that particular laboratory course for grading)

Drawing and Design Related Courses(Internal: 30 Marks | External: 70 Marks)

Total Internal Marks	: 30 Marks
Distribution for Continuous Evaluation	
Continuous Assement	: 15 Marks
Internal Test	: 15 Marks
Total External Marks	: 70 Marks

There shall be two internal tests in a semester for 15 marks each and final marks will be calculated by considering equal proportion for both the CIA.

Mandatory Courses

Assessment	:As prescribed in the Academic Regulation
Online certification course	:01 course (in the relevant area of the pursuing mandatory course with a minimum duration of 30 hours and the students need to submit the certification of completion and assessment compliance issued by the respective online learning platforms)

Technical Paper Writing

Internal Review #1	: 10 Marks
Internal Review #2	: 10 Marks
Final Review and Presentation	: 30 Marks

Paper Publications: Students are requested to publish their review articles to either peer-reviewed journals or any one of the reputed conferences and submit the published paper. It is mandatory for the award of the degree. Academic regulation suggest to publish the articles either in UGC – CARE or journals indexed by SCOPUS.

Summer Internship (Internal: 50 Marks)

Interim Assessment and Report Writing	: 20 Marks
Final Presentation	: 30 Marks

Full Summer Internship (Internal: 100 Marks | External: 100 Marks)

Interim Review #1 (Industry Supervisor)	: 20 Marks (Rubrics based)
Interim Review #2 (Industry Supervisor)	: 30 Marks (Rubrics based)
Terminal Presentation	: 15 Marks (Presentation)
Report	: 25 Marks
Video based assessment	: 10 Marks

In all the continuous assessment pertaining to internship, the major focus of the assessment will be predominently on skills and application of knowledge viz. Communication Skills, Team-Work, Organization Skills, Interpersonal Skills, Analytical and Problem Solving Skills, Leadership Skills, Work Ethics and any specific intiatives by the interns.

Skill Oriented Courses (Internal: 50 Marks)

Interim Assessment and Report Writing	:15 Marks

Outcomes	: 20 Marks
Final Presentation	:10 Marks
Video based assessment	: 05 Marks

The outcomes shall be in the form of design, development of working model of a system component or a product and these 20 marks shall be awarded based on Rubrics that addresses Critical Thinking, Creativity, Collaboration and Communication.

Project (Internal: 100 Marks | External: 100 Marks)

Distribution of Marks (Continuous Internal Assessment)

Innovativeness of the Project	: 10 Marks
Literature Survey	: 05 Marks
Experimentation/ Simulation	: 15 Marks
Presentation, Interpretation& Analysis of Results	: 15 Marks
Interim Review #1(Presentation)	: 05 Marks
Interim Review #2 (Presentation)	: 05 Marks
Product Development	: 15 Marks
Terminal Presentation	: 10 Marks
Report	: 05 Marks
Publication in Conference / Journal (CARE)	: 05 Marks
Video based assessment	: 05 Marks (Mandatory)
Online Certification	: 05 Marks (Mandatory)

The online certification shall be from MOOCs platform with a minimum duration of 30 – 45 hours and the student need to earn the certification and for which there will not be any further assessment from the institution or program of study.

A student shall earn the following percentage of minimum percentage of marks in each theory, practical, design and drawing course in B. Tech. program.

- A minimum of 35% (24 and above out of 70 marks) of marks for each course Semester End Examinations (SEE) and
- A minimum of 40% marks for each course considering both CIA and SEE taken together

6. Attendance Finalization and Result Declaration

6.1. Procedure

The attendance shall be calculated as per this autonomous regulation 2020 for the students to appear for the end semester examinations as per clause 6.2. The Institute shall formulate a committee "Joint Board" constituting of Principal (Chairman), Chairpersons of all Boards of Studies, Controller of Examinations (Member Secretary) and two senior members of faculty. The tenure for the senior members of faculty shall be of 2 years. The member secretary shall place the attendance of all the students before the Joint Board for approval before the finalization and declaration of attendance. The same procedure shall be adopted for declaring the end semester examination results.

6.2. Attendance Requirements and Result Declaration Procedure

a. A student shall be eligible to appear for the end semester examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the courses in a semester and shortage of attendance below 65% shall in no case be condoned and such cases will not be permitted to appear for the end semester examinations
b. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be permittedbased on medical leave (hospitalization / accident / specific illness) and on-duty leave for participation in College / University / State / National / International Sports events with prior approval from the competent authority. After taking necessary approval from the Head of the Institution or Competent Authority, the student shall be permitted to appear for the end-semester examination by paying the condonation fee as prescribed by the Office of CoE. However, the student who have represented the college in outside world activities shall be exempted in paying the condonation fee
c. A student who has secured less than 40% of attendance in a particular course shall not be permitted to appear for the end semester examination though he/she maintains more than 75% of attendance in aggregate of all courses in that particular semester. In such cases, the student need to reappear physically as and when the courses are being offered by the respective department and accordingly the time-table shall be optimized to avoid overlapping
d. Students, who do not meet the minimum required attendance in a semester, shall be detained in that particular semester and they will not be promoted to the next semester. In such cases, the student need to rejoin in that particular semester in the subsequent academic year
e. Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student
f. In case if there are any professional electives and/or open electives, the same may also be re-registered if offered by the respective program of study. However, if those electives are not offered in the later semesters, alternatively, the students may opt other electives from the same set of elective courses offered under that category in that particular semester

7. Promotion Policies

During the four year (Regular) or three year (Lateral) program of study, it is mandatory for all students to maintain a minimum of 40% of the credits pertaining to the current year of study to get promoted to subsequent year of study, say 2nd year to 3rd year and so on. In case if the student fails to earn the necessary percentage of credits required for promoting to subsequent year of the program of study, he/she will be detained and he/she need to earn the required credits and take re-admission in the subsequent years of the academic year to complete the B. Tech. degree program.

8. Eligibility for the Award of the Degree

A student shall be declared to eligible for the award of the degree in B. Tech. (Regular) program if he/she has fulfilled the following requirements

a. The student should eam the minimum requirement of credits (160 for regular admission and 121
credits for lateral entry) and cleared all the mandatory courses as prescribed in the curriculum within the maximum duration of 8 consecutive academic years (Regular) and 6 consecutive academic years (Lateral) from date of admission
b. The student should maintain more than 5 CGPA at any point of time
c. The student shall not have any pending disciplnary issues

The student shall forfeit his/her Degree and his/her admission stands cancelled if he/she fails to meet the above compliance.

9. Award of Grades

Range of Marks	Letter Grade	Grade Point
>= 90	'O'	10
>= 80 < 90	'A+'	09
>= 70 < 80	'A'	08
>= 60 < 70	'B+'	07
>= 50 < 60	'B'	06
>= 40 < 50	'C'	05
< 40	'F'	0
Absent	'AA'	0
Non completion of a semester (Repeat)	'I'	0
Withdrawal from end semester examination	'W'	0

After completion of the programme, the Cumulative Grade Point Average (CGPA) from the I Semester to VIII Semester (from III to VIII semester for lateral entry) is calculated using the formula:

$$CGPA = \frac{\sum_{i=1}^{n-1}(c_i \times g_i)}{\sum_{i=1}^{n-1} c_i}$$

where 'n' is the number of courses registered for, 'c_i' is the credits allotted to the given course and 'g_i' is the grade point secured in the corresponding course

10. Classification of the Degree Awarded

a. **B. Tech. (Honors):** In addition to the requirement as cited in (10.c), if the student secures 20 additional credits in accordance with the clause (14), he/she shall be declared with B. Tech. (Honors)

b. **B. Tech. (Minor with Specialization):** In addition to the requirement as cited in (10.c), if the student secures 20 additional credits in accordance with the clause (15), he/she shall be declared with B. Tech. (Minor with Specialization)

c. **B. Tech. (Regular) - First Class with Distintion:** The student who qualifies for the award of the B. Tech. degree in the chosen program of study with 160 credits (Regular) and 121 credits (Lateral) within 5 consecutive academic years (Considering the formal approval for the break of study from the competent authority) from the date of admission at his/her first attempt maintaining 7.5 CGPA and above shall be declared to have passed in first class with distintion and should not have been prevented from appearing end semester examinations for the want of attendance requirements

d. **B. Tech. (Regular) - First Class:** The student who qualifies for the award of the B. Tech. degree in the chosen program of study with 160 credits (Regular) and 121 credits (Lateral) within 4 consecutive academic years from the date of admission maintaining 6.75 CGPA and above shall be declared to have passed in first class and should not have been prevented from appearing end semester examinations for the want of attendance requirements

e. **B. Tech. (Regular) - Second Class:** The student who qualifies for the award of the B. Tech. degree in the chosen program of study with 160 credits (Regular) and 121 credits (Lateral) within 8 consecutive academic years from the date of admission maintaining 5.75 CGPA and above and less than 6.75 CGPA shall be declared to have passed in second class

f. **B. Tech. (Regular) - Pass:** All other students who have not covered and qualifies for the award of the degree maintaining 5.00 CGPA and above and less than 5.75 CGPA shall be declared to get Pass with minimum credit requirement for the award of the degree in B. Tech. program

11. Flexibility to Add or Drop Self Study Courses (SSC)

a. It is mandatory that all the students need to earn the minimum number of the credits for the award of B. Tech. degree in their respective program of study. However, a student can earn more number of credits if he/she opt, by registering additional courses, from the list of courses available in the curriculum of all disciplines, over and above to the existing courses from semester IV – VI. The student shall be permitted to drop any SSC at any point of time and registration for such courses gets cancelled and will not be reflected in Cumulative Grade Memo (CGM)

b. All the courses registered and cleared by a student in this mode will be mentioned in the CGM as additional acquired. However, the CGPA is calculated as per the minimum requirement of the credits for the award of the B. Tech. degree

12. Withdrawal from the Examination

a. A candidate may, for valid reasons, be granted permission by the Principal to withdraw from appearing for the examination in any course or courses of only one semester examination during the entire duration of the Degree Programme. Also, only ONE application for withdrawal is permitted for that semester examination in which withdrawal is sought

b. Withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination and if it is made prior to the commencement of the examination in that course or courses and also recommended by the Head of the Department

c. Such withdrawal from the examination shall be treated as absent for the 1st attempt to the respective examination and will lose the eligibility for First Class with Distinction

d. If any student is intended to drop FSI subsequent to his/her registration followed by allotment, he/she needs to re-register the course

13.Transitory Regulations: To enable the students to take admission or entry into NSRIT from other Institution either by Transfer, Re-admission, Admission, or Transfer from other engineering Institution affiliated to JNTUK/Academic regulation within the Institute, the following regulations shall be followed based on the nature of case as cited above.

- Transfer of candiate from Autonomous / Non-Autonomous Institution affiliated to JNTUK
- Within the Institution from one regulation to other academic regulation

a. Transfer of a candidate from Autonomous / Non-Autonomous Institution affiliated to JNTUK

Any canddate who is interested to take admission in NSRIT from a non-autonomous engineering institution affiliated to the parent university either in the semester III or thereafter, shall acquire the

credits required for graduation as per the Institute autonomous regulations and the candidature shall be treated under following category

Students from non-autonomous institution seeking admission into semester III shall be treated in par with the students taking admission for 3 year program of study (i.e. lateral entry students) and should have cleared all the courses in the semester I and II as per university regulation. The same shall be calculated as per NSRIT regulations if the student is seeking admission into NSRIT from an autonomous institution. The credits earned during semester I and II shared be calculated as per the Institute autonomous regulations and in case if the earned credits during first two semestersare not adequate to take admission in the semester III, the student shall take additional courses approved by the respective Board of Studies and Academic council during semester III at NSRIT on self study mode and the same procedure shall be followed for taking admission into higher semesters

b. **Within the Institution from one regulation to other academic regulation**

A student taking admission under one regulation, say Academic Regulation 2020 in the first year, shall continue with the same regulation and should earn the necessary credits as metioned in the academic regulation at the time of joining. However, In case of readmission into a subsequent new regulation, and if the readmission is into any of the semesters from semester I through IV, the student shall follow the current regulations to which he/she taking admission and continue with the same regulation till graduation. In case of any credit shortage, the necessary credits shall be earned on self study mode to compensate the required number of credits. In case of excess credits, it will be treated as over and above.

In both the cases (a) and (b), the details shall be forwarded to the parent university along with the proceedings of the Academic Council.

14. **B.Tech. (Honors):** The curriculum provides flexibility to enable the students to register for B.Tech. (Honors) program by earning additional 20 credits which is over and above the requirement for the award of B.Tech.(Regular) degree. He/She shall register in the office of the CoE during semester III provided he/she secures ≥8 CGPA without backlogs in earlier semesters. If he/she wishes to withdraw from B.Tech. (Honors) program at any point of time, the credits obtained will not be compensated for the award of the degree and considered as over and above. The maximum enrollment B. Tech. (Honors) shall be restricted to 10% of the total intake in a particular batch of students.

The additional 20 credits shall be earned by opting four 4-credit courses offered by the respective program of study which are categorized in the curriculum and these courses shall be offered with a combination of guided learning or taught courses or self study mode depending on the total number of students registered for that particular course and the Chairperson of the Board of Studies reserves the right to decide the mode of delivery. Apart from this, he/she shall choose two 2-credit MOOCs of 30 hours or 6 weeks duration. Above all, if any student fails to maintain the 8 SGPA in the subsequent semesters after semester III, the registration for the B. Tech. (Honors) program stands cancelled without any notification. In case of students admitted through lateral entry, the CGPA compliance will be considered from semester III onwards as already mentioned.

15. **B.Tech. (Minor with Specialization):** The curriculum provides flexibility to enable the students to register for B. Tech. (Minor with Specialization) program by earning additional 20 credits which is over and above the requirement for the award of B. Tech. (Regular) degree. He/She shall register in the office of the CoE during the semester III provided he/she secures ≥8 CGPA without backlogs in earlier semesters. If he/she wishes to withdraw from B. Tech. (Minor with Specialization) program at any point of time, the credits obtained will not be compensated for the award of the degree and considered as over and above. In case of students admitted through lateral entry, the CGPA compliance will be considered from semester III onwards.

    The student shall opt three inter-disciplinary courses each of 3-credit as listed in the curriculum offered by other programs and one 3-credit MOOCs of 30 hours or 6 weeks duration in addition to a project of 8-credit leading to design, process development, system component design & fabrication and application development relevant to the chosen field of interest prescribed in the curriculum.

16. **Academic Bank of Credits:** This academic regulation 2023 provides complete scope of academic flexibility in accordance with The Gazette of India, the notification issued by UGC pertaining to the Academic Bank of Credits (ABC) vide File No. 14-31/2018 (CPP – II) dated 28th July, 2021, New Delhi. The ABC provides a full length academic flexibility while removing rigid curriculum boundaries and creating new possibilities of life-long learning.

    Incase with students registering under ABC, it is very much mandate and recommended to complete the courses pertaining to professional core and the courses at the lower semesters, especially, the courses pertaining to Mathematics, Physics, Chemistry and few related to Engineering Sciences. Further, the students opting for industry connect courses can be accumulated, transferred and redeemed for the award of B. Tech (Regular) degree alone and courses in the curriculum other than the category of Basic Sciences, Engineering Sciences and Professional Core can be compensated.

17. **Temporary Break of Study from the Program**: The curriculum provides flexibility for the students having ≥9 CGPA to take a break of one year at any time after the end of I/II/III year of study to pursue entrepreneurship on full time. This period of gap shall be counted for the maximum time of graduation. A committee approved by the Academic Council shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the break of study.

18. **Revision of the Academic Regulations and Curriculum**

    The Joint Board Committee and the Academic Council of the institute reserve the right to revise, change or amend the regulations, the scheme of examinations, the curriculum and the syllabi from time to time if found necessary.

19. **Representation of Special Cases**

    In case of any clarification in the interpretation of the above rules and regulations, they shall be referred to the Joint Board Committee through the Head of the Institution. The Joint Board Committee will offer suitable interpretations/ clarifications /amendments required for special case on such references and get them ratified in the next meeting of the Academic Council. The decision of the Academic Council is final.

20. Curriculum and Syllabi of various Programs of Study (Scan to view the Program Curriculum and Syllabi)

Civil Engineering

Preamble: The curriculum of B. Tech. (Civil Engineering) program offered by the Department of Civil Engineering under Academic Regulation 2020 is prepared in accordance with the curriculum framework of AICTE, UGC and Andhra Pradesh State Council of Higher Education (APSCHE). Further this Outcome Based Curriculum (OBC) is designed with Choice Based Credit and Semester System (CBCSS) enabling the learners to gain professional competency with multi-disciplinary approach catering the minimum requirement (Program Specific Criteria) of Lead Societies like American Society of Civil Engineering (ASCE) and other Professional Bodies as per the Engineering Accreditation Commission (EAC) of ABET and NBA. In addition, the curriculum and syllabi are designed in a structured approach by deploying Feedback Mechanism on Curriculum from various stakeholders viz. Industry, Potential Employers, Alumni, Academia, Professional Bodies, Research Organizations and Parents to capture their voice of the respective stake holders.

The Curriculum design, delivery, and assessment, the three major pillars of academic system is completely aligned in line with Outcome Based Education (OBE) to assess and evaluate the learningoutcomes facilitating the learners to achieve their Professional and Career Accomplishments.

The Vision

To train the students to be professional and competent Civil Engineers to take up the challenges in the society and strive continuously for excellence in education and research

The Mission

- To provide quality education for successful career and higher studies in Civil Engineering
- To emphasizes academic and technical excellence in the profession
- To take up consultancy and research in solving the problems related to Civil engineering

Program Educational Objectives (PEOs)

The PEOs are the educational goals that reflect Professional and Career Accomplishments that a graduate should attain after 4 – 5 years of his/her graduation.

The graduates of Civil Engineering of NSRIT will

1. Demonstrate the real-world Engineering problem solving skills by applying the fundamental and conceptual engineering knowledge as a practicing civil engineer or as a member/lead in a multidisciplinary project setting that utilize 21st century skills
2. Provide research-based engineering solutions addressing the tribble bottom line of environment and sustainability maintaining the professional standards, ethics, and integrity
3. Foster self-directed learning through their professional experience and research, technology advancements in their relevant field of interest and desiring graduates pursue advanced higher education

Program Outcomes (POs)

The POs are the transactional statements of graduate attributes (GAs) that each graduating engineer should possess in terms of knowledge, skill and behavior with a minimum target performance level at the time of graduation as fixed by the program of study seeking continuous improvement year on year.

The graduates of Civil Engineering of NSRIT will be able to demonstrate the following outcomes in terms knowledge, skill, and behavioral competencies at the time of graduation with the expected target performance level

1. Apply the knowledge of basic sciences and fundamental engineering concepts in solving engineering problems (Engineering Knowledge)
2. Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences (Problem Analysis)
3. Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations (Design/Development of Solutions)
4. Perform investigations, design and conduct experiments, analyse and interpret the results to provide valid conclusions (Investigation of Complex Problems)
5. Select/develop and apply appropriate techniques and IT tools for the design & analysis of the systems (Modern Tool Usage)
6. Give reasoning and assess societal, health, legal and cultural issues with competency in professional engineering practices (The Engineer and Society)
7. Demonstrate professional skills and contextual reasoning to assess environmental/societal issues for sustainable development (The Environment and Sustainability)
8. Demonstrate Knowledge of professional and ethical practices (Ethics)
9. Function effectively as an individual, and as a member or leader in diverse teams, and in multi- disciplinary situations (Individual and Team Work)
10. Communicate effectively among engineering community, being able to comprehend and write effectively reports, presentation and give / receive clears instructions (Communication)
11. Demonstrate and apply engineering & management principles in their own / team projects in multidisciplinary environment (Project Finance and Management)
12. Recognize the need for, and have the ability to engage in independent and lifelong learning (Life Long Learning)

Program Specific Outcomes (PSOs)

1. Demonstrate adequate core competency in planning, analyzing, and designing structural elements/structures, basic transportation and environmental systems, hydraulic structures, and similar others, as well as providing sustainable computer aided solutions that meet Indian codes of practice (BIS) adopting ethical practices
2. Demonstrate adequate knowledge in the allied specialization of Civil Engineering that adds value addition for professional practices

Category-wise Credit Distribution of Courses

	Category	AICTE	APSCHE	NSRIT (A)
HS	Humanities and Social Science	12.0	10.5	10.5
BS	Basic Science	25.0	18.0	21.0
ES	Engineering Science	24.0	22.5	21.0
PC	Professional Core	48.0	55.5	54.0
PE	Professional Elective	18.0	15.0	15.0
OE	Open Elective	18.0	12.0	12.0
IN	Internship (s), Project & Seminars	15.0	16.5	16.5
SC	Skill Oriented Courses	-	10.0	10.0
MC	Mandatory Courses	-	-	-
AC	Audit Course	-	-	-
	Total no. of credits	160	160	160

Civil Engineering

Credit requirement for the award of the degree under academic Regulation 2020 – 2021 for the candidates admitted from the academic year 2021 onwards

	Four Years	Three Years
B. Tech. (Regular Degree)	160	121
B. Tech. (Honors Degree)	180	141
B. Tech. (With Minor specialization other than Chosen Branch of Engg. & Tech.)	180	141

Semester I

No.	Code	Course	POs	Contact Hours L	T[1]	P	C	
01	20HSX01	Communicative English	10	3	0	0	3.0	HS
02	20BSX11	Linear Algebra and Differential Equations	1, 12[2]	3	1	0	3.0	BS
03	20BSX21	Engineering Chemistry	1	3	0	0	3.0	BS
04	20ESX01	Engineering Drawing	1, 5, 10	1	0	4	3.0	ES
05	20ESX02	Programming for Problem Solving Using 'C'	1	3	0	0	3.0	ES
06	20HSX02	Communicative English Lab	10	0	0	3	1.5	HS
07	20BSX22	Engineering Chemistry Lab	1, 4	0	0	3	1.5	BS
08	20ESX07	Programming for Problem Solving Using 'C' Lab	1, 4	0	0	3	1.5	ES
			Sub-total	13	01	13	**19.5**	

Semester II

01	20BSX12	Partial Differential Equations and Vector Calculus	1	3	1	0	3.0	BS
02	20BSX31	Engineering Physics	1	3	0	0	3.0	BS
03	20ESX05	Basic Electrical and Electronics Engineering	1	3	1	0	3.0	ES
04	20ESX04	Engineering Mechanics	1	3	1	0	3.0	ES
05	20CE201	Building Materials	2, 5	3	0	0	3.0	ES
06	20BSX32	Engineering Physics Lab	1, 4	0	0	3	1.5	BS
07	20ESX08	Basic Electrical and Electronics Engineering Lab	1, 4	0	0	3	1.5	ES
08	20ESX06	Engineering Workshop	4	0	0	3	1.5	ES
09	20MCX01	Environmental Science	1	2	0	0	-	MC
			Sub-total	17	03	09	**19.5**	

Semester III

01	20BSX13	Numerical Methods and Transforms	1	3	1	0	3.0	BS
02	20CE302	Building Planning and Drawing	1, 10, PSO 1	3	0	0	3.0	PC
03	20CE303	Surveying	1	3	1	0	3.0	PC
04	20CE304	Strength of Materials	1, PSO #1	3	1	0	3.0	PC
05	20CE305	Fluid Mechanics	1, 3, PSO #2	3	1	0	3.0	PC
06	20CE306	Surveying Lab	5, 10	0	0	3	1.5	PC
07	20CE307	Strength of Materials Lab	1, 4	0	0	3	1.5	PC
08	20CE308	Fluid Mechanics and Hydraulic Machinery Lab	1, 4	0	0	3	1.5	PC
09	20CES01	Short-term Skill Oriented Elective	1, 5, 10	0	0	4	2.0	SC
10	20MCX02	Constitution of India[3]	-	2	0	0	-	MC
			Sub-total	18	04	11	**21.5**	

[1] Suggested tutorial hours will not carry any credits
[2] By default, all courses are mapped to PO 12 as they are weakly contributing
[3] It is mandate for all students to pursue an online certification course for minimum duration of 30 hours covering the areas of Sustainability, Climate changes, Environmental Impact Assessment in line with Sustainable Development Goals (SDG)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-53117

Semester IV

No.	Code	Course	POs	Contact Hours L	T	P	C	
01	20HSX03	Managerial Economics and Financial Analysis	11	3	0	0	3.0	HS
02	20CE402	Hydraulics and Hydraulic Machinery	1, 3, PSO #2	3	1	0	3.0	ES
03	20CE403	Concrete Technology	1, 2, 6, 8	3	0	0	3.0	PC
04	20CE404	Soil Mechanics	1, 2, 3, 6, PSO #1	3	0	0	3.0	PC
05	20CE405	Construction Project Management	11	3	0	0	3.0	PC
06	20CS407	Python Programming Lab	1	0	0	3	1.5	ES
07	20CE407	Concrete Technology Lab	1, 2, 4	0	0	3	1.5	PC
08	20CE408	Soil Mechanics Lab	1	0	0	3	1.5	PC
09	20CES02	Short-term Skill Oriented Elective	1, 5, 10	0	0	4	2.0	SC
			Sub-total	16	01	11	**21.5**	

Semester V

01	20CE501	Structural Analysis	1, PSO 1	3	1	0	3.0	PC
02	20CE502	Design of Reinforced Concrete Elements	1, 3, 8, PSO #1	3	1	0	3.0	PC
03	20CE503	Foundation Engineering	1, 3, 6, PSO #1, 2	3	1	0	3.0	PC
04	-	Professional Elective I	-	3	0	0	3.0	PE
05	-	Open Elective I	-	3	0	0	3.0	OE
06	20CE506	Drawing of Reinforced Concrete Structures	1, 3, PSO #1	0	0	3	1.5	PC
07	20CE507	Irrigation Design and Drawing	5, 10, 6, PSO #1, 2	0	0	3	1.5	PC
08	-	Technical Paper Writing[4]	1, 4, 5, 10	0	0	4	2.0	SC
09	20MCX03	Intellectual Property Rights and Patents[5]	-	2	0	0	-	MC
10	-	Summer Internship #1[6] / CSP	5, 8, 9, 10, PSO 1	0	0	0	1.5	IN
			Sub-total	17	03	08	**21.5**	

[4] The students are expected to identify one research area in the recent trends, collect recent research articles, prepare a technical research review paper and publish in renowned annual conferences/ journals, preferably indexed in Scopus or UGC care

[5] The students are expected to identify one research area in the recent trends, collect recent research articles, prepare a technical research review paper and publish in renowned annual conferences/ journals, preferably indexed in Scopus or UGC care

[6] The work pertaining to summer Internship #1 and #2 shall be completed at the end of the semesters IV & VI respectively. The assessment shall be carried out during the semesters V and VII
It is mandate for all the students to undergo 4-6 weeks of industrial training and appear for assessment during Semester V with report. With regard to Community Service Project (CSP), based on the availability the students can opt CSP as an alternate option for summer internship #1 for a duration of 08 weeks

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam

Semester VI								
01	20CE601	Transportation Engineering	PSO 2	3	0	0	3.0	PC
02	20CE602	Design of Steel Structures	3, 10, PSO #1	3	1	0	3.0	PC
03	20CE603	Environmental Engineering	2, 3,6, PSO #2	3	0	0	3.0	PC
04	-	Professional Elective II	-	3	0	0	3.0	PE
05	-	Open Elective II	-	3	0	0	3.0	OE
06	20CE606	Detailing and Drawing of Steel Structures	10, PSO 1	0	0	3	1.5	PC
07	20CE607	Transportation Engineering Lab	4, PSO 2	0	0	3	1.5	PC
08	20CE608	Environmental Engineering Lab	4, PSO 2	0	0	3	1.5	PC
09	20CES04	Short-term Skill Oriented Elective	1, 5, 10	0	0	4	2.0	SC
10	20MCX04	Indian Traditional Knowledge[7]	-	2	0	0	-	MC
			Sub-total	17	01	13	**21.5**	
Semester VII								
01	-	Professional Elective III	-	3	0	0	3.0	PE
02	-	Professional Elective IV	-	3	0	0	3.0	PE
03	-	Professional Elective V	12	3	0	0	3.0	PE
04	-	Open Elective III	-	3	0	0	3.0	OE
05	-	Open Elective IV	12	3	0	0	3.0	OE
06	20HSX04	Professional Ethics	8	3	0	0	3.0	HS
07	20CES05	Finishing School for Civil Engineering	9, PSO 1	0	0	4	2.0	SC
08	-	Summer Internship #2[8]	5, 8, 9, 10, PSO 1	0	0	0	3.0	IN
			Sub-total	18	0	04	**23.0**	
Semester VIII								
01	-	Full Semester Internship[9]	5-10, PSO 1, PSO 2	0	0	0	06	IN
02	-	Capstone Project	5-10, PSO 1, PSO 2	0	0	0	06	IN
			Sub-total	0	0	0	**12.0**	
			Total Credits	-	-	-	**160**	

[7] It is mandate for all the students to pursue an online certification course for minimum duration of 30 hours covering the application of ITK in Science Engineering & Technology

[8] It is mandate for all the students to undergo 6-8 weeks of industrial training and appear for assessment during Semester VII with report and those opted FSI during Semester VII shall appear through online for reviews

[9] Students opting for FSI in VII semester have to take up courses of VII semester in VIII semester. The students are expected to do a capstone project parallelly demonstrating their POs & PSOs and submit a separate report

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

List of Electives

Professional Elective #1								
1	20CE001	Advanced Concrete Technology	-	3	0	0	3.0	PE
2	20CE002	Environmental Geotechnics	-	3	0	0	3.0	PE
3	20CE003	Transportation Planning and Management	-	3	0	0	3.0	PE
4	20CE004	Water Resources Systems Planning and Management	-	3	0	0	3.0	PE
5	20CE005	Construction Equipment Automation	-	3	0	0	3.0	PE
6	20CE006	Harbor Engineering	-	3	0	0	3.0	PE
Professional Elective #2								
7	20CE007	Pre-Stressed Concrete	-	3	0	0	3.0	PE
8	20CE008	Environmental Impact Assessment	-	3	0	0	3.0	PE
9	20CE009	Pavement Analysis and Design	-	3	0	0	3.0	PE
10	20CE010	Urban Hydrology	-	3	0	0	3.0	PE
11	20CE011	Sustainable Construction Methods	-	3	0	0	3.0	PE
12	20CE012	Advanced Structural Analysis	-	3	0	0	3.0	PE
Professional Elective #3								
13	20CE013	Repair and Rehabilitation of Structures	-	3	0	0	3.0	PE
14	20CE014	Solid Waste Management	-	3	0	0	3.0	PE
15	20CE015	Traffic Engineering	-	3	0	0	3.0	PE
16	20CE016	Hydraulic Structures	-	3	0	0	3.0	PE
17	20CE017	Construction Cost Analysis	-	3	0	0	3.0	PE
18	20CE018	Coastal Zone Management	-	3	0	0	3.0	PE
Professional Elective #4								
19	20CE019	Self-Healing Concrete	-	3	0	0	3.0	PE
20	20CE020	Solid Waste Management	-	3	0	0	3.0	PE
21	20CE021	Urban Transportation Planning	-	3	0	0	3.0	PE
22	20CE022	Hydro Power Engineering	-	3	0	0	3.0	PE
23	20CE023	Safety Engineering	-	3	0	0	3.0	PE
24	20CE024	Ocean Engineering	-	3	0	0	3.0	PE
Professional Elective #5								
The curriculum provides academic flexibility to choose any of the domain specific courses from MOOCs as approved by the respective Board of Studies and Academic Council. The students can take up this course on self-study mode. The course shall be of 45 – 60 hours duration (4-credits) and the assessment shall be as per the academic regulation 2020.								PE
Open Elective #1								
29	23CE001	Urban Environmental Service	-	3	0	0	3.0	OE
30	23CS001	Data Structures and Algorithms	-	3	0	0	3.0	OE
31	23AI001	Machine Learning for Engineers	-	3	0	0	3.0	OE
32	23DS001	Introduction to Database Management Systems	-	3	0	0	3.0	OE
33	23EC001	Architectures and Algorithms of IoT	-	3	0	0	3.0	OE
34	23EE001	Introduction to Renewable Energy Sources	-	3	0	0	3.0	OE
35	23ME001	Nano Technology	-	3	0	0	3.0	OE
36	23SH001	Women and Society	-	3	0	0	3.0	OE
Open Elective #2								
37	23CE002	Ecology, Environment and Resource Management	-	3	0	0	3.0	OE
38	23CS002	Designing the Internet of Things	-	3	0	0	3.0	OE
39	23AI002	Fundamentals of Deep Learning	-	3	0	0	3.0	OE
40	23DS002	Introduction to Data Science	-	3	0	0	3.0	OE
41	23EC002	IoT for Smart Grids	-	3	0	0	3.0	OE
42	23EE002	Electrical Safety and Management	-	3	0	0	3.0	OE
43	23ME002	Fundamentals of Automobile Engineering	-	3	0	0	3.0	OE
44	23SH002	Constitution of India	-	3	0	0	3.0	OE
Open Elective #3								
44	23CE003	Disaster, Risk Mitigation and Management	-	3	0	0	3.0	OE
45	23CS404	Operating System	-	3	0	0	3.0	OE
46	23AI003	Intelligent Robots and Drone Technology	-	3	0	0	3.0	OE
47	23DS003	Introduction to Big Data	-	3	0	0	3.0	OE
48	23EC003	Privacy and Security in IoT	-	3	0	0	3.0	OE
49	23EE003	Low- Cost Automation	-	3	0	0	3.0	OE
50	23ME003	Industrial Automation	-	3	0	0	3.0	OE

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of [illegible]
Sontyam, [illegible]

51	23SHO03	Design Thinking	-	3	0	0	3.0	OE

Open Elective #4

The curriculum provides academic flexibility to choose any of the inter-disciplinary courses from MOOCs as approved by the respective Board of Studies and Academic Council. The students can take up this course on self - study mode. The course shall be of 45 – 60 hours duration and the assessment shall be as per the academic regulation 2023. OE

B. Tech. (Honors)

Category I

1	20CEH01	Cognitive Management of IoT for Smart Cities	-	4	0	0	4.0	HO
2	20CEH02	Energy Efficient Buildings	-	4	0	0	4.0	HO
3	20CEH03	Structural Health Monitoring	-	4	0	0	4.0	HO

Category II

4	20CEH04	Structural Failure Protection using AI	-	4	0	0	4.0	HO
5	20CEH05	Architecture and Town Planning	-	4	0	0	4.0	HO
6	20CEH06	Safety Analysis and Risk Management	-	4	0	0	4.0	HO

Category III

7	20CEH07	Intelligent Transportation Networks	-	4	0	0	4.0	HO
8	20CEH08	Building Information Modelling	-	4	0	0	4.0	HO
9	20CEH09	Traffic Engineering and Management	-	4	0	0	4.0	HO

Category IV

10	20CEH10	Structural Health Monitoring using IoT	-	4	0	0	4.0	HO
11	20CEH11	GIS and Remote Sensing	-	4	0	0	4.0	HO
12	20CEH12	Disaster Risk Mitigation	-	4	0	0	4.0	HO

B. Tech. (Minor with Specialization)

Category I

1	20CEM01	Air Pollution	-	3	0	0	3.0	MI
2	20CSM01	E-Commerce	-	3	0	0	3.0	MI
3	20MEM01	Biomaterials	-	3	0	0	3.0	MI
4	20EEM01	Basic Control Systems	-	3	0	0	3.0	MI
5	20ECM01	Semiconductor Devices & Circuits	-	3	0	0	3.0	MI
6	20AIM01	Fundamentals of Neural Networks	-	3	0	0	3.0	MI
7	20DSO03	Introduction to R Programming	-	3	0	0	3.0	MI
8	20SHM01	Psychology	-	3	0	0	3.0	MI
9	20SHM02	Statistical Methods	-	3	0	0	3.0	MI
10	20MBM01	General Management	-	3	0	0	3.0	MI
11	20MBM02	Human Resource Planning	-	3	0	0	3.0	MI

Category II

12	20CEM02	Climate Change Mitigation and Adaptation	-	3	0	0	3.0	MI
13	20CSM02	Knowledge Discovery and Databases	-	3	0	0	3.0	MI
14	20MEM02	Micro Electromechanical Systems	-	3	0	0	3.0	MI
15	20EEM02	Basics of Electrical Machines and Drives	-	3	0	0	3.0	MI
16	20ECM02	Digital Electronics	-	3	0	0	3.0	MI
17	20AIM02	Machine Learning with Python	-	3	0	0	3.0	MI
18	20DSM02	Data Management and Analysis	-	3	0	0	3.0	MI
19	20SHM03	English for Media	-	3	0	0	3.0	MI
20	20SHM04	Statistical Inference	-	3	0	0	3.0	MI
21	20MBM03	Organizational Behavior	-	3	0	0	3.0	MI
22	20MBM04	Compensation Management & Employee Welfare Laws	-	3	0	0	3.0	MI

Category III

23	20CEM03	Sustainability and Pollution Prevention Practices	-	3	0	0	3.0	MI
24	20CSM03	Database Security	-	3	0	0	3.0	MI
25	20MEM03	Surface Engineering	-	3	0	0	3.0	MI
26	20EEM03	Electrical Engineering Material Science	-	3	0	0	3.0	MI
27	20ECM03	Analog Electronic Circuits	-	3	0	0	3.0	MI
28	20AIM03	Interpretable Machine Learning	-	3	0	0	3.0	MI
29	20DSM03	Data Governance	-	3	0	0	3.0	MI
30	20SHM05	Journalism	-	3	0	0	3.0	MI
31	20SHM06	Statistical Quality Control	-	3	0	0	3.0	MI
32	20MBM05	Entrepreneurship and Business Venture Planning	-	3	0	0	3.0	MI
33	20MBM06	Performance Management and Talent Management	-	3	0	0	3.0	MI

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531

Short Term Skill Oriented Electives

34	20CES01	Python Programming		0	0	4	2.0	SC
35	20CES02	Computer Applications in Civil Engineering		0	0	4	2.0	SC
36	20CES04	Estimation and Costing		0	0	4	2.0	SC
Industry Connect Courses (Skill Oriented Courses)[10]								
37	20ICC01	Competitive Programming	-	2	0	8	6.0	ICC
38	20ICC02	Web Technologies – Transferring to Practice	-	2	0	8	6.0	ICC
39	20ICC03	Java and Spring boot	-	2	0	8	6.0	ICC
40	20ICC04	Robotics Process Automation	-	2	0	8	6.0	ICC
41	20ICC05	Information Security and Forensics	-	2	0	8	6.0	ICC
42	20ICC06	Battery System – Design Engineering	-	2	0	8	6.0	ICC
43	20ICC07	Blockchain Technology	-	2	0	8	6.0	ICC
44	20ICC08	Network Administration	-	2	0	8	6.0	ICC
45	20ICC09	Product Engineering	-	2	0	14	9.0	ICC
46	20ICC10	Machine Learning Engineer	-	2	0	8	6.0	ICC
47	20ICC11	Data Scientist	-	2	0	8	6.0	ICC
48	20ICC12	Industrial IoT	-	2	0	8	6.0	ICC

[10] The credits earned through Industry Connect Courses (Skill Oriented Course) can be tradeoff with any other 3-Credit course other than Professional Core

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

BS 20BSX13 Numerical Methods and Transforms 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO12	DoK
20BSX13.1	Calculate the approximate roots of the algebraic equations and transcendental equations by different techniques	3	1	L1, L2, L3
20BSX13.2	Make use of the concepts of interpolation to estimate the unknown functional values	3	1	L1, L2, L3
20BSX13.3	Find approximate values of finite integrals using different numerical techniques and use different algorithms for approximating solutions of ordinary differential equation to its analytical computations	3	1	L1, L2, L3
20BSX13.4	Apply the Laplace transform to solve ordinary differential equations with initial conditions	3	1	L1, L2, L3
20BSX13.5	Solve engineering problems using Fourier transforms	3	1	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Iterative Methods 11 + 1 Hour

Introduction – Bisection Method – Secant Method – Method of False Position – Iteration Method – Newton - Raphson Method – Jacobi and Gauss - Seidel Methods Solving System of Equations.

Convergence of – Bisection Method, Secant Method, Method of False Position Newton - Raphson Method

Unit II: Cayley-Hamilton Theorem and Quadratic Forms 11 + 1 Hour

Introduction – Finite Differences – Forward Differences – Backward Differences – Central Differences – Relations Between Operators – Newton's Forward and Backward Formulae for Interpolation – Interpolation with Unequal Intervals – Lagrange's Interpolation Formula – Newton's Divide Difference Formula.

Errors in Polynomial Interpolation – Error Propagation in a Difference Table - Milne's Method and Adams - Bashforth Methods

Unit III: Numerical Integration and Solution of Ordinary Differential Equations 11 + 1 Hour

Numerical Integration: Trapezoidal Rule – Simpson's 1/3rd and 3/8th Rule
Solution of Ordinary Differential Equations by Taylor's Series – Picard's method of successive approximations – Euler's Method – Runge - Kutta Method (Second and Fourth order).

Cubic Spline Interpolation, Numerical Differentiations

Unit IV: Laplace Transforms 11 + 1 Hour

Laplace Transforms of Standard Functions – Shifting Theorems – Transforms of Derivatives and Integrals. Unit Step Function – Inverse Laplace Transforms – Convolution Theorem (Without Proof).
Applications: Solving Ordinary Differential Equation (Initial Value Problems) using Laplace Transforms.

Simple Harmonic Motion, Higher Order Differential Equation with Variable Coefficient

Unit V: Fourier Transforms 11+1 Hour

Fourier Transforms: Fourier Integrals - Fourier Cosine and Sine Integrals- Fourier Transform - Sine and Cosine Transform - Properties.

Finite Fourier Sine Transforms, Finite Fourier Cosine Transform

Text Books

1. Grewal B. S., "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, 2018
2. Ramana B. V., "Higher Engineering Mathematics", Tata McGraw Hill Education, 2018

Reference Books

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhap...

1. Erwin Kreyszig, "Advanced Engineering Mathematics",10th Edition, Wiley, India, 2015
2. Bali N. P., "Engineering Mathematics", 22th Edition, Lakshmi Publications, 2018
3. Peter o'Neil, "Advanced Engineering Mathematics" 8th Edition, Cengage Publications, 2017
4. Dr. Iyenger T. K. V., Dr. Prasad. M. V. S. S. N., Ranganatham S. and Dr. Krishna Gandhi B., "Engineering Mathematics I, II & III ", S. Chand Publications, 2019

Web References

1. https://nptel.ac.in/courses/122/102/122102009/
2. https://nptel.ac.in/courses/111/106/111106139/
3. https://nptel.ac.in/courses/111/102/111102129/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	50	40
L3	30	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Identify the root lies between which values for $x^3 - 5x + 1 = 0$
2. Prove that $(1+\Delta)(1-\nabla)=1$
3. Find the first difference of the polynomial $x^4-12x^3+42x^2-30x+9$ with interval of differencing h=2
4. Define unit step function
5. State convolution theorem

L2: Understand

1. Find a real root of xtanx+1=0 using false position method
2. Find a real root of the equation $xe^x-cosx=0$ using Newton - Raphson method
3. Use Gauss backward interpolation formula to find f(32) given that f(25)=0.2707 f(30)=0.3027 ,f(35)=0.3386, f(40)=0.3794
4. Using Lagrange's formula find the value of f(1) given that

x	-2	-1	2	7
y	-1	0	4	11

5. Find $\int_0^1 \frac{1}{1+x}$ dx by (i) Trapezoidal rule (ii) Simpsons $\frac{1}{3}$rd rule (iii) Simpsons $\frac{3}{8}$th rule

L3: Apply

1. Using Newton - Raphson method compute $\sqrt[3]{37}$ correct to 4 decimal places
2. Find $\sqrt{12}$ & $\frac{1}{\sqrt{12}}$ by the fixed point iteration method
3. The population of a nation in the decimal census was given below .Estimate the population in the year 1925 using appropriate interpolation formula

Year x	1891	1901	1911	1921	1931
Population y	46	66	81	93	101

4. Given that $Sin45^0$ =0.7077, $Sin50^0$ = 0.766, $Sin55^0$ =0.8192, $Sin60^0$ =0.866 find $Sin40^0$ using Newton's forward difference formula
5. Solve $y^1=y-x^2$, y(0)=1 using Picard's method up to fourth approximation

CONTROL COPY ATTESTED

Chairman Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering

PC 20CE302 Building Planning and Drawing 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				DoK
		PO1	PO10	PO12	PSO1	
20CE302.1	Identify the factors to be considered in planning of buildings	3	3	1	3	L2
20CE302.2	Recognize different types of sign conventions and bonds in the building construction	3	3	1	3	L1, L2
20CE302.3	Plan different types of building following the Bye - Laws	3	3	1	3	L2, L6
20CE302.4	Implementing the construction practices and techniques for Doors, Windows, Ventilator and Roof trusses	3	3	1	3	L2
20CE302.5	Draw the plan, section and elevation of a building	3	3	1	3	L2, L6

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1. Remember | L2. Understand | L3. Apply | L4. Analyze | L5. Evaluate | L6. Create. DoK: Depth of Knowledge

Unit I: Sign Conventions and Bonds — 12 Hours

Earth, Water, Brick, Stone, Plaster, Sand Filling, Concrete, Glass, Steel, Cast Iron, Copper Alloys, Aluminium Alloys etc., Lead, Zinc, Tin, etc., Rock, Timber and Marbles. English Bond and Flemish Bond - Odd and Even Courses for One, One and Half, Two and Two and Half Brick Walls in Thickness at the Junction of a Corner.

Plumbing and Electrical Insulator Symbols

Unit II: Building Bye - Laws and Regulations — 12 Hours

Introduction – Terminology – Objectives of Building Bye - Laws. Principles Underlying Building Bye - Laws. Classification of Buildings. Floor Area Ratio (FAR). Floor Space Index (FSI). Specifications of the Buildings, Open Space Requirements. Built Up Area Limitations. Height of Buildings. Wall Thickness. Lighting and Ventilation Requirement.

Lighting and Ventilation Requirement

Unit III: Residential and Public Buildings — 10 Hours

Residential Buildings: Minimum Standards for Various Parts of Building Requirements of Different Rooms and their Grouping-Relationship between Plan, Elevation and Forms and Functions. Public Buildings: Planning of Educational Institutions, Hospitals, Dispensaries, Office Buildings, Banks, Industrial Buildings, Hotels and Motels, Buildings for Recreation.

Characteristics of Various Types of Residential Buildings, Landscaping Requirements

Unit IV: Doors, Windows, Ventilator and Roof trusses — 12 Hours

Panelled Door, Glazed Door, Panelled Windows, Glazed Windows, Ventilators. King Post Truss, Queen Post Truss Different Shapes of Roofs and Drawing Plans, Elevations and Cross Sections of given Sloped and Flat Roof Buildings.

Glazed Door, Glazed Window

Unit V: Planning and Designing of Buildings — 12 Hours

Draw the Plan, Elevation and Sections of a Residential and Public Buildings from the given Line Diagram.

Structural Elements of the Building

Text Books

1. Gurucharan Singh and Jagadish Singh, "Building Planning Designing and Scheduling", 5th Edition, Standard Publications Distributers, New Delhi, 2010
2. Chakravarthi M., "Building Planning and Drawing", UBS Publications, 2014
3. Shah M.G., Kale C. M. and Patki S. Y., "Building Drawing", 4th Edition, Tata McGraw Hill, New Delhi, 2002
4. Sane Y. S., "Planning and Design of Buildings", Allies Book Stall
5. Kumara Swamy N., "Building Planning and Drawing", by, 3rd Edition, Anand Charotar Publishing House Pvt. Ltd., 2010

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Tech...ogy(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Shah M. G. and Kale C. M., "Principles of Building Drawing", 2nd Edition, Trinity Publications, New Delhi, 2015
2. Verma B. P., "Civil Engineering Drawing and House planning", 12th Edition, Khanna Publishers, New Delhi, 2018
3. Civil Engineering Building practice, Suraj Singh: 12th Edition, CBS Publications, New Delhi, and Chennai, 2018
4. A series and B Series of JNTU Engineering College, Anantapur
5. Bhavikatti S. S. and Chitawadagi M. V., "Building Planning and Drawing" 1st Edition, IK International Publishing House, 2014

Web References

1. https://www.youtube.com/watch?v=i4wM8UYatPc&list=PL70qbtliJSJYqYQ81hS-a4loKr50LyF5I
2. https://www.youtube.com/watch?v=X9x_VaJZgBs&list=PL70qbtliJSJYqYQ81hS-a4loKr50LyF5I&index=10
3. https://www.youtube.com/watch?v=EXpeFmSe4iI
4. https://www.youtube.com/watch?v=gdjzGpr0GOU
5. https://www.google.co.in/?gfe_rd=cr&ei=ILgaWfKmIcHFoAOKIY_gCA#q=conventional+symbols+in+civil+engineering

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	30	30
L6	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define FSI
2. What is difference between site area and plinth area?
3. What is carpet area?
4. List out the classification of residential buildings
5. What is plinth area?

L2: Understand

1. Explain the significance of Bye-Laws in construction of residential building plans
2. Classify buildings according to the use of occupancy
3. Explain different principles used in planning a residential building along with minimum dimensions of each room
4. Draw elevation and sectional plan of panelled door of size 1000 x 2000 mm. size
5. Draw elevation and sectional plan of sloped roofs

L6: Create

1. Design the layout of a school building constructed in a village
2. Design the layout of the bank
3. Explain different principles used while planning a cinema theatre in city
4. Design the layout of a building of two bedroom with attached toilet, kitchen and hall in 2500 sft. area
5. Design the layout of a building of three storied of individual floors of 1500 sft. area

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531173.

PC 20CE303 Surveying 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO12	
20CE303.1	Identifying the basic concepts of surveying its principles and usage of chain, tape, compass and plane table instruments	3	2	2	L1, L2
20CE303.2	Determine the reduced level obtained by leveling and prepare contour maps and calculate the earth work volume and capacity of reservoirs and measuring the horizontal, vertical angles including tachometry using theodolite	3	2	2	L2, L3
20CE303.3	Executing the setting out the curve in field, conduct control surveying and possible errors and rectification in surveying	3	2	2	L2, L3
20CE303.4	Explaining photogrammetry and data acquisition process, creation of stereo model and preparation of DTM, DEM, Aero triangulation and making of ortho photos.	3	2	2	L1, L2
20CE303.5	Summarizing the Geographic Information System (GIS) as effective modern map making tool	3	2	1	L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge

Unit I: Chain, Compass and Plane Table Surveying 11 + 1 Hour

Definition – Principles – Classification – Scales – Conventional Signs – Survey Instruments, Their Care and Adjustment (Temporary and Permanent Adjustments). Chaining and Ranging - Ranging – Types. Compass – Types - Bearing – Systems and Conversions – Local Attraction - Magnetic Declination – Dip – Traversing. Brief Introduction on Plane Table Surveying and its Types.

Chain Traversing, Compass Traversing

Unit II: Leveling and Contouring 11 + 1 Hour

Basic Terms Related to Leveling – Leveling Instruments – Fly and Check Leveling – Booking – Reduction Longitudinal and Cross Sections – Plotting. Contouring: Methods Characteristics. Theodolite: Types – Description and Uses – Measurement of Horizontal and Vertical Angles – Heights and Distances – Traversing. Tachometry: Principle – Methods.

Calculation of Areas and Volumes, Uses of Contours

Unit III: Curves and Control Surveying 11 + 1 Hour

Definition – Types – Elements of Simple Curve –Setting out of Simple Curves – Linear Methods - Instrumental Methods – Compound, Reverse and Transition Curve - Functions and Requirements of – Types of Vertical Curves. Trigonometric leveling - Working from Whole to Part – Horizontal and Vertical Control Methods – Triangulation – Signals – Base Line – Satellite Station – Reduction to Centre –Analysis of Triangulation Networks - Total Station: Uses – Features – Setting Up – Orientation – Electronic Data Recording Field Procedures – Care and Adjustments of Electronic Instruments.

Functions and Requirements of Curves

Unit IV: Geomatics 11 + 1 Hour

Definition - Purpose - Data Acquisition – Photogrammetry - Aerial Photographs –Types - Flight Planning - Creation of Stereo Model – DTM - DEM - Digital Aero Triangulation - Ortho Photograph - Satellite Platforms - Resolution Types. Introduction to Cartography-Map – Scale - Coordinate System – Map Projection Types – UTM - Datum. GPS: Concept and Techniques – GPS Segments and Tracking System; Cadastral Mapping (LIS).

Image Interpretation

Unit V: Geographical information System (GIS) 11 + 1 Hour

Definition – Historical Perspective - Fundamental Units and Components of GIS - Input and Output Devices. Data Types - Spatial and Non-Spatial - Raster and Vector Data. Data Conversion - Vector to Raster, Raster to Vector. Data Structure - Data Storage and Retrieve- Data Manipulation. Data Processing - Image Classification - Supervised and Unsupervised Classification.

Topology Creation and Data Analysis, Data Output

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books

1. B C Punmia B. C., "Surveying", Volume I & II, 16th Edition, Laxmi Publications, New Delhi, 2016
2. Thomas Lillesand, Ralph w., Kiefer, Jonathan Chipman, "Remote Sensing and Image Interpretation," 7th Edition, Wiley, 2015
3. Peter Alan Burrough, Rachael A., Mc Donnell, "Principles of Geographical Information Systems", 2nd Edition, 2002
4. Duggal S.K., "Surveying", Volume I, 4th Edition, Tata McGraw Hill Ltd., Reprint 2015
5. Duggal S.K., "Surveying", Volume II, 5th Edition, Tata McGraw Hill Ltd., 2019
6. Adarsh Kumar, "Surveying", 2nd Edition, Vayu Education of India, 2020
7. Saiful Islam, "Surveying", 2nd Edition, Vayu Education of India, 2020

Reference Books

1. Basak N. N., "Surveying and Levelling", 2nd Edition, Tata McGraw Hill, New Delhi, 2014
2. Venkatramaiah C., "Text book of surveying", Universities Press (India) Private Ltd, 2011
3. Kanetkar T. P., "Surveying and Leveling", Volume I & II, United Book Corporation, 2006
4. Floyd F. Sabins, "Remote Sensing Principle and Practice", 3rd Edition, Levant Books, 2012
5. Kumar S., "Basics of Remote Sensing and GIS", 1st Edition, Laxmi Publications, 2016

Web References

1. https://theconstructor.org/surveying/
2. https://nptel.ac.in/courses/105/107/105107122/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define surveying
2. List out all the fundamental lines of theodolite
3. Write an expression to calculate horizontal and vertical distances in tacheometry when the line of sight is inclined
4. Define plane and geodetic surveying
5. Define magnetic declination and its types

L2: Understand

1. Explain the different classifications of surveying
2. Describe the principle involved in surveying
3. Compare the advantages and disadvantages of plane table surveying with those of chain surveying
4. Explain in detail about obstacles with different cases
5. Explain in detail about uses of contours

L3: Apply

1. A 20 m chain was found to be 15 cm too long after chaining a distance of 1600 m. It was found to be 30 cm too long at the end of day's work after chaining a total distance of 3200 m. Determine the correct distance if the chain was correct before the commencement of the work
2. The following perpendicular offsets were taken at 10m intervals from a survey line AB to an irregular boundary line: 2.50, 3.80, 4.33,6.76, 5.30, 7.25, 8.95, 8.25 and 5.50. Calculate the area in sqm, enclosed between the survey line, the irregular boundary, the first and the last offsets by i) Simpsons rule ii) Trapezoidal rule
3. The following readings were taken with a dumpy level and a 4 m levelling staff on a continuously sloping ground at 30 m intervals. 0.685, 1.455, 1.850, 2.330, 2.885 ,3.380, 1.055, 1.860, 2.265, 3.540, 0.835, 0.945, 1.530 and 2.250. The

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

reduced level of the first point is 80.750. Rule out a page of a level book and enter the above readings. Determine RLs of all points using height of instrument method. Determine the gradient of the line joining the first and last point

4. Calculate the side widths and cross-sectional areas of cut and fill in a side hill section having the following dimensions. Centre height in cut: 1 m Formation width: 22 m Side slope in cut: 1 to 1 Side slope in fill: 2 to 1 Transverse slope: 5.5 to 1
5. Two horizontal distances of 30 m and 70 m were accurately measured, and the intercepts on the staff between the outer stadia wires were 0.526 and 0.826 respectively. Calculate the tachometric constants

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE304 Strength of Materials 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO12	DoK
20CE304.1	Categorizing various types of stresses and strains developed in the member	3	3	L1, L2
20CE304.2	Interpreting the bending and shear stress distribution of a member	3	3	L2, L3
20CE304.3	Compute the deflection of beams by different methods and selection of method for determining slope or deflection	3	3	L2, L3
20CE304.4	Describe the failure modes for various types of columns	3	3	L2, L3
20CE304.5	Illustrating the members subjected to torsion	3	3	L2, L3, L4

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Stress, Strain and Deformation of Solids 11 + 1 Hour

Introduction – Stress, Strain – Types – Elastic Limit – Hooke's Law – Stress Strain Curves – Elastic Constants – Relationship between Elastic Constants. Simple and Compound Bars – Principles of Superposition – Varying Cross Section Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Thermal Stress in Composite Bars

Unit II: Shear force, Bending Moment and Flexural Stress 11 + 1 Hour

Shear force and Bending moments: Beams- Types of beams- Types of loads- Concept of Shear force and Bending moment, S.F and B.M diagrams for the cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, Point of Contraflexure

Theory of Simple Bending – Bending Equation – Flexural Rigidity - Bending Stress Distribution in Symmetrical Sections. Shear Stress - Variation of Shear Stress in Beam Cross Section – Shear Stress Distribution for Symmetrical Sections.

Assumptions in Bending

Unit III: Deflection of Beams & Torsion 11 + 1 Hour

Deflection: Methods - Integration Method, Macaulay's Method, Conjugate Beam Method, Area Moment Method.
Torsion: Introduction, Derivation, Torsion of Circular shafts, pure shear, transmission of power by circular shafts, shafts in series and shafts in parallel

Deflection of Beams by Uniformly Varying Load, Power transmission

Unit IV: Compression Members 11 + 1 Hour

Column: Types - Modes of Failure - Factor of Safety - Euler's Expression for Crippling Load for Different End Conditions – Rankine's Gordon Formula - Combined and Bending Stress - Core Section.

Comparison of Euler's and Rankine's

Unit V: Cylinders 11 + 1 Hour

Thin seamless cylindrical shells, Derivation of formula for the longitudinal and circumferential stresses, hoop, longitudinal and Volumetric strains, changes in diameter, and volume of thin cylinders, Riveted boiler shells, thin spherical shells, wire wound thin cylinders. Lame's equation, cylinders subjected to inside & outside pressures, compound cylinders

Deflections of a Leaf Springs

Text Books

1. Ramamrutham S., "Strength of materials", Dhanpat Rai Publishing Company, New Delhi, 11th Edition ,2017
2. Popov, Prentice Hall- Solid Mechanics, Engle wood cliffs, New jersey- 13th Edition -2017
3. Gere and Timoshenko, Mechanics of Materials- CBS publishers- 12th Edition - 2014
4. Rajput R. K., "Strength of Materials", S. Chand & Company Ltd., New Delhi, 2015
5. Punmia B. C., Ashok K. Jain, Arun Kumar Jain, "Mechanics of Materials", Laxmi Publications Pvt. Ltd., New Delhi
6. Subramanian R., "Strength of Materials", 2nd Edition, Oxford University Press, New Delhi, 2010

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Bansal. R. K, Strength of Materials, Dhanpat Rai Publications- 11th Edition -2017
2. Beer F. P. and Johnston E. R., "Mechanics of Materials", Tata McGraw Hill, New Delhi, 2014
3. Egor P. Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2009
4. Rattan, "Strength of Materials", Tata McGraw Hill Education, India,
5. Gunneswra Rao T. D. and Mudimby Andal, "Strength of Materials - Fundamentals and Applications", 1st Edition, Cambridge University Press, 2018
6. S.S.Bhavikatti, "Engineering Mechanics", 6th Edition, New Age International, 2018

Web References

1. https://nptel.ac.in/courses/105/105/105105108/
2. https://theconstructor.org
3. https://gradeup.co/civil-engineering/strength-of-materials

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	30	30
L3	30	30
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define centroid
2. Define stress and strain
3. Define Hooke's Law
4. What is meant by flexural rigidity?
5. What are the different methods to estimate deflection?

L2: Understand

1. Explain Lami's theorem
2. Derive an expression for shear stress distribution for a rectangular beam of cross-Section
3. What is the ratio between the maximum horizontal shear stress to the mean stress in a circular beam?
4. Derive the shear stress expression in a beam of rectangular cross-section
5. Explain Macaulay's method for determining deflection in beams

L3: Apply

1. A rectangular steel bar, 15 mm wide by 30 mm high and 6 m long, is simply supported at its ends. If the density of steel is 7850 kg/m3, determine the maximum bending stress caused by the weight of the bar
2. A beam of I section 50 cm deep and 20 cm wide has equal flanges 2 cm thick and web 1cm thick. It carries at a cross-section a shear force of 200kN. Determine the shear stress distribution in the beam and the ratio of maximum shear to mean shear
3. Derive the expression of deflection at the center of span for a simply supported beam of span L subjected to UDL throughout its span. Use Integration method
4. Derive the expression for crippling load on columns when both the ends are hinged
5. A solid round bar 3 m long and 5 cm in diameter is used as a strut with one end is fixed and other is hinged. Determine the crippling load. Take E = 2x105 N/mm²

L4: Analyze

1. A leaf spring carries a central load of 3000 N. The leaf spring has to be made of 10 steel plates 5 cm wide and 6 mm thick. If the bending stress is limited to 150 N/mm2 determine: (i) length of the spring and (ii) deflection at the centre of the spring. Take E = 2x105 N/mm²
2. A circular shaft 100 mm diameter is subjected to combined bending and twisting of moments the B.M being 3 times the twisting moment. If the direct tensile yield point of the material is 350 N/mm² , and the factor of safety is 4, calculate the allowable twisting moment according to the following theories of failures. (i). maximum principle stress theory, (ii) shear strain energy theory, if the simple shear is not to exceed 60 N/mm
3. Derive the maximum shear stress induced, in the wire of a closed-coiled helical spring which carries an axial load W. Assume mean radius of spring coil is R and diameter of spring wire is d

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technol...
Sontyam, Visakhapatnam-53...

CONTROL COPY ATTESTED
Chairman
Board of Studies (CE)

PC 20CE305 Fluid Mechanics 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				DoK
		PO1	PO3	PO12	PSO2	
20CE305.1	Summarizing the properties of fluid and forces acting on a fluid at rest	3	3	1	3	L1, L2
20CE305.2	Describing the principles of mass and energy conservation in Fluid kinematics and dynamics	3	3	1	3	L2, L3
20CE305.3	Illustrate the principles of laminar flow in pipe flow	3	3	1	3	L3
20CE305.4	Illustrate the principles of turbulent flow in pipe flow	3	3	1	3	L3
20CE305.5	Interpret the concept of boundary layer, drag and lift in fluid flow	3	3	1	3	L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Fluid Mechanics 12 + 1 Hour

Properties of Fluid: Definition of a Fluid, Units of Measurement, Mass Density, Specific Gravity, Specific Weight, Specific Volume, Vapour Pressure, Compressibility, Surface Tension. Fluid Pressure at Rest: Pascals Law, Atmospheric, Absolute, Gauge and Vacuum Pressure, Measurement of Pressure Using Manometers. Total Pressure, Centre of Pressure, Total Pressure on a Plane and Curved Surface, Buoyancy, Centre of Buoyancy, Metacentre and Metacentric Height.

Capillarity, Flotation

Unit II: Fluid Kinematics and Fluid Dynamics 12 + 1 Hour

Fluid Kinematics: Types of Fluid Flow, Continuity Equation, Acceleration of Fluid Particle, Velocity Potential, Stream Function, Streamlines, Equipotential Lines and Flow Net. Fluid Dynamics: Forces acting on Fluid in Motion, Euler's Equation of Motion, Principle of Conservation of Energy, Kinetic Energy Correction Factor, Bernoulli's Equation for a Compressible Fluid, Application of Bernoulli's Equation, Venturi meter, Orifice meter, Pitot Tube. Impulse Momentum Equation, Momentum Correction Factor, Applications on Impulse Momentum Equation.

Conservation of mass, Energy and Momentum Principles

Unit III: Flow Through Pipes and Laminar Flow 12 + 1 Hour

Flow through Pipes: Introduction, Types of Flows, Laws of Fluid Friction, Froude Experiment, Darcy Weisbach Equation, Flow through Long Pipes, Pipes in Series, Pipes in Parallel, Siphon, Laminar Flow: Introduction, Shear and Pressure Gradient in Pipe Flow, Laminar Flow between Circular Pipes – Hagen-Poiseuille Law, Laminar Flow between Parallel Plates, Laminar Flow between Parallel Flat Plate – One Plate Moving and the other at Rest.

Head Loss due to Friction Pipe

Unit IV: Turbulent Flow 12 + 1 Hour

Layout of a typical Hydropower installation – Heads and efficiency. Pelton wheel - Franci's turbine – Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency –Turbine unit and specific quantities, selection of turbines, performance characteristics-geometric similarity

Classification of Turbines, Governing of Turbines, Surge tanks, Cavitation

Unit V: Forces on Immersed Bodies 12 + 1 Hour

Boundary Layer Theory: Introduction, Thickness of Boundary Layer, Boundary Layer along a Thin Plate and its Characteristics, Boundary Layer Equations, Momentum Integral Equations of the Boundary Layer, Laminar Boundary Layer, Turbulent Boundary Layer, Boundary Layer on Rough Surface, Separation of Boundary Layer, Methods of Controlling Boundary Layer. Dragand its Types, Effect of Free Surface on Drag.

Development of Lift on Immersed Bodies

Text Books

1. Modi P. N. and Seth S. M. "Hydraulics and Fluid Mechanics" ,22nd Edition, S. B. H. Publishers, New Delhi, 2019
2. Rajput R. K., "Fluid Mechanics and Hydraulic Machines, 6th Edition, S. Chand Publishers, 2016

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Tech...
Sontyam, Visakhapatnam-5...

3. Jain A. K., "Fluid Mechanics",12th Edition, Khanna Publishers, Delhi, 1998
4. Arora K. R., "Fluid Mechanics, Hydraulics and Hydraulic Machines, 9th Edition, Standard Publishers, 2005
5. Subramanya K., "Flow in Open Channels", 3rd Edition, Tata McGraw Hill, 2009
6. Anup Goel, ., "Fluid Mechanics", 1st Edition, Technical Publications, 2021

Reference Books

1. Streeter V. L., "Fluid Mechanics", 9th Edition, McGraw Hill Publishers, 2017
2. Robert W. Fox Ogukuo, Orutcgardm H. and Alan T. Mc Donald, "Introduction to Fluid Mechanics", Student 7th Edition, Wiley, India, 2011
3. Som S. K. and Biswas G., "Introduction to Fluid Machines", 3rd Edition, Tata McGraw Hill Publishers Pvt. Ltd., 2013
4. Frank M. White, "Fluid Mechanics", 7th Edition, McGraw Hill, 2011
5. Mohanty A. K., "Fluid Mechanics", 2nd Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2006
6. Narayana Pillai N., "Principles of Fluid Mechanics and Fluid Machines", 4th Edition, University Press, 2011
7. Kumar D. S., "Fluid Mechanics and Fluid Power Engineering", 6th Edition, S. K. Kataria & Sons, 2013

Web References

1. https://nptel.ac.in/courses/105/103/105103192/
2. https://www.sciencedirect.com/book/9780124059351/fluid-mechanics
3. https://www.udemy.com/topic/fluid-mechanics/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	30	30
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is a surface tension?
2. What is capillarity?
3. What is Pascal's law?
4. Define Buoyancy
5. What is center of pressure?

L2: Understand

1. Explain Pascal's law
2. Explain the measurement of pressure using manometers
3. Derive the principle of conservation of energy in fluid dynamics
4. Derive Bernoulli's equation
5. Explain water hammer in pipes

L3: Apply

1. A U-tube manometer is used to measure the pressure of water in a pipeline which is in excess of atmospheric. The left limb is connected to the pipeline and right limb is open to atmosphere. The free surface of mercury in the right limb is in level with the Centre line of the pipe and the level difference of mercury in the limbs of the manometer is 20 cm. Compute the water pressure in the pipeline. If the pressure of water is increased by 50 %, compute the manometric reading
2. A solid cylinder 2 m in diameter and 2 m in length floats in water with its axis vertical. If the specific gravity of the material of the cylinder is 0.65, find the meta centric height and comment on the stability of the body
3. A pipeline of 600 m diameter is 1.5 km long. To increase the discharge, another pipe of same diameter is introduced in parallel to the first pipe, for the second half of length. If f = 0.04, and head at inlet is 300 mm, calculate the increase in discharge. Neglect minor losses

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technolo
Sontyam, Visakhapatnam-52

4. Water is flowing over a thin smooth plate of length 5 m and width 2.7 m at a velocity of1.2 m/sec. If the boundary layer flow changes from laminar to turbulent at a Reynolds number 5 x 105. Find: i) The distance from leading edge up to which boundary layer is laminar and ii) Thickness of the boundary layer at the transition point
5. A very wide rectangular channel carries a discharge of 8 cumecs per width. The channel has a bed slope of 0.004 and Manning's roughness coefficient 0.015. Find the distance to a section where water depth is 0.9 m using single step method

CONTROL COPY ATTESTED

Chairman

Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE306 Surveying Lab

0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO2	PO10	PO12
20CE306.1	Recognize, select and use appropriate equipment for finding the horizontal and vertical properties understanding the limitations of the equipment's	2	2	2	3
20CE306.2	Explain the chaining, ranging and apply it to take the angular measurement and identify local attraction and appropriate methods to rectify it.	2	2	1	2
20CE306.3	Calculate the irregular traverse area using Plane table methods, Collect the level of different points and calculate the reduced level of the respective points by appropriate methods	3	3	1	3
20CE306.4	Illustrate the lens principle to find the tachometric constants. Setting out of curve by linear and angular methods and trigonometric leveling	3	3	2	2
20CE306.5	Identify the ground co-ordinates with elevation of earth surface points with help of GPS and explain Aerial photo Interpretation through stereo model creation with help of provided aerial photographs. Calculate the area and volume using total station	3	2	2	1

1 Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

List of Experiments

1. Establish the compass traverse, Introduce the correction for local attraction and calculate the area for the same
2. Calculate the area for the given irregular polygon by conducting plane table surveying methods: Radiation, Intersection and Traversing
3. Find the elevation differences of the given area through finding the RL value of given points by height of the Instrument method and Rise and Fall method
4. Assess the horizontal and vertical angles of given points for transit
5. Determine the tachometric constant of the analytical lens fixed transit theodolite
6. Prepare the calculation for execution of setting out of circular curve in instrument method types (single and double theodolite methods
7. Apprise the gradient of the given land / topography through field observation of GPS
8. Adopt the computer aided contour plotting using surfer software
9. Establishment of traverse using total station and calculate the area
10. Calculate the area and volume using total station on under prism mode
11. Create the Stereo model for the given aerial photographs and interpret the spatial objects present in it

References

1. Lab Manual for Surveying Lab, Department of Civil Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-53

PC 20CE307 Strength of Materials Lab

0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO4	PO12
20CE307.1	Recognize, select and use appropriate equipment for finding the mechanical properties of materials and understanding the limitations of the equipment	3	2	1
20CE307.2	Estimate compressive strength of wood, concrete, brick materials and decide their suitability for the construction purpose	3	2	1
20CE307.3	Evaluate the tensile strength and comment on their usage in reinforced concrete structures	3	2	1
20CE307.4	Determine the impact resistance of steel used in construction works	3	2	1
20CE307.5	Determine the young 's modulus of wood/steel materials and shear modulus of rigidity for helical spring	3	2	1

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

List of Experiments

1. Determine the tensile strength of mild steel rod
2. Determine the young's modulus of elasticity for wooden cantilever beam
3. Determine the young's modulus of elasticity for wooden simple supported beam
4. Determine the Rockwell's Hardness number for the given indenter
5. Determine the shear modulus of rigidity for helical spring
6. Determine the Compression strength of concrete cube
7. Determine the energy absorption of given specimen by using Izod
8. Determine the energy absorption of given specimen by using Charpy
9. Determine the Shear strength of given specimen
10. Verification of Maxwell 's Reciprocal theorem on simply supported beams

References

1. Lab Manual for Strength of Materials, Department of Civil Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531

PC **20CE308 Fluid Mechanics and Hydraulics Lab** **0 0 3 1.5**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO4	PO12
20CE308.1	Recognize, select and use appropriate equipment and hydraulic machinery for finding the fluid properties understanding the limitations of the equipments and machinery	3	3	1
20CE308.2	Estimate the discharge in pipes and canals using flow meters and notches	3	3	1
20CE308.3	Estimate energy loss in pipe system	3	3	1
20CE308.4	Estimate the performance characteristics of hydraulic turbines and pumps	3	3	1
20CE308.5	Gain proficiency in designing efficient pipe systems and hydraulic machinery	3	3	1

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

List of Experiments

1. Determination of co-efficient of discharge using venturimeter
2. Determination of co-efficient of discharge using orifice meter
3. Determination of co-efficient of discharge for mouthpiece by variable head method
4. Determination of discharge for flow through rectangular and triangular notch
5. Determination of discharge for a small orifice by constant head method
6. Determination of head loss in pipes
7. Verification of Bernoulli's theorem
8. Performance test on Pelton wheel turbine
9. Performance test on Francis's turbine
10. Efficiency test on centrifugal pump
11. Efficiency test on reciprocating pump

References

1. Lab Manual for Fluid Mechanics and Hydraulics Lab, Department of Civil Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

SC 20CES01 Computer Aided Building Drawing 1 0 2 2

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			
		PO5	PO10	PO12	PSO1
20CES01.1	Recognize, select and use appropriate drawing commands for drafting understanding the limitations of the soft computing tools	3	3	1	3
20CES01.2	Recognize the various drafting tools and understand the limitations with theoretical knowledge	3	3	1	3
20CES01.3	Apply commands for two and three dimensional drawing	3	3	1	3
20CES01.4	Gain proficiency in creating plans and elevations of buildings	3	3	1	3
20CES01.5	Read the building plan for onsite execution	3	3	1	3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

List of Experiments

1. Demonstrate to usage of computer aided drawing, installation of operating systems
2. Study exercise on usage of commands
3. Principles of planning, orientation and functional requirements of the building drawing
4. Draw the important building components like section of a load bearing wall foundation to parapet
5. Plan, elevation, section of residential building one bed room house with flat roof
6. A residential building two bed room house with sloped roof
7. A primary school building
8. Layouts of electrical lines in buildings.
9. Creation of 3D view of residential building
10. Creation of 3D view of bank building

References

1. Lab Manual for Computer Aided Building Drawing, Department of Civil Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam

20MCX02 Constitution of India **2 0 0 0**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO12	
20MCX02.1	Summarizing the basic features and modalities about Indian Constitution	3	3	1	L1
20MCX02.2	Identify the Indian Federalism and Panchayath Raj systems in Indian Constitution	3	3	1	L1
20MCX02.3	Identify the Legislature and Judiciary systems in Indian Constitution	3	3	1	L2
20MCX02.4	Interpreting the political system that exists in India	3	3	1	L1, L2
20MCX02.5	Categorising the contemporary issues in global politics and Election commission in India	3	3	1	L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Indian Constitution **9 Hours**

Meaning of the Indian Constitution, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Indian Constitution and its Salient Features, The role of B. R. Ambedkar in the making of the Indian Constitution, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional, The Historical Perspectives of the Constitutional Amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency and Local Self Government – Constitutional Scheme in India.

Unit II: Indian Federalism **9 Hours**

Meaning and Definition of Federalism, Structure and Features of Indian Federalism, Difference between Indian and Federation of other States, Difference between Federal and Unitary Features, Critical Evaluation of the Indian Federal System, Decentralisation of Powers, Centre-State Relations, 73rd Amendment, Panchayath Raj Institutions.

Unit III: Union Government **9 Hours**

Powers of Indian Parliament, Functions of Rajya Sabha and Lok Sabha, Powers and Functions of the President, Powers and Functions of the Prime Minister. Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Lok Pal and Lokayukta, The Lokpal and Lokayuktas Act 2013.

Unit IV: Challenges to Indian Political System **9 Hours**

Caste: A General Overview of the Indian Scenario, The Caste Issues in the Pre Independence-Period, Gandhi Ambedkar Debate and the Poona Pact. The Politics of Caste in the Post Independence Period, Mandal Commission Reservation Policy in Government Jobs. The History of Communalism in India, The Concept of Terrorism and its Emergence in the Global Phenomenon since the End of Cold War.

Unit V: India's External Relations and Election Commission **9 Hours**

Cold War and Post Cold War Era, Foreign Policy, Indian and its Neighbours, India's Extended Neighbourhood in West Asia and South East Asia. India's Relations with the United States and Russia, India and the World Organisations, India in the 21st Century. Election Commission - Role of Chief Election Commissioner and Election Commissionerate State Election Commission, Functions of Commissions for the Welfare of SC/ST/OBC and Women.

Text Books

1. Austin G., "Working of a Democratic Constitution of India", Oxford University Press, New Delhi, 2004
2. Basu D. D., "An Introduction to the Constitution of India", Prentice Hall, New Delhi, 2005
3. Chandhoke N. and Priyadarshini, "Contemporary India: Economy, Society, Politics", Oxford University Press, New Delhi, 2009
4. Jayal N. G. and Maheta P. B., Oxford Companion to Indian Politics", Oxford University Press, New Delhi, 2010
5. Vanaik A. and Bharghava R. "Understanding Contemporary India: Critical Perspectives", Orient Blackswan, New Delhi, 2010

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam

Reference Books

1. Noorani A. G., "Constitution Questions in India: The President, Parliament and the States", Oxford University Press, New Delhi, 2000
2. Chakravarthy B. and Pandey K. P., "Indian Government and Politics", Sage Publications, New Delhi, 2006
3. Bajpai. Kanti and Pant V. Harsh, "India's Foreign Policy: A Reader", Oxford University Press, New Delhi, 2013
4. Laxmikanth M., "Indian Polity for Civil Services Examinations", Tata McGraw Hill, New Delhi, 2016
5. Singh M. P. and Saxena R., "Indian Politics: Contemporary Issues and Concerns", PHI Learning, New Delhi, 2008

Web References

1. https://en.wikipedia.org/wiki/Federalism.in.India
2. https://legislative.gov.in/constitution-of-india
3. https://en.wikipedia.org/wiki/Foreign_relations_of_India
4. https://en.wikipedia.org/wiki/Government_of_India

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HS 20HSX03 Managerial Economics and Financial Analysis 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO11	DoK
20HSX03.1	Understand the theoretical concepts of managerial economics to make decisions for business problems	3	L1, L2
20HSX03.2	Gain adequate theoretical knowledge on microeconomics concepts to perform successful business operations	3	L1, L2
20HSX03.3	Understand the basic accounting principles and capital formation and planning	3	L1, L2
20HSX03.4	Apply accounting concepts to analyze financial strength of business	3	L3, L4
20HSX03.5	Gain theoretical knowledge on the entrepreneurship management and types of firms	3	L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1. Remember | L2. Understand | L3. Apply | L4. Analyze | L5. Evaluate | L6. Create. DoK. Depth of Knowledge

Unit I: Introduction to Managerial Economics and Demand Analysis 9 Hours

Definition of Managerial Economics – Scope of Managerial Economics and its Relationship with other Subjects – Concept of Demand, Types of Demand, Determinants of Demand- Demand Schedule, Demand Curve, Law of Demand and its Limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement - Demand Forecasting and Methods of Forecasting.

Role of Managerial Economist, Law of Supply

Unit II: Production and Cost Analysis 9 Hours

Theory of Production: Meaning and Factors of Production, Production Function with One Variable Input (Law of Variable Proportion), With Two Variable Inputs (Law of Returns to Scale) Theory of Cost: Different Cost Concepts and Different Relations between Cost and Output in Short Run and Long Run. Managerial uses of Revenue and Cost Concepts Break-Even Point). Pricing Strategies.

Economies of Scale and Diseconomies of Scale

Unit III: Introduction to Accounting and Financial Planning 9 Hours

Financial Accounting - Concepts and Conventions – Double Entry System – Preparation of Journal, Ledger and Trial Balance – Preparation of Final Accounts: Trading, Profit and Loss Account and Balance Sheet.
Capital and Capital Budgeting: Capital Budgeting: Meaning of Capita l - Capitalization - Meaning of Capital Budgeting - Time Value of Money - Methods of Appraising Project Profitability - Traditional Methods and Modern Methods.

Branches of Accounting, Concept of Working Capital

Unit IV: Financial Analysis through ratios 9 Hours

Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and Quick Ratio), Activity Ratios (Inventory Turnover Ratio and Debtor Turnover Ratio), Capital Structure Ratios (Debt - Equity Ratio, Interest Coverage Ratio) and Profitability Ratios (Gross Profit Ratio, Net Profit Ratio, Operating Ratio, P/E Ratio and EPS).

Cash Flow Statement and Funds Flow Statement (Theory Only)

Unit V: Introduction of Entrepreneurship and New Economic Environment 9 Hours

Definition of Entrepreneur and Entrepreneurship, Internal and External Factors; Types of Entrepreneurs; Classification of Entrepreneurship.
Characteristic Features of Business, Features and Evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises, Changing Business Environment in Post - Liberalizations Scenario.

Industrial Policy 1991

Text Books

1. Appa Rao N., Vijay Kumar P., "Managerial Economics and Financial Analysis", Cengage Publications, New Delhi, 2011
2. Siddiqui S. A. and Siddiqui A. S., "Managerial Economics and Financial Analysis", New Age International Publishers, 2012

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Tech
Sontyam, Visakhapatnam

3. Kuberudu B. and Ramana T. V., "Managerial Economics and Financial Analysis", Himalaya Publishing House, 2014
4. Aryasri A. R., "Managerial Economics and Financial Analysis", Tata McGraw Hill, 2011

Reference Books

1. Maheswari V., "Managerial Economics", Sultan Chand, 2014
2. Suma Damodaran, "Managerial Economics", Oxford, 2011
3. Vanitha Agarwal, "Managerial Economics", Pearson Publications, 2011
4. Sanjay Dhameja, "Financial Accounting for Managers", Pearson Publications, 2011
5. Maheswari V., "Financial Accounting", Vikas Publications, 2012
6. Dominick Salvatore, "Managerial Economics: Principles and World-Wide Application", 7th Edition, Oxford University Press, 2012

Web References

1. https://btechgeeks.com/mefa-notes/#google_vignette
2. https://www.smartzworld.com/notes/managerial-economics-and-financial-analysis-pdf-notes-mefa
3. https://www.scribd.com/document/259129127/Mefa-course-plan
4. https://www.coursera.org/browse/business/entrepreneurship

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	20	20
L3	20	20
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is Managerial Economics?
2. What is meant by Elasticity of demand? How do you measure it?
3. Define different product curves
4. Define Accounting
5. Define Partnership

L2: Understand

1. Explain the role of a Managerial Economist in a Business firm
2. Explain the concept cross elasticity of demand. Illustrate your answer with suitable examples
3. Explain the formation of a Joint Stock Company
4. Distinguish between a partnership and a joint stock company
5. Explain accounting principles

L3: Apply

1. Journalise the following transactions
   2013 Jan 1st — ABC Firm commenced business with Rs.40000
   Jan 2nd — Deposited into bank Rs.30000
   Jan 3rd — Bought goods worth Rs.48000 from Kamala
   Jan 4th — Sold goods worth Rs.60000
2. Calculate Net Profit Ration from the following data
   Sales returns Rs.100000 — Administration expenses Rs.10000
   Gross Profit Rs.40000 — Selling expenses Rs.10000
   Income from investment Rs.5000 — Loss on account of fire Rs.3000
3. From the following particulars find out
   Selling price — Rs.200 per unit
   Variable cost — Rs.100 per unit

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

Total fixed cost Rs.96000

i) Break even units and values

ii) Sales to earn a profit Rs.20000

4. The following are the Ratios related to XYZ Limited company.
   Inventory holding period 2 months
   Gross profit ration 25 %
   Gross profit for the current year announced Rs.200000
   Closing stock is excess of Rs 40000 over opening stock. Find out
   A) Sales
   B) Cost of goods sold
   C) Closing stock
   D) Opening stock

L4: Analyze

1. A Project cost is Rs.144000. The average annual cash inflows are likely to be Rs.45000 for a period of 5 Years calculate IRR for the project
2. The cost of project is Rs.50000 The annual cash inflows for the next 4 years are Rs.25000 what is the PBP for the project
3. A firm is considering two different investment options A & B details of both the options are given below (Rs, in Lakhs)

	Investment cost	Inflow 1	Inflow 2	Inflow 3
Option A	(25)	10	10	12
Option B	(40)	15	20	24

4. ARR method (ARR on original investment)
   Initial investment Rs.1200000

Year	Cash inflows (Rs)	
	Project A	Project B
1	600000	500000
2	500000	300000
3	200000	200000
4	-	300000

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
M.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE402 Hydraulics and Hydraulic Machinery 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				DoK
		PO1	PO3	PO12	PSO2	
20CE402.1	Demonstrate the properties of flow channel and flow characteristics in an open channel flow	3	3	1	3	1
20CE402.2	Describing the principals of Dimensional Analysis	3	3	1	3	1
20CE402.3	Illustrate the essential parameters of the Turbo Machinery	3	3	1	3	1
20CE402.4	Interpret the characteristics of Pelton wheel, Franci's turbine, Kaplan turbine	3	3	1	3	1
20CE402.5	Demonstrate the working principles of Centrifugal pumps and Reciprocating pumps	3	3	1	3	1

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Uniform and Non-Uniform low 12 Hour

Uniform Flow: Introduction, Types of Flow in Channels, Geometrical Properties of Channel Section, Velocity Distribution in Channel Section, Uniform flow in Channels, Most Economical or Most Efficient Section of Channel, Computation of Uniform Flow, Critical Flow and its Computations, Classification of Slopes. Non-Uniform Flow: Introduction, Gradually Varied Flow, Classification of Channel Bottom Slopes, Classification of Surface Profiles, Characteristics of Surface Profile.

Specific Energy and Critical Depth, Hydraulic Jump

Unit II: Dimensional Analysis 12 Hour

Dimensional Analysis - Rayleigh's method and Buckingham's pi theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities - dimensionless numbers – model and prototype relations.

Types of quantities, Dimensions of quantities

Unit III: Turbo Machinery 12 Hour

Hydrodynamic force of jets on inclined and curved vanes, jet striking centrally and at tip, velocity triangle at inlet and outlet, expressions for work done and efficiency-Angular momentum principle.

Force of jets on stationary and moving flat plate

Unit IV: Hydraulic Turbines 12 Hour

Layout of a typical Hydropower installation – Heads and efficiency. Pelton wheel - Francis turbine – Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and efficiency –Turbine unit and specific quantities, selection of turbines, performance characteristics-geometric similarity

Classification of Turbines, Governing of Turbines, Surge tanks, Cavitation

Unit V: Centrifugal and Reciprocating Pumps 12 Hour

Centrifugal-Pumps: work done- Manometric head-minimum starting speed-losses and efficiencies-specific speed- multistage pumps - performance of pumps-characteristic curves - NPSH- Cavitation.
Reciprocating-Pumps: Introduction, components, working, discharge, indicator diagram, work done and slip.

Pump installation, Classification of pumps, pumps in parallel and series

Text Books

1. Modi P.N. and Seth S .M., "Hydraulics and Fluid Mechanics", 22nd Edition, S. B. H. Publishers, New Delhi, 2019
2. Rajput R .K., "Fluid Mechanics and Hydraulic Machines, 6th Edition, S. Chand Publishers, 2016
3. Khurmi R. S., "Hydraulics, Fluid Mechanics and Hydraulic Machines", 9th Edition, S. Chand Publishers, Reprint 2007,
4. Arora K. R., "Fluid Mechanics, Hydraulics and Hydraulic Machines, 9th Edition, Standard Publishers, 2005
5. Subramanya K., "Flow in Open Channels", 3rd Edition, Tata McGraw Hill, 2009

Reference Books

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

1. Som S. K. and Biswas G., "Introduction to Fluid Machines", 3rd Edition, Tata McGraw Hill Publishers Pvt. Ltd., 2013
2. Narayana Pillai N.,"Principles of Fluid Mechanics and Fluid Machines", 4thEdition, University Press, 2011
3. Kumar D. S., "Fluid Mechanics and Fluid Power Engineering", 6th Edition, S. K. Kataria & Sons, 2013
4. Bansal R. K., "Fluid Mechanics and Hydraulic Machines"10th Edition, Laxmi Publications, 2018
5. Hanif Chowdary M., "Open Channel Flow", 2nd Edition, Springer Publications, 2007

Web References

1. https://www.digimat.in/nptel/courses/video/112103249/L01.html
2. https://www.youtube.com/watch?v=mszImY7jJq8
3. https://www.udemy.com/courses/search/?q=hydraulics+and+hydraulics+machinery

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	30	30
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is the specific energy at critical depth?
2. What is NPSH?
3. What is Utilization factor?
4. What is Bazin's formula and how is it used?
5. Define the term 'dynamic similarity'

L2: Understand

1. Explain Hydraulic mean depth
2. Explain Wetted perimeter
3. Derive the principle of conservation of energy in fluid dynamics
4. Derive Bernoulli's equation
5. Explain water hammer in pipes

L3: Apply

1. Determine the number of turbines and diameter of runner for a power plant having 40 cumecs inflow, 20 m head. The efficiency of turbine is 85% with the speed of 225 rpm. Assume the specific speed as 250 and speed ratio as 0.8
2. Explain Reynold's number, Froude's number and Mach number. Derive expressions for any above two numbers
3. A jet of water of 60 mm diameter strikes a curved vane at its center with a velocity of 18 m/s. The curved vane is moving with a velocity of 6 m/s in the direction of the jet. The jet is deflected through an angle of 165°. Assuming the plate to be smoot find: (i) Thrust on the plate in the direction of jet, (ii) Power of the jet, and (iii) Efficiency of the jet
4. A Pelton wheel has to be designed for the following data. Power to be developed = 6,000 kW. Net head available=300 m; Speed= 550 r.p.m.; Ratio of jet diameter to wheel diameter = 1/10; and overall efficiency = 85 %. Find the number of jets; diameter of the jet; diameter of the wheel; and the quantity of water required
5. A double-acting reciprocating pump, running at 45 rpm, is discharging 0.009 m3/s of water. The pump has a stroke of 40 cm. The diameter of the piston is 20 cm. The suction and delivery heads are 3 m and 14 m, respectively. Find the slip of the pump and power required to drive the pump. Neglect the effect of piston rod area

CONTROL COPY ATTESTED
Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE403 Concrete Technology 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				DoK
		PO1	PO2	PO6	PO8	
20CE403.1	Categorizing the properties of concrete	3	3	3	3	L1, L2
20CE403.2	Summarizing the properties of construction material and fresh and hardened concrete	3	3	3	3	L2
20CE403.3	Determining the strength of hardened concrete by non-destructiv testing methods	3	3	3	3	L3
20CE403.4	Implementing special concrete methods depending upon site conditions	3	3	3	3	L3
20CE403.5	Preparing the concrete mix design and recommend the use of construction materials as per IS code for building construction	3	3	3	3	L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Ingredients of Concrete 12 Hours

Cement: Manufacture of Portland Cement, Chemical Composition, Hydration of Cement, Classification and Types of Cement, Tests on Cement. Aggregate: Classification, Mechanical and Physical Properties, Deleterious Materials, Soundness, Alkali - Aggregate Reaction, Grading of Aggregate, Tests on Aggregate, Artificial and Recycled Aggregate. Water - Quality of Water, Mixing Water Curing Water.

Cement Ingredients, Definition of Fine Aggregates and Coarse Aggregates

Unit II: Manufacture of Concrete and Properties of Fresh Concrete 12 Hours

Manufacture of Concrete: Batching, Mixing, Transporting, Placing, Compaction, Finishing, Curing. Properties of Concrete in Fresh State: Factors Affecting Workability, Segregation and Bleeding, Harshness, Measurement of Workability, Admixture, Plasticizers, Accelerators, Retarders and Air Entraining Agents.

Concrete Ingredients, Uses of Admixture

Unit III: Properties of Concrete in Hardened State and Non - Destructive Testing of Concrete 12 Hours

Properties of Concrete in Hardened State: Unit Weight, Strength Characteristics, Impermeability, Dimensional Changes. Non-Destructive Testing of Concrete - Importance, Methods - Rebound Hammer Test, Penetration and Pull-out Test, Ultrasonic Pulse Velocity Test - Principles, Applications and Limitations.

Durability of Concrete, Destructive Testing Methods

Unit IV: Special Concretes 12 Hours

Light Weight Concrete, Polymer Concrete, Fiber Reinforced Concrete, Ready Mix Concrete, Ferro Cement Concrete, Mass Concrete, High Strength Performance Concrete, Pumped Concrete, No Fines Concrete, Under Water Concreting, Hot and Cold Weather Concreting, Shotcreting. Introduction to Self - Compacting Concrete.

High Density Concrete, Self-Healing Concrete

Unit V: Concrete Mix Design 12 Hours

Concept of Mix Design, Variables in Proportioning, Exposure Conditions, Procedure of Mix Design as per IS 10262-2009, Numerical Examples of Mix Design with and without Mineral Admixtures.

Nominal Mixes, Design Mix Types

Text Books

1. Shetty M. S., "Concrete Technology", 7th Edition, S. Chand & Company, 2006
2. Santha Kumar A. R., "Concrete Technology", 2nd Edition, Oxford University Press, New Delhi, 2018
3. Orchard D. F., "Concrete Technology", 4th Edition, Elsevier Science & Technology,1979

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

4. Neville A. M., "Properties of Concrete", 5th Edition, Pearson Education, 2013
5. Gambhir M. L., "Concrete Technology", 5th Edition, K. B. Centre, 2010
6. Narayan V. Nayak, Gupta K. G., "Concrete Technology", 1st Edition, Creative Books Publishers, 2021
7. Bajaj, Kataria & Raheja, "Concrete Technology", 1st Edition, Ishan Publications, 2021

Reference Books

1. Neville A.M. and Brooks J. J., "Concrete Technology II", 2nd Edition, Trans-Atlantic Publications, Philadelphia, USA, 2019
2. Gambhir M. L., "Concrete Technology II", 5th Edition, Tata McGraw Hill Education, New Delhi, 2017
3. IS 10262: 2009, "Recommended Guidelines for Concrete Mix Design II", 2nd Edition, BIS Publication, New Delhi, 2009
4. All relevant IS codes

Web References

1. https://www.slideshare.net/justinthesecond/ingredients-and-mixing-concrete
2. https://www.slideshare.net/gauravhtandon1/concrete-mix-design-46415349
3. https://youtu.be/T4pjWFzd3rA
4. https://youtu.be/PpUnxU57vAM
5. https://www.slideshare.net/Shanmugasundaramnagaraj/special-concretes-239742583

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	30	40
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What are the uses of aggregates?
2. Define the aggregate
3. Define workability of concrete
4. Define admixture
5. Define accelerators

L2: Understand

1. Explain the concrete manufacturing process
2. Illustrate the properties of the concrete
3. Describe the factors effecting of workability
4. Illustrate the concrete manufacturing process
5. Demonstrate the various NDT testing methods

L3: Apply

1. Choosing various types of tests on concrete
2. Integrating various types of NDT tests on concrete
3. Choosing various mix proportions for concrete mix design
4. Determining the various numerical examples of mix design as per is code

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE404 Soil Mechanics 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO 1	PO2	PO3	PO6	PSO 1	DoK
20CE404.1	Impart the fundamental concepts of soil mechanics and identify the soil properties and understand compaction of soil	2	2	2	2	2	L1, L2
20CE404.2	Determining the knowledge aspects of permeability in soil	2	2	1	2	2	L2, L3
20CE404.3	Estimating the stress developed in the soil medium	3	2	2	2	2	L3, L4
20CE404.4	Executing the Shear strength in soil	3	3	1	2	2	L3, L4
20CE404.5	Explaining the stability of slopes.	3	3	2	2	2	L3, L4

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective Pos
L1. Remember | L2. Understand | L3. Apply | L4. Analyze | L5. Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Soil Classification and Compaction — 14 Hours

Nature of Soil – Phase Relationships – Soil Description and Classification for Engineering Purposes - Their Significance – Index Properties of Soils - BIS Classification System, Soil Compaction: Theory - Comparison of Laboratory and Field Compaction Methods - Compaction Proctor's Test – Moisture – Density Relations.

Factors Influencing Compaction Behavior of Soils

Unit II: Effective Stress Principle and Permeability — 14 Hours

Soil Water: Static Pressure in Water - Effective Stress Concepts in Soils – Capillary Stress; Permeability Measurement in The Laboratory and Field Pumping in and Pumping Out Tests – Factors Influencing Permeability of Soils, Seepage – Introduction to Flow Nets – Simple Problems.

Flow Path, Equipotential Lines

Unit III: Stress Distribution Concept and Settlement — 14 Hours

Stress Distribution - Soil Media - Boussinesq Theory - Use of New Marks Influence Chart, Settlement - Components of Settlement - Immediate and Consolidation Settlement - Methods of Minimizing Settlement – Terzaghi's One Dimensional Consolidation Theory - Computation of Rate of Settlement – Square Root 'T' And Log T Methods– e-Log P Relationship.

Factors Influencing Compression Behaviour of Soils

Unit IV: Shear Strength Behaviour of Soil — 14 Hours

Shear Strength of Cohesive and Cohesionless Soils - Mohr's and Coulomb's Failure Theory - Relationship between Principal Stresses at Failure - Measurement of Shear Strength - Direct Shear Test - Triaxial Compression Test - Unconfined Compression Test and Vane Shear Test - Pore Pressure Parameters - Cyclic Mobility.

Liquefaction

Unit V: Stability of Slopes — 14 Hours

Slope Failure Mechanisms – Types - Infinite Slopes – Finite Slopes, Total Stress Analysis for Saturated Clay – Fellenius Method - Friction Circle Method, Factor of Safety - Use of Stability Number.

Slope Protection Measures

Text Books

1. Gopal Ranjan, "Basic and Applied Soil Mechanics" 3rd Edition, New Age International, New Delhi, 2011

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

2. Punmia, B.C. "Soil Mechanics and Foundations", Laxmi Publications, New Delhi, 2014
3. Venkatramaiah, Geotechnical Engg., 3rd Edition, Universities Press, 2006
4. Arora K. R., Geotechnical Engineering, 7th Edition, Standard Publishers, 2019
5. Terzaghi K. and Peck R. B., "Soil Mechanics in Engineering Practice", 3rd Edition, John Wiley, 1967

Reference Books

1. Braja M. Das, "Principles of Geotechnical Engineering", Cengage learning Pvt. Ltd., 8th Edition, 2014
2. Holtz D. and Kovacs W. D., "An Introduction to Geotechnical Engineering", Prentice Hall, 2nd Edition, 2011
3. Purshotam Raj P. "Geotechnical Engineering", 2nd Edition, Tata McGraw Hill , 2013
4. Alam Singh and Chowdhary, G.R., "Soil Engineering in Theory and Practice", Volume I, 4th Edition, CBS Publishers and Distributors, New Delhi, 2014
5. Purushothamaraj P., "Soil Mechanics and Foundation Engineering", 2nd Edition, Dorling Indersley (India) Pvt. Ltd., 2013
6. NarsingaRao B. N. D., "Soil Mechanics and Foundation Engineering", Wiley India Pvt. Ltd., New Delhi, 2015

Web References

1. https://nptel.ac.in/courses/105/103/105103097/
2. https://gradeup.co/civil-engineering-exams/soilmechanics

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	30	30
L3	20	20
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define and mention the formulae for the following terms
2. Void ratio
3. Porosity
4. Degree of saturation
5. State all the assumptions of Terezaghi's one dimensional theory of consolidation

L2: Understand

1. Derive the following relation with neat phase diagrams esr =WG
2. Explain how liquefaction of soil can be prevented
3. Explain in detail about various soil types
4. Explain in detail important features of Indian soil classification system
5. Explain the different properties of flow net

L3: Apply

1. A soil sample of height 6 cm and area of cross section 100 cm^2 was subjected to constant head permeability test with head of 36 cm and 90 cc of water passes through the specimen during a test interval of 5 min. Compute the coefficient of permeability of the soil sample
2. Derive the equation for effective stress of a soil medium of height h which is saturated up to a height h/2 and carries a uniform surcharge load of q kN/m
3. A concentrated load of 500 kN is applied at ground surface. Compute the vertical pressure (i) at a depth of 5 m below the load, (ii) at a distance of 3m at the same depth. Use Boussinesq's theory

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

4. A structure having rectangular area 3 m x 1.5 m is uniformly loaded with load intensity of 125 kN/m² at the ground surface. Calculate the vertical pressure at a point 4.5m below one of its corners
5. Derive the relation between principal stresses at failure

L4: Analyze

1. A falling head permeability test was performed on a sample of silly sand. The time required for the head to fall in the stand pipe from 60 cm to the 30 cm mark was 70 min. The cross-sectional area of the stand pipe was 1.25 cm². If the height and diameter of the sample were respectively 10 and 9 cm, determine the value k in cm/min
2. A concrete dam is constructed across a river over a permeable stratum of soil of limited thickness. The water heads are upstream side 16 m and 2 m on the downstream side. The flow net constructed under the dam gives N_f= 4 and N^d=l2. Calculate the seepage loss through the subsoil, if the average value of the hydraulic conductivity is 6 x 10^{-3} cm/sec horizontally and 3 x 10-4 cm/sec vertically. Calculate the exit gradient, if the average length of the last field is 0.9 m. Assuming e = 0.56, and G_s= 2.65, determine the critical gradient. Comment on the stability of the river bed on the downstream side
3. A circular ring foundation for an overhead tank transmits a contact pressure of 300 kN/m². Its internal diameter is 6 m and external diameter 10 m. Compute the vertical stress on the center line of the footing due to the imposed load at a depth of 6.5 m below the ground level. The footing is founded at a depth of 2.5 m
4. The four legs of a transmission tower form in plan a square of side 4 m and together carry a total load of 300 kN. Compute the increase in vertical stress data depth of 2 m vertically below a leg and also at the center of the plan at 2 m depth. Use Bousnesq's theory
5. There is a layer of soft clay 4 m thick under a newly constructed building. The overburden pressure over the center of the clay layer is 300 kN/m² . Compute the settlement, if there is an increase in pressure due to construction of 100 kN/m² . Take Cc = 0.50, G = 2.70. The water content of the deposit was found to be 50%

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE405 Construction Project Management 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO11	PO12	DoK
20CE405.1	Summarizing various stages of construction project like planning, scheduling and controlling	3	1	L1, L2
20CE405.2	Estimating the required time for completion of project	3	1	L2
20CE405.3	Executing the cost analysis of a project	3	1	L3
20CE405.4	Explaining various construction equipment and handling measures	3	1	L3
20CE405.5	Predict the risk analysis and follow safety measures in construction project	3	1	L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Construction Project Management and its Relevance — 12 Hours

Introduction, Project Life Cycle, Qualities of a Project Manager, Project Initiation and Conception, Planning, Scheduling, Implementation, Execution.

Performance Monitoring and Closing

Unit II: Critical Path Method and Project Evaluation and Review Technique — 12 Hours

Introduction and Concept, Activity, Event, Dummies, Basic Assumptions in Creating a Network, Rules for Drawing Networks, Work Break Down Structure, Activity Time Estimation in CPM, PERT Techniques.

Advantages of CPM and PERT

Unit III: Cost Benefit Analysis — 12 Hours

Introduction, Definition, Purpose, Process, Limitations, Crashing for Optimum Cost, Crashing for Optimum Resources, Allocation of Resources, Introduction to Software's for Construction Project Management, Data Analysis Method - Project Management Information System Method.

Basics of Data Analysis

Unit IV: Construction Equipment's and Handling — 12 Hours

Economic Considerations, Earthwork Equipment, Trucks and Handling Equipment, Rear Dump Trucks, Capacities of Trucks, Handling Equipment, Calculation of Truck Production, Types of Compaction Rollers, Hoisting and Earthwork Equipment, Hoists, Cranes, Graders, Scrapers, Draglines, Clamshell Buckets Concreting Equipment.

Tractors, Bulldozers

Unit V: Risk and Safety Management — 12 Hours

Risk Management, Project Management, Decision, Making Process, Project Selection, Risk Identification and Assessment, Causes of Accidents on Various Sites, Safety Management - Measures and Safety Policies to be Adopted, Determination of Safety Parameters.

Personal protective equipment (PPE)

Text Books

1. Rory Burkey, "Project Management - Planning and Control", 4th Edition, Wiley, India, 2003
2. Punamia B. C. and Khandelwal K. K., "Project Planning and Control with PERT and CPM", Laxmi Publications, 2015
3. Kumar Neeraj Jha, "Construction Project Management Theory & Practice", 2nd Edition, Pearson Education, 2012
4. Sharma S. C., "Construction Equipment and Management", 4th Edition Khanna Publications, 2008
5. Nigel J. Smith, Tony Merna and Paul Jobling, "Managing Risk in Construction Projects", 3rd Edition, Wiley Publishers, 2014

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Charles Patrick, "Construction Project Planning & Scheduling", 2nd Edition, Pearson Education, 2012
2. Peter Fewings, "Construction Project Management - An Integrated Approach", 3rd Edition, Taylor and Francis, 2019
3. Joy P. K., "Hand Book of Construction Management", 4th Edition, Trinity Press Chennai, New Delhi, 2011
4. Gahlot P. S. and Dhir B. M., "Construction Planning & Management", 2nd Edition, New age international Limited Publications, 1992
5. Amit Bijon Dutta, "Understanding Risk Management in Construction Projects", 5th Edition, Evince Publishing, 2020
6. Moder, Joseph J. and Cecil R. Phillips, Project Management with CPM and PERT, 2nd Edition, Van Nostrand - Reinhold Company, New York, 1970
7. Clough, Richard H.," Construction Project Management", 4th Edition, Wiley – Inter science, New York, 1972

Web References

1. https://www.slideshare.net
2. http://www.sciencedirect.com/science
3. https://www.researchgate.net

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	40	40
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is scheduling?
2. What is the role of project manager?
3. List any four steps required for construction project
4. What is planning?
5. Define project execution

L2: Understand

1. Explain the process of project planning
2. How to identify and predict the risks in project?
3. Explain hauling and hoisting equipment's
4. Explain the steps in project management
5. Explain the rules for drawing a network diagram

L3: Apply

1. How to execute cost benefit analysis?
2. Demonstrate the methods in data analysis

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

ES 20CS407 Python Programming Lab

0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO12
20CS407.1	Illustrate the use of basic concepts of Python Programming	3	1
20CS407.2	Demonstrate the use of control Structures and Data Structures in Python	3	1
20CS407.3	Build programs using functions for resolving simple problems	3	1
20CS407.4	Explain the usage of Object oriented concepts and files	3	1
20CS407.5	Apply mathematical libraries for analyzing data sets with GUI	3	1

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective Pos

List of Experiments

1. a. Write a program that asks the user for a weight in kilograms and converts it to pounds
   b. Write a program to find total and average of 3 numbers
   c. Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89
2. a. Write a program that should print out the user's name the specified number of times
   b. Use for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be

```
*
**
***
****
```

   c. Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not
3. a. Write a program that asks the user for two numbers and prints Close if the numbers are within .001 of each other and Not close otherwise
   b. Write a program that asks the user to enter a word and prints out whether that word contains any vowels
   c. Write a program that asks the user to enter two strings of the same length. If they are not, the program should print an appropriate message and exit
4. a. Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers
   b. Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate
5. Write a program that generates a list of 20 random numbers between 1 and 100. Print the list.
   a. Print the average of the elements in the list.
   b. Print the largest and smallest values in the list.
   c. Print the second largest and second smallest entries in the list
   d. Print how many even numbers are in the list
6. a. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer
   b. Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row
   c. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0]
7. a. Write a function called sum digits that is given an integer num and returns the sum of the digits of numbers
   b. Write a function called first diff that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1
   c. Write a function called number of factors that takes an integer and returns how many factors the number has
   d. Write a function called is sorted that is given a list and returns True if the list is sorted and False otherwise
8. a. Write a function called root that is given a number x and an integer n and returns x1/n. In the function definition, set the default value of n to 2
   b. Write a function called primes that is given a number n and returns a list of the first n primes. Let the default

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

value of n be 100

c. Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list: i. Do this using the sort method ii. Do this without using the sort method

9. a. Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
   b. Write a program that reads a list of temperatures from a file called temps.txt, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
10. Write programs to demonstrate the usage of class
11. Write programs to demonstrate the usage of GUI
12. Write programs to demonstrate the usage Matplotlib library

References

1. Lab Manual for " Python Programming ", Department of Computer Science Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC **20CE407 Concrete Technology lab** **0 0 3 1.5**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			
		PO1	PO2	PO4	PO12
20CE308.1	Recognize, select and use appropriate equipment and hydraulic machinery for finding the fluid properties understanding the limitations of the equipment's and machinery	3	3	3	1
20CE308.2	Estimate the discharge in pipes and canals using flow meters and notches	3	3	3	1
20CE308.3	Estimate energy loss in pipe system	3	3	3	1
20CE308.4	Estimate the performance characteristics of hydraulic turbines and pumps	3	3	3	1
20CE308.5	Gain proficiency in designing efficient pipe systems and hydraulic machinery	3	3	3	1

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective Pos

List of Experiments

1. Determination of fineness and specific gravity of cement
2. Determination of normal consistency of cement
3. Determination of Initial and final setting time of cement
4. Determination of compressive strength of cement
5. Determination of fineness modulus and zoning of sand
6. Determination of fineness modulus of coarse aggregate
7. Determination of bulk density of fine aggregate and coarse aggregate
8. Determination of compressive strength of brick
9. Determination of workability of concrete using slump cone test
10. Determination of workability of concrete using Vee Bee consistometer
11. Determination of workability of concrete using flow test
12. Determination of workability of concrete using flow table
13. Determination of Strength of concrete

References

1. Lab Manual for Concrete Technology Lab, Department of Civil Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE308 Soil Mechanics Lab

0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO4	PO12	
20CE408.1	Recognize, select and use appropriate equipment and soil machinery for finding the soil properties understanding the limitations of the equipment's and machinery	2	3	1	L1
20CE408.2	Classify the soils by sieve analysis, hydrometer method and specific gravity	2	3	1	L2
20CE408.3	Experimenting the knowledge of science and techniques in engineering properties of soil	3	3	1	L3
20CE408.4	Estimating to design and conduct experiments to analyze critically and interpret resulting data related to various engineering properties of soil	3	3	1	L1, L3, L4
20CE408.5	Evaluate the impact of field density test of soil and California Bearing Ratio Test	3	3	1	L5

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos

List of Experiments

1. Determination of Index Properties
   a. Specific Gravity of Soil Solids
2. Grain Size Distribution – Sieve Analysis
   a. Grain Size Distribution - Hydrometer Analysis
   b. Liquid Limit and Plastic Limit Tests
   c. Shrinkage Limit and Differential Free Swell Tests
3. Determination of Insitu Density and Compaction Characteristics
   a. Field Density Test (Sand Replacement Method)
   b. Determination of Moisture – Density Relationship using Standard Proctor Compaction Test
   c. Semi Solid Composite Characteristics
4. Determination of Engineering Properties
   a. Permeability Determination (Constant Head and Falling Head Methods)
   b. One Dimensional Consolidation Test (Determination of Co-Efficient of Consolidation only)
   c. Direct Shear Test in Cohesion - Less Soil
   d. Unconfined Compression Test in Cohesive Soil
   e. Laboratory Vane Shear Test in Cohesive Soil
   f. Tri-Axial Compression Test in Cohesion-Less Soil (Demonstration only)
   g. California Bearing Ratio

References

1. Lab Manual for Soil Mechanics Lab, Department of Civil Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-5311.

SC 20CES02 Building Information Modelling Lab 1 0 2 2

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				DoK
		PO1	PO5	PO10	PO12	
20CES02.1	Recognize, select and use appropriate commands for building modelling understanding the limitations of the soft computing tools	3	3	3	1	L1, L2, L3
20CES02.2	Explaining the commands in creating architectural views	3	3	3	1	L3
20CES02.3	Estimating the specifications of structural members of the building	3	3	3	1	L3
20CES02.4	Structuring the schedule, cost and asset management of the building	3	3	3	1	L3, L4
20CES02.5	Gain proficiency in planning, designing and managing the building and infrastructure	3	3	3	1	L4, L6

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

List of Experiments

Introduction to BIM & AUTODESK REVIT.

1. Basic Drawing and editing tools
2. Setting Up Levels and Grids
3. Modelling Walls
4. Working With Doors and Windows
5. Working With Curtain Walls
6. Working With Views and Adding Components
7. Modelling floors
8. Modelling Ceilings & Roofs
9. Modelling Stairs and Railing
10. Editing Family files
11. Quantity take-off
12. Demonstration of different dimensions of BIM - 4D, 5D, 6D

References

1. Lab Manual for Building Information Modelling, Department of Civil Engineering, NSRIT

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE501 Structural Analysis 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO2	PO3	DoK
20CE501.1	Able to calculate the deflections for the determinate and indeterminate structures by using various methods.	3	3	3	L1, L2, L3
20CE501.2	Apply slope deflection method to analyze continuous beams andportal frames	3	3	3	L1, L2, L3
20CE501.3	Apply moment distribution method for beams and portal frames	3	3	3	L1, L2, L3
20CE501.4	Analyze two hinged and three hinged arches	3	3	3	L1, L2, L3
20CE501.5	Analyze beams subjected to moving loads using Influence line diagrams	3	3	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Deflection of Determinate Structures — 12 Hours

Determination of Static and Kinematic Indeterminacy in Beams, plane and space Trusses and Frames - Degree of Freedom - Deflection of statically determinate beams, pin jointed trusses and rigid jointed frames by energy method and unit load method. - Analysis of pin connected indeterminate trusses by consistent deformation method - Castiglione's First Theorems.

Determination of Static and Kinematic Indeterminacy in Beams

Unit II: Slope Deflection Method — 12 Hours

Introduction- Derivation of slope deflection equations - Application of Continuous beams-with and without sinking supports- portal frames - sway and non-sway conditions.

Application to Continuous beams

Unit III: Moment Distribution Method — 12 Hours

Introduction-Absolute and relative stiffness - Carry over factors - Distribution factors - Analysis of continuous beams - with and without sinking supports- portal frames -sway and non-sway conditions.

Absolute and relative stiffness and carry over factors

Unit IV: Arches — 12 Hours

Introduction - Types of arches - Analysis of three hinged - Eddy's theorem- Determination of horizontal thrust, bending moment, normal thrust and radial shear-temperature stress two hinged arches - Determination of horizontal thrust, bending moment, normal thrust and radial shear- temperature stress.

Temperature effects on arches

Unit V: Moving Loads and Influence Lines — 12 Hours

Influence Lines: Introduction - Construction of ILD for shear force and bending moment at a sections-determination of load positions for maximum shear force and bending moments for simply supported and overhanging beams with several point loadsand UDL and determination of their values - Sketching of absolute maximum BMD.

Influence line diagrams for SF and BM

Text Books

1. Hibbeler, R. C., "Structural Analysis",6th Edition, Pearson Publications, New Delhi 2012.
2. Vazirani & Ratwani, "Analysis of Structures", 19th Edition, Khanna Publications, 2008
3. Vaidyanathan, R. and Perumal, P., "Comprehensive Structural Analysis" (Vol. I & II), Laxmi Publications Pvt. Ltd., New Delhi.
4. Bhavikatti, S. S., "Analysis of Structures", (Vol. I & II), 6th Edition, Vikas Publications, 2009.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-53117

Reference Books

1. Reddy, C. S., "Structural Analysis", Tata McGraw Hill, New Delhi, 2008.
2. Devdas Menon, "Structural Analysis", Narosa Publishing Housing Pvt. Ltd.
3. Pandit, G. S. and Gupta, S. P., "Structural Analysis: A Matrix Approach", Mc Graw Hill Pvt. Ltd.

Web References

1. Introduction to Structural Analysis – Engineering Libre Texts
2. NPTEL: Civil Engineering – NOC:Structural analysis I
3. Structural Analysis1.pdf (giacr.ac.in)

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	20	20
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive LevelsL1:

Remember

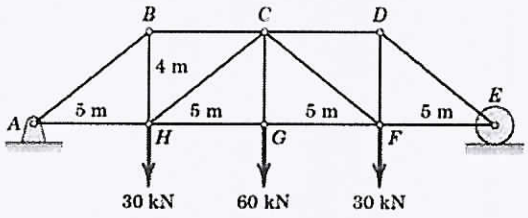
1. What is carry over factor?
2. What is distribution factor?
3. What is relative stiffness?
4. What is point of contra flexure?
5. What are the fixed end moment for a fixed beam of length L and subjected to udl of w kN/m?

L2: Understand

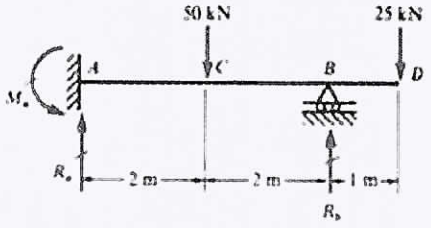
1. Explain the Clapeyron's theorem of three moments.
2. What do you understand by an Influence line diagram (ILD).
3. Difference between 'Beam-action' and 'Arch-action'.
4. What is the concept of the influence line?

L3: Apply

1. Determine the force in each member of the loaded truss by Method of Joints
   Is the truss statically determinant externally? Is the truss statically determinant internally? Are there any Zero ForceMembers in the truss

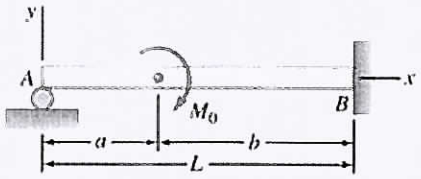


2. Solve Problem (a propped cantilever beam with an overhang). Calculate the reactions Ra, Rb and Ma for the propped cantilever beam with an overhang shown in the figure. (Take the reaction Rb at support B as the redundant)

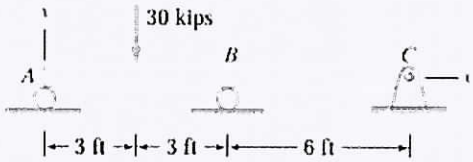


Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

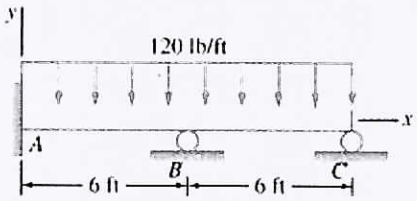
3. Solve the following problem by choosing MA and MB as the redundant reactions. Determine all the support reactions for the propped cantilever beam shown in the figure



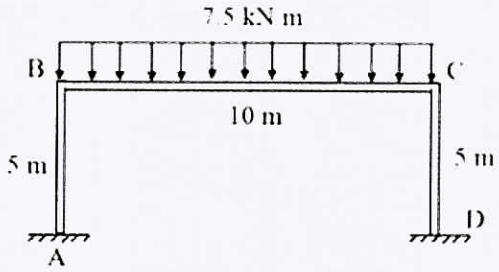
4. Find all the support reactions for the beam shown below:



5. The beam ABC has a built-in support at A and roller supports at B and C. Find all the support reactions



6. Analyze the Portal Frame (without sway) using Slope Deflection Method



CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE502 Design of Reinforced Concrete Elements 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs						DoK
		PO1	PO2	PO3	PO8	PSO1	PSO 2	
20CE502.1	Understand the philosophy of different methods& design of reinforced concrete elements subjected to bending and shear	3	1	1	2	3	3	L1, L2, L3, L4
20CE502.2	Design slabs with different boundary conditions and RC Staircases as per IS: 456-2000.	3	1	1	2	3	3	L1, L2, L3, L4
20CE502.3	Design of underground and overhead water tank; design principle of retaining wall	3	1	1	2	3	3	L1, L2, L3, L4
20CE502.4	Design of short and long columns for axial, uniaxial and biaxial loading as per IS: 456-2000.	3	1	1	2	3	3	L1, L2, L3, L4
20CE502.5	Design of footings for axial load& principle of combined and raft foundation as per IS: 456-2000.	3	1	1	2	3	3	L1, L2, L3, L4

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Design Philosophy and Limit State Design for Flexure 12 Hours

Introduction to RC design method, Difference between Working stress and Limit State Method – Philosophy and principle of limit state design with assumptions – Stress block parameters, concept of balanced section, under reinforced and over reinforced section – Limit State design of singly, doubly reinforced rectangular and flanged beam for bending – Design of beams for shear as per IS-456. Check for serviceability – Design for development length.

Modular ratio, Neutral axis depth

Unit II: Design of Slabs 12 Hours

Design of one way and two-way rectangular slabs subjected to uniformly distributed load for various boundary conditions and corner effects – Design of grid floor – Design of staircase –waist slab (dog legged).

Classification of slabs

Unit III: Limit State Design of Compression Members 12 Hours

Effective Length of a column, Design concepts of the column – Limit state design of short and long columns – Under axial loads, uniaxial and biaxial bending – Braced and un-braced columns- IS Code provisions

Types of R.C Column, slenderness ratio

Unit IV: Limit State Design of Footings 12 Hours

Different types of Footings – Design of Rectangular and square column footings with axial load and moment – reinforcement detailing. Design of combined footings – Raft foundation (Design principle only).

Design of wall footings, isolated footings

Unit V: Design of Water tank& Retaining Walls 12 Hours

Principle of working stress method with assumptions – Design of underground rectangular tanks – Design of overhead circular water tank (slab, wall and ring beam). Cantilever and counterfort retaining walls (Design principle only).

Types of water tanks, Types of Retaining walls, Tank resting on grounds.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531173

Case study (PO2)

1. In a city of Andhra Pradesh where a building is in construction, on a fine day the 5th floor slab collapsed at the corners on the 4th slab. The experts found the reason for the failure is due to the column shear failure. As a civil engineering graduate what is the suggestions you recommend to over this failure and also suggest how to repair the structure and make it useful.
2. In the place of Karnataka an industrial structure is being developed, as a part of it long columns were built to a height of 12m in a same lane by placing the beams in the middle. But on a certain day the columns were deformed. What might be the reason for this failure and what recommendation can be given from your side?

Text Books

1. Punmia, B. C. and Jain A. K., "Limit State Design of Reinforced Concrete", Laxmi Publications Pvt. Ltd., New Delhi, 2016
2. Unnikrishna Pillai and Devdass Menon, Reinforced Concrete Design, Tata Mc Graw Hill Publishing Company Ltd., NewDelhi, 2016
3. Krishna Raju N., "Reinforced Concrete Design:IS:456-2000, Principles and Practice", New Age International Publishers,New Delhi, 2018

Reference Books

1. Subramanian, N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2014
2. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2013
3. Sinha, S. N., "Reinforced Concrete Design", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2014
4. Shah, V. L. and Karve, S. R., "Limit State Theory and Design of Reinforced Concrete", Structures Publications, Pune, 2013.
5. https://www.uceb.eu/DATA/Books/THE%20CIVIL%20ENGINEERING%20HANDBOOK.pdf

IS Codes

1. IS 456:2000 Plain and Reinforced Concrete – Code of Practice, Bureau of Indian Standards, New Delhi
2. IS 875:1987 Code of Practice for Design Loads (other than earthquake) for buildings and structures, Bureau of Indian Standards, New Delhi
3. National Building Code 2016, BIS, New Delhi
4. SP16:1980 Design Aids for Reinforced Concrete to IS456 : 1978, BIS, New Delhi
5. SP34:1987 Handbook on Concrete Reinforcement and Detailing, BIS, New Delhi

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://onlinecourses.swayam2.ac.in/nou20_cs14/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	40	40
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is difference between limit state& working stress method?
2. What the difference is between under reinforced, over reinforced and balanced sections?
3. List out the types of beams
4. List out any 3 types of water tanks

L2: Understand

1. Classify the various types of slabs

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

2. Illustrate the difference between raft foundation and shallow foundation
3. Illustrate the concept of effective length of the column
4. Explain the principle for counter fort retaining walls

L3: Apply

1. A Cantilever beam with span 3m has an effective depth of 350mm at the supports and 250mm at the end and a constant width of 250mm. It carries a load of 75kN/m including the self-weight. It is reinforced with 04 bars of 20mm diameter. Use M20 grade of concrete and Fe 415 grade steel. Design shear reinforcement.
2. A simply supported RCC slab has to be provided for the roof of a room of clear dimensions 3m X 8m. Width of supporting wall is 300mm. The weight of weathering course over the slab is 1 kN/m^2. Take the live load on the slab as 2kN/m^2. Design the slab using M20 grade of concrete and HYSD steel. Check the design for the stiffness. Use M20 grade of concrete and Fe 415 grade steel.
3. Design a two way slab for the room 4000mm X 3500mm clear in size, if the super imposed load is 3kN/m^2 and floor finish is of 1kN/m^2. The edges of the slab are simply supported and corners are not held down.
4. Calculate the ultimate strength in axial compression of a column 400mm in diameter and reinforced with 06 No. 25mm diameter and of grade Fe415, when the column helically reinforced by 8mm diameter bars at 30mm pitch. Assume clear cover 40mm and M20 grade of concrete.
5. Design a reinforced concrete footing of uniform thickness for a reinforced concrete column of 400mm X 400mm size carrying an axial load of 1200kN using M20 grade of concrete and Fe415 steel. The safe bearing capacity of soil is 220kN/m^2
6. Design a counter fort retaining wall to retain 7m high embankment above ground level. The foundation is to be taken 1m deep where the safe bearing capacity of the soil may be taken as 180kN/m^2. The top of earth retained is horizontal, and soil weighs 18 kN/m^2 while angle of internal friction $\emptyset = 30^0$. Coefficient of friction between concrete and soil may be taken as 0.5. Use M20 grade of concrete and Fe415 steel
7. Design a Circular water tank with flexible base resting on the ground to store 50,000 liters of water. The depth of tank may be kept 4m. Use M25 concrete and Fe 415 steel

CONTROL COPY ATTESTED

Chairman

Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC **20CE503 Foundation Engineering** 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs							DoK
		PO1	PO2	PO3	PO6	PO8	PO12	PSO1	
20CE503.1	Determine soil properties by conducting various field and lab tests by getting exposure to IS: 1892-1979	3	2	3	3	2	1	3	L1, L2, L3, L4, L5
20CE503.2	Determine the bearing capacity of soils and settlements of footings in shallow foundations as per the recommendations of the IS: 1892-1979	3	2	3	3	2	1	3	L1, L2, L3, L4, L5
20CE503.3	Determine the slopes stability	3	1	3	3	2	1	3	L1, L2, L3, L4, L5
20CE503.4	Assess the load carrying capacity of piles using differentmethods and settlement analysis and know about well foundations	3	2	3	3	2	1	3	L1, L2, L3, L4, L5
20CE503.5	Estimate lateral earth pressures on retaining walls and checkthe stability	3	1	3	3	2	1	3	L1, L2, L3, L4, L5

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Soil Exploration **12 Hours**

Purpose of Subsurface Exploration – Depth of Exploration - Methods of Subsoil Exploration - Types of Soil Samples – Design Features affecting the Sample Disturbance - Planning of exploration program and Preparation of Soil investigation report

Types of borings

Unit II: Shallow Foundations **12 Hours**

Introduction – Basic Definitions - Terzaghi's Bearing Capacity Theory - Effect of Water Table on Bearing Capacity - Factors affecting Bearing Capacity of Soil - IS Code method for Bearing Capacity of Footings – Bearing Capacity from In-situ tests (SPT and Plate Load Test). Settlement Analysis -Causes of settlement – Determination of settlement of Foundations on Granular and Clay soils- Allowable Settlements

Modes of shear failures

Unit III: Stability of Slopes **12 Hours**

Analysis of Infinite and Finite Slopes - Stability Analysis of an Infinite Slopes in Cohesion less and Cohesive soils, Stability Analysis of Finite Slopes - Swedish Circle Method, Standard Method of Slices, Taylors Stability Number

Different factors of safety, Types of Slope Failures

Unit IV: Deep Foundations **12 Hours**

Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests – Load carrying capacity of pile groups – Settlement of pile groups. Well Foundation - Components of well foundation – Different Shapes of wells - Construction and Sinking of Well - Tilts and Shifts.

Classification of piles

Unit V: Earth Pressure Theories **12 Hours**

Different types of Lateral Earth Pressures, Rankine's Earth Pressure Theory, Rankine's Earth Pressure when the Surface is Inclined, Rankine's Earth Pressure in Cohesive Soils, Coulombs Wedge Theory, Culmanns Graphical Method

Rankine's theory assumptions.

Text Books

1. Arora, K. R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2005

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

2. Purushothama Raj, P., "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, 2013
3. Varghese, P. C., "Foundation Engineering", Prentice Hall of India Private Limited. New Delhi, 2005
4. Gopal Ranjan and Rao A. S. R., "Basic and Applied soil mechanics", New Age International Pvt. Ltd, New Delhi, 2005
5. Murthy, V. N. S., "Soil Mechanics and Foundation Engineering". CBS Publishers and Distributers Ltd., New Delhi, 2007.

Reference Books

1. Narsinga Rao B. N. D., "Soil Mechanics and Foundation Engineering", Wiley India Pvt. Ltd., New Delhi, 2015
2. Swami Saran, Analysis and Design of Substructures, 5th Edition, Oxford and IBH Publishing Company Pvt. Ltd., 2006
3. Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2007(Reprint)
4. Das, B. M., "Principles of Foundation Engineering", 7th Edition, Cengage Learning, 2011

Web References

1. https://nptel.ac.in/courses/105/105/105105176/
2. https://www.youtube.com/watch?v=lsYFtwwlHIw&list=PLbRMhDVUMngeiZjKPTPEFI1CByXmYX3Kv
3. https://nptel.ac.in/courses/105/101/105101083/
4. https://www.youtube.com/watch?v=RJyXfz8jEns
5. https://www.uceb.eu/DATA/Books/THE%20CIVIL%20ENGINEERING%20HANDBOOK.pdf

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	15	10
L2	10	15
L3	35	35
L4	35	40
L5	5	0
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is the objective of site investigation?
2. What is correction to be applied to find N value?
3. Define earth pressure at rest
4. What are modes of shear failure of shallow foundation?
5. Write the assumptions of Rankine's theory

L2: Understand

1. What is significant depth?
2. What are the limitations of Terzaghi's theory?
3. What is meant by critical depth of vertical cut for a clay soil?
4. Define Standard Penetration Number
5. Differentiate disturbed and undisturbed samples

L3: Apply

1. The internal diameter of a sampler is 40 mm and the external diameter is 42 mm. Will you consider the sample obtainedfrom the sampler as disturbed or undisturbed?
2. The field N value in a deposit of fully submerged fine sand was 40 at a depth of 6m.The average saturated unit weight of the soil is 19 kN/m^3. Calculate the corrected N value
3. Estimate the immediate settlement of a concrete footing, 1 m x 2 m, founded at a depth of 1m in a soil with $E = 10^4$ kN/m^2, $\mu = 0.3$. The footing is subjected to a pressure of $200kN/m^2$. Assume the footing is rigid
4. A retaining wall has a vertical back and is 8m high. The back face of the wall is smooth and the upper surface of the fill is horizontal. Determine the thrust on the wall per unit length. Take c = 10 kN/m^2, γ =19 kN/m^3 and ϕ =20°. Neglect tension
5. A 30cm diameter concrete pile is driven in a normally consolidated clay deposit 15 m thick. Estimate the safe load. Takecu = 70 kN/m^2 and adhesion factor is 0.9 and FOS = 2.5

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

L4: Analyze

1. A square column foundation has to carry a gross allowable load of 1805 kN (FS = 3). Given: Df = 1.5 m, γ = 15.9 kN/m^3, ϕ = 34° and c' = 0. Use Terzaghi's equation to determine the size of the foundation (*B*). Assume general shear failure.
2. A 6-m-high retaining wall is to support a soil with unit weight γ = 17.4 kN/m^3, soil friction angle ϕ = 26°, and cohesion c' = 14.36 kN/m^2. Determine the Rankine active force per unit length of the wall both before and after the tensile crack occurs, and determine the line of action of the resultant in both cases.
3. A vertical cut is made in a clay deposit (c = 30 kN/m^2, γ =16 kN/m^3 and ϕ =0°). Find the maximum height of the cut which can be temporarily supported
4. A concrete pile of diameter 40 cm is to be driven in stiff clay. Unconfined compressive strength of clay is 180kN/m^2. What is length required to be penetrated by the pileto support a safe working load of 350kN. Take adhesion factor as 0.7.A square foundation is 2 m X 2 m in plan. The soil supporting the foundation has a friction angle of ϕ' = 25°and c = 20 kN/m^2 .The unit weight of soil γ = 16.5 kN/m^3. Determine the allowable gross load on the foundation with a factor of safety(FS) of 3. Assume that the depth of the foundation is 1.5 m and that general shear failure occurs in the soil.

L5: Evaluate

1. As we can take a problem which focused in the south Indian movie, the lead role was an civil engineer planned to construct a project in the area where a small river is present near to the project site, and that site is not good for construction. If you come across this situation as a civil engineer back ground person what idea you can recommend for this problem instead of stopping. (PO6)
2. Same like above in the other film we can observe, the lead role is an college lecturer who is celebrating the Diwali on the same night, piling work is being carried out near to that residential area, due to that piling activity the nearby apartments got drown and the total building was collapsed. Later in the investigations it is found that the building was constructed by covering the pond and above that it was build. To overcome this type of situation what type of measures you recommend at the initial stages of construction. (PO8)

CONTROL COPY ATTESTED

Chairman

Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC **20CE506 Drawing of Reinforced Concrete Structures** **0 0 3 1.5**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			
		PO1	PO3	PO10	PSO1
20CE506.1	Design principles and Drawing of RC beam as per the IS: 456-2000	2	3	3	2
20CE506.2	Design principles and Drawing of a RC slab as per the IS: 456-2000	2	3	3	2
20CE506.3	Design Principles and Drawing of a RC retaining wall as per the code of practice	2	3	3	2
20CE506.4	Design principles and Drawing of a RC water tank as per the code of practice	2	3	3	2
20CE506.5	Design principles and Drawing of a RC column & footings as per the IS: 456-2000	2	3	3	2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

List of Experiments

1. Design and Drawing of a singly reinforced beam
2. Design and Drawing of a doubly reinforced beam
3. Design and Drawing of a Tee beam
4. Design and Drawing of a RC one-way slab
5. Design and Drawing of a RC Two-way slab
6. Design and Drawing of a Cantilever Retaining Wall
7. Design and Drawing of a Counterfort Retaining Wall
8. Design and Drawing of a short column
9. Design and Drawing of a long column
10. Design and Drawing of a Isolated footing

List of Augmented Experiments

1. Design and Drawing of a Dome
2. Design and Drawing of an Underground Rectangular Water Tank
3. Design and Drawing of an Elevated Water Tank
4. Design and Drawing of stair case
5. Design and Drawing of Pile foundation
6. Design and Drawing of Chimneys

Text Books

1. Varghese, P.C., "Limit State Design of Reinforced Concrete", Prentice Hall of India, Pvt. Ltd., New Delhi, 2002
2. Gambhir, M. L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2006
3. Subramanian, N., "Design of Reinforced Concrete Structures", Oxford University Press, New Delhi, 2013

Reference Books

1. Jain, A. K., "Limit State Design of RC Structures", Nemchand Publications, Roorkee, 1998
2. Sinha, S. N., "Reinforced Concrete Design", Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2002
3. Bandyopadhyay, J. N., "Design of Concrete Structures", Prentice Hall of India Pvt. Ltd., New Delhi, 2008
4. IS:456-2000, "Code of practice for Plain and Reinforced Concrete", Bureau of Indian Standards, New Delhi, 2000
5. SP16, IS:456-1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999
6. Shah, V. L. and Karve, S. R., "Limit State Theory and Design of Reinforced Concrete", Structures Publications, Pune, 2013.

CONTROL COPY ATTESTED

Chairman

Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC **20CE507 Irrigation Design and Drawing** **0 0 3 1.5**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				
		PO5	PO6	PO10	PSO #1	PSO #2
20CE608.1	Understand concept of irrigation and different hydraulicstructure	2	2	2	1	1
20CE608.2	Recognize the importance, location, components and typesof irrigation structures	2	2	2	1	1
20CE608.3	Identify various types of irrigation structures and their design aspects	3	2	2	1	1
20CE608.4	Examine the drawing of irrigation structures	3	2	2	1	1
20CE608.5	Understand the design and drawing of various irrigation structures	3	2	2	1	1

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos

Design and Drawing of

1. Barrage
2. Tank sluice with a tower head
3. Tank Surplus weir
4. Canal drop - Notch type
5. Canal regulator
6. Syphon aqueduct type III

Text Books

1. Satyanarayana Murthy, C., "Water Resources Engineering – Principles and Practice" New age International Publishers, 2020
2. Murthy, R. S. N., "Type Designs of Irrigation Structures", 1st Edition, 1970

Reference Books

1. Garg, Santosh Kumar, "Irrigation Engineering and Hydraulic Structures", 1st Edition, Khanna Publishers, 2006
2. Punmia, B. C. and Lal, "Irrigation and Water Power Engineering", 17th Edition, Lakshmi Publications Pvt. Ltd., NewDelhi, 2021

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531173.

MC **20MCX03 Intellectual Property Rights and Patents** **2 0 0 0**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20MCX03.1	Acquire knowledge on intellectual property rights	-	L1, L2
20MCX03.2	Know about the acquisition of trademarks		L1, L2
20MCX03.3	Identify the importance of copyrights, patents and Transfer of Ownership		L1, L2
20MCX03.4	Reciprocate to new developments of intellectual property rights		L1, L2
20MCX03.5	International overview of IPR		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Intellectual property: **4 Hours**

Concepts, types of intellectual property, international organizations, agencies and importance of intellectual propertyrights.IndustrialProperty,technologicalResearch,InventionsandInnovations – Important examples of IPR.,IPR in India and Abroad

Unit II: Introduction to Trade Marks: **4 Hours**

Purpose and function of trademarks, acquisition of trademark rights, selecting and evaluating trademark, trademark registration processes. Trade Secrets and Industrial Design registration in India and Abroad

Unit III: Registration of Copy Rights **4 Hours**

Fundamentals of copy right law, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copyright registration, international copyright laws.
Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

Unit IV: Latest development of intellectual property Rights **4 Hours**

New developments in trademark law; copy right law, patent law, intellectual property audits. Infringement of IPRs, Enforcement Measures, Emerging issues–

Unit V: Enforcement of IPRs **4 Hours**

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and inter development in trade secrets law.

Text Books

1. Intellectual property right, Deborah, E. Bouchoux, engage learning.
2. Intellectual property right - Unleashing the knowledge economy, Prabuddha Ganguli, Tata McGraw Hill Publishing Company Ltd.
3. Cornish, William Rodolph & Llewelyn, David. Intellectual property: patents, copyright, trademarks and allied rights. Sweet& Maxwell,8/e,2013.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Cornish, William Rodolph. Cases and materials on intellectual property. Sweet & Maxwell, 5/e,2006.
2. Lo, Jack and Pressman, David. How to make patent drawings: a patent it your self-companion. Nolo, 5/e 2007.

Web References

1. https://www.investopedia.com/terms/i/intellectualproperty.asp
2. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3217699/
3. https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	60	60
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is Industrial property?
2. What are the fundamentals of copy rights
3. Define patents and its approval process
4. Define copy right law.
5. Define transfer of trade marks.

L2: Understand

1. Explain the role trade secrets in company law.
2. Explain the concept ownership rights of patents with suitable examples
3. Explain the international patent law.
4. Distinguish between copy rights and patents.
5. Explain copy right registration.

CONTROL COPY ATTESTED

Chairman
Board of Studies (MBA)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

IN	**Summer Internship #1**	**0**	**0**	**0**	**1.5**

At the end of the course, students will be able to

No.	Course Outcomes
1	Demonstrate the theoretical learning outcomes
2	Integrate theory and practice during graduation
3	Comprehend the industry practices in the relevant and allied field of study
4	Develop communication skills in terms of oral, written, and graphical communications
5	Develop problem solving skills
6	Develop work habits and teamwork in a multidisciplinary setting for a successful career after graduation

Note: All the above course outcomes are relatively mapped to all POs as it caters to all program outcomes

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

AC **Technical Paper Writing** **0 0 4 2**

At the end of the course, students will be able to

No.	Course Outcomes
1	Develop searching latest relevant literature pertaining to the topic of interest
2	Develop self-learning ability to become a lifelong independent learner
3	Develop the habit of writing technical manuscript as per the requirement
4	Develop presentation skills and speak with appropriate technical phrases
5	Explore the research topics and develop research interests
6	Comprehend the latest technologies, techniques, tools, and methodologies

Note: All the above course outcomes are relatively mapped to all POs as it caters to all program outcomes

CONTROL COPY ATTESTED
Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE601 Transportation Engineering 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO3	PSO1	DoK
20CE601.1	Understand the highway and traffic engineering	3	1	L1, L2
20CE601.2	Identify components of railway engineering and their functions	3	1	L1, L2
20CE601.3	Understand the planning and classifications of air, docks, portand harbors	3	1	L1, L2
20CE601.4	Use various design factors of transportation engineering	3	1	L2, L3,L4
20CE601.5	Interpret the maintenance and controlling of transportation systems	3	1	L2, L3

Unit I: Highway and Traffic Engineering **9 Hours**

Necessity for Highway Planning, Different Road Development Plans, Planning Surveys – Highway Alignment- Factors affecting Alignment- Engineering Surveys, types of pavements, Functions and requirements of different components of pavements. Basic Parameters of Traffic, Factors Affecting, LOS Concepts, Road Traffic Signs, Road markings, Types of Intersections.

Highway alignment, components of pavement

Unit II: Railway Engineering **9 Hours**

Components of Railway Engineering: Permanent way components – Railway Track Gauge – Cross Section of Permanent Way –Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails – Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

Components of railway engineering

Unit III: Airports, Docks and Harbors **9 Hours**

Airport Master plan – Airport site selection – Aircraft characteristics – Airport classification – Runway orientation – Wind rose diagram, Runway length – Taxiway design – Terminal area and airport layout. Planning, layout, construction docks & harbors:Classification of ports – Requirement of a good port – Classification of harbors – Docks – Dry & wet docks – Transition sheds and workhouses – Layouts, Quays – Construction of Quay walls – Wharves – Jetties – Tides – Tidal data and Analysis – Break waters – Dredging

Runway length, breakwaters

Unit IV: Geometrical Design **9 Hours**

Importance of Geometric Design of highway – Design controls and Criteria of highways, Design of Traffic Signals –Webster Method – IRC Method, Design of Plain, Flared, Rotary and Channelized Intersections Geometric Design of Railway Track: Alignment – Engineering Surveys – Gradients – Grade Compensation, Various Design factors in airports – Design methods, Airport Drainage – Design of surface and subsurface drainage.

Importance of geometrical design, gradient

Unit V: Maintenance of Transportation **9 Hours**

Pavement failures, Maintenance of highways, pavement evaluation, strengthening of existing pavements. Turnouts & controllers, Signal objectives signaling systems – Mechanical signaling system – Electrical signaling system – System for controlling train movement maintenance and rehabilitation of airfield pavements – Evaluation & strengthening of airfield pavements visual aids and air traffic control. Airfield pavement failures, Maintenance of ports, docks and harbors.

Pavement evaluation, strengthening

Text Books

1. Kadyali L. R. and Lal N. B., "Principles and Practices of Highway Engineering", Khanna Publishers, 2006
2. Khanna, S. K., Arora, M. G. and Jain, S. S., "Airport Planning & Design", Nem Chand & Bros., 1999
3. Rao, G. V., "Airport Engineering", Tata McGraw Hill Publishing Co., New Delhi, 1999
4. Srinivasan, R. and Rangwala, S. C., "Harbor, Dock and Tunnel Engineering", Charotar Publishing House, 1995

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

5. Rangwala, "Airport Engineering", 15th Edition, Charotar Publishing House Pvt. Ltd., 2015
6. Venkatramaiah, C., "Transportation Engineering, Vol. 2: Railways, Airports, Docks and Harbours, Bridges and Tunnels"The Orient Black swan, 2016

Reference Books

1. Subramanian, K. P., "Highways, Railways, Airport and Harbor Engineering", V Scitech Publications (India), Chennai,2010
2. Saxena Subhash, C. and Satyapal Arora, "A Course in Railway Engineering", Dhanapat Rai and Sons, Delhi, 1998
3. Khanna, S. K., Arora, M. G. and Jain. S. S., "Airport Planning and Design", Nemachand and Bros, Roorkee, 1994
4. Mannering Fred, L., Kilarski Walter, P. and Washburn Scott, S., "Principles of Traffic Engineering and Traffic Analysis", 3rd Edition, Wiley, 2007
5. Roess, R. P., Prassas, E. S. and McShane, W. R.,"Traffic Engineering", 4th Edition, Prentice Hall, 2010

Web References

1. https://www.iare.ac.in
2. https://www.smartzworld.com

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	35
L2	40	40
L3	20	20
L4	-	5
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. List any 3 elements in engineering survey.
2. Define the term alignment.
3. Difference between dock and a harbor.
4. What are the basic parameters to be considered in traffic control?
5. Define rotary.

L2: Understand

1. Explain the concept of LOS
2. Discuss the components of railway track formation.
3. Explain the pavement evaluation and strengthening.
4. Explain briefly about Break waters.
5. Write short notes on the ports, Docks & Harbors.

L3 : Apply

1. Apply the design criteria for a new highway project.
2. Illustrate the use of Webster method for traffic signals.
3. Examine various design factors in airport engineering.
4. Mention how the electrical signaling system function, how it is designed.

L4 : Analyze

1. As a transportation engineer how would you recommend for the pedestrian problem in crossing the road at a busy junction say like Maddilapalem in the Visakhapatnam. As you can observe many accidents are being occurred at that place while crossing.
2. What recommendations can you present for the roads from pendurthi to Aruku route, as there are many pit holes are observed might be because of heavy rains or due to the wear and tear of the vehicle movement. As they can be covered by the patch works but as a technical person how can you suggest to avoid these types of problems.

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC **20CE602 Design of Steel Structures** 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO3	PO10	PSO 1	
20CE602.1	Analyze and design welded connections	1	3	3	L1, L3
20CE602.2	Design simple and compound beams as per IS:800-2007	2	3	3	L1, L2
20CE602.3	Design tension and compression members as per IS:800- 2007	2	3	3	L1, L2, L3
20CE602.4	Design built-up column and column base systems as per IS:800-2007	2	3	3	L1, L2
20CE602.5	Design the plate girder and gantry girder	2	3	3	L1, L2

Unit I: Welded connections **12 Hours**

Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and Fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints.

Types of welds

Unit II: Beams **12 Hours**

Introduction to plastic analysis, Design requirements as per IS Code, Design of simple and compound beams-Curtailment of flange plates, laterally supported and unsupported beams.

Plastic analysis

Unit III: Tension Members and Compression Members **12 Hours**

General design of members subjected to direct tension, design and strength of angle for tension with bolting and welding.
Effective length of columns, Slenderness ratio – permissible stresses, Design of compression members composed of a channel and I section (Strut members).

Slenderness ratio

Unit IV: Built up Columns and Column Bases **12 Hours**

Design of built-up compression members made of channel, I section and angles connecting system – Design of lacings and battens. Design of slab base and gusset base. Column bases subjected to axial force and moment

Lacings and Battens

Unit V: Roof Trusses & Industrial Structures **12 Hours**

Roof trusses – Different types-design loads – load combinations - design of purling and elements of truss; – Design of plate girder -welded-curtailment of flange plates - Stiffeners -Splicing and columns Design of gantry girders-analysis of probabilities for different combination of forces and contribution of critical stress.

plate girders, gantry girders

Text Books

1. Subramanian, N., "Steel structures (Design & Practice)", Oxford University Press, 2011
2. Duggal, S. K., "Limit State Design of Steel Structures", 2nd Edition, Tata Mc Graw Hill, New Delhi, 2014
3. Bhavikatti, S. S., "Design of Steel Structure by Limit State Method as per IS: 800-2007", 4th Edition, IK International Publishing House, Bangalore, 2014

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Shah, V. L., Veena Gore, "Limit State Design of Steel Structures", 1st Edition, Structures Publications, 2009
2. Dayaratnam, P., "Design of Steel Structures", 2nd Edition. S. Chand Publishers, 2009
3. Sai Ram, K. S., "Design of Steel Structures", 2nd Edition, Pearson, 2013

Web References

1. design of steel structures nptel - Bing
2. CE2352 DSS.pdf (sasurieengg.com)
3. design of steel structures book - Bing

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	40	40
L3	30	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is structural steel design?
2. What are the mechanical properties of structural steel?
3. What are the defects you can except during inspection of material receiving at the site?
4. What are the types of joints you can use for erection of structural steel?
5. What is minimum thickness of any part of structural steel shape?
6. Write any six features of structural steel
7. What are the cross-section classification defined in IS 800-2007 based on slenderness of plate elements?

L2: Understand

1. Explain the design process of structural steel?
2. Describe the steps used for erection of structural steel?
3. What Is the minimum size of bolt used at Astm A32 N?
4. Describe the types of foundations used for columns
5. Explain different types of welds
6. Explain the purpose of lug angles in tension member connection
7. Explain the failure modes of axially loaded columns

L3: Apply

1. Determine the design load capacity of the column ISHB 300@577 N/m if the length of the column is 3m and its both ends are hinged
2. Determine the design forces in the members of a Fink type roof truss for an industrial building for the following data. Overall size of building: 48 m x16 m., C/c spacing of trusses: 8 m , Rise of truss :1/4 of span , Self-weight of purlins : 318 N/m., Height of columns : 11 m. Roofing : A C sheets (171N/m^2), Location : Agra
3. Derive the expression for calculating the force F in a bolt subjected to a factored load P at an eccentricity e. The line of action of the load is in the plane of the bolted connection and the centre of gravity of the connection is the centre of rotation
4. Determine the tensile strength of ISA 125 x 95 x 8 mm connected to the gusset plate of 10mm through the shorter leg by 4,M20 bolts arranged in one row. The grade of steel is Fe410. Take p = 65 mm ,Edge & End distance 40 mm

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CE603 Environmental Engineering 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO2	PO3	PO6	
20CE603.1	Explain the necessity of water supply system and characteristics of water and wastewater	1	2	3	L1,L2
20CE603.2	Explain various conveyance system in water supply scheme	3	2	3	L1, L2
20CE603.3	Design various units of conventional water treatment plant and water supply system	2	2	3	L2,L3
20CE603.4	Design various units in the wastewater treatment plant	3	2	3	L2, L3
20CE603.5	Adapt a treatment unit for the safe disposal of sludge and effluent into the environment	2	2	3	L1,L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction **9 Hours**

Importance and Necessity of Protected Water Supply systems, Flow chart of public water supply system, Role of Environmental Engineers and Agency activities.

Water Demand and Quantity Estimation: Estimation of water demand for a town or city, Per capita Demand and factors influencing it - water demands - its variations- factors affecting water demand, Design Period, Factors affecting the *Design period, Population Forecasting.*

UNIT II Collection and Conveyance System **9 Hours**

Sources of water, capacity of storage reservoirs, wells, infiltration galleries, – intake structures – types of Pipes and Pipe materials and its selection criteria –Selection and considerations of pumps, pumping and plumbing systems
Hydraulics of flow in pipes

Unit III: Quality analysis and treatment of water **9 hours**

Quality analysis - Characteristics and analysis of water – physical, chemical and biological aspects
Treatment of Water: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration.
Theory of disinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of colour and odours - Iron and manganese removal –Adsorption-fluoridation and defluorination–aeration– Reverse Osmosis-Iron exchange– Ultra filtration.
Desalination, filtration by membranes

Unit IV: Design of Sewage Treatment Units **9 Hours**
Primary treatment: Unit Operations and Processes, Selection of treatment processes, Onsite sanitation-Septic tank, Imhoff tanks, , Principles, functions and design of sewage treatment units, Construction, Operation and Maintenance aspects.
Secondary Treatment: Activated Sludge Process, Trickling filters, UASB, FAB reactors, Waste Stabilization Ponds, Other treatment methods, , Recent Advances in Sewage Treatment.
Construction, Operation and Maintenance aspects; Sewer Appurtenances

Unit V: Sludge management and disposal **9 Hours**
Effluent Disposal: Standards for Disposal, Methods, dilution, Self-purification of river, Oxygen sag curve, deoxygenation and disposal of Sewage.
Sludge Disposal: Sludge characterization, Thickening, Sludge digestion, Biogas recovery, Sludge Conditioning and Dewatering, Sludge drying beds.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531173.

Ultimate residue disposal and recent advances; Soil Dispersion System.

Textbook (s)

1.B.C. Punmia, Ashok Jain &Arun Jain, Water Supply Engineering, Vol. 1, Wastewater Engineering, Vol. II, 2nd Ed., Laxmi Publications Pvt. Ltd, New Delhi, 2016
2.G.S. Birdi, Water supply and Sanitary Engineering, Revised Ed., DhanpatRai& Sons Publishers, 2015
3.K.N. Duggal, Elements of Environmental Engineering, 3rd Ed., S. Chand Publishers, 2010

Reference (s)

1. Manual on Sewerage and Sewage Treatment Systems Part A, B and C, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2013.
2. Metcalf and Eddy- Wastewater Engineering–Treatment and Reuse, Tata Mc.Graw-Hill Company, New Delhi, 2010.
3. Syed R. Qasim "Wastewater Treatment Plants", CRC Press, Washington D.C.,2010 4. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.

Web References

1. https://nptel.ac.in
2. https://ocw.mit.edu

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Enumerate the components of a water supply scheme.
2. Define coagulation.
3. Define design period.
4. What are the factors governing the selection of a water source?
5. What are the factors governing the location of the intake structure?
6. Define reverse osmosis.
7. Define oxidation pond and oxidation ditch.
8. What is the role of skimming tank in STP?
9. Define standard rate and high rate trickling filter.

L2: Understand

1. Explain the need for supplying protected water supply.
2. Differentiate between slow and rapid sand filter with respect to (a). Rate of filtration. (b). loss of head.
3. Explain in detail about various factors affecting the water demand.
4. Explain in detail about water requirement for domestic and public uses.
5. Explain in detail about characteristics of water.
6. Explain in detail about different sources of water.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam

L3: Apply

1. Describe the step involved in the design of septic tank. And also explain the working of a trickling filter with neat sketch.
2. Determine the size of a high-rate trickling filter for the following data
   Sewage flow= 4.5 million litres per day
   Recirculation ratio = 1.5
   BOD for raw sewage = 230 mg/l BOD removal in PST = 30%
   BOD of treated effluent required = 25 mg/l.
3. The population of 5 decades from 1930 to 1970 is given below in the table. Find out the population of 1, 2, 3 decades be-yond the last known decade by using arithmetic increase method.

Year	1930	1940	1950	1960	1970
Population	25000	28000	34000	42000	47000

4. If 2% solution of a sewage sample is incubated for 5 days at 20°C and depletion of oxygen was found to be 5 ppm. Determine the B.O.D. of the sewage.
5. Design a rectangular sedimentation tank for treating 4.5 million litres per day adopting L: B ratio as 2, overflow rate 20 m3 /d.m2 and detention time of 3 hours.
6. Design a septic tank for 100 users. Assume necessary data
7. Design 6 slow sand filter beds from the following data:
   Population to be served = 50000 persons
   Per capita demand = 150 lt/cap/d
   Rate of filtration = 180 lt/hr/m^2
   Length of each bed = twice the breadth
   Assume maximum demand as 1.8 times the average daily demand. Also assume that one unit, out of six will be kept as stand by.
8. Design a Sludge digestion tank for 40000 persons. The solids content per day is 0.068 kg/c/d. the moisture of the sludge is 1.02 & 3.5% of the digester volume is daily filled with the fresh sludge, which is mixed with digested sludge
9. Design a primary settling tank (rectangular) for a town having a population of 50,000 with a water supply of 180 l/c/d.
10. Design a grit chamber for the following data
    Discharge = 8000 m^3/d
    Settling velocity = 0.018 to 0.022 m/s
    Velocity of flow = 0.3 m/sec

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Techn...
Sontyam, Visakhapatnam-...

PC **20CE606 Detailing and Drawing of Steel Structures** **0 0 3 1.5**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO3	PO10	PSO1	
20CE606.1	Apply the basic requirements of the IS design specifications	3	3	2	L1, L2, L3
20CE606.2	Design of steel members subjected to compression	3	3	2	L1, L2, L3
20CE606.3	Design of flexural members subjected to various loads	3	3	2	L1, L2, L3
20CE606.4	Design of plate girders subjected to various loads	3	3	2	L1, L2, L3
20CE606.5	Design of column members based subjected to various loads	3	3	2	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1 Remember | L2 Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create DoK Depth of Knowledge

List of Experiments

1. Design, Drawing and detailing of bolted and welded connection.
2. Design, Drawing and detailing of members subjected to direct tension, design and strength of angle for tension with bolting and welding.
3. Design of compression members composed of a channel and I section (Strut members).
4. Design and Drawing of lacings in a column.
5. Design, Drawing and Detailing of Plate girder with the Intermediate stiffeners and end stiffeners.
6. Design, Drawing and Detailing of Column base.
7. Design, Drawing and detailing of gusseted base.
8. Design, Drawing and detailing of gantry girders.

Text Books

1. Krishnaraju, N., "Structural Design and Drawing Reinforced Concrete and Steel", Universities Press, 3rd Edition, 2009
2. Duggal, S. K., "Limit State Design of Steel Structures", Tata Mc Graw Hill Publishing Company, 2005
3. Bhavikatti, S. S., "Design of Steel Structures", Limit State Method as per IS: 800, 2007, IK International Publishing House Pvt. Ltd., 2009
4. Subramanian, N., "Design of Steel Structures", Oxford University Press, New Delhi, 2013

Reference Books

1. Gambhir, M. L., "Fundamentals of Structural Steel Design", Mc Graw Hill Education India Pvt. Ltd., 2013
2. Shiyekar, M. R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd., Learning Pvt. Ltd., 2nd Edition, 2013
3. Narayanan, R., et. al., "Teaching Resource on Structural Steel Design", INSDAG, Ministry of Steel Publications, 2002
4. Shah, V. L., and Veena Gore, "Limit State Design of Steel Structures", IS 800, 2007, StructuresPublications, 2009
5. IS 800:2007, General Construction in Steel, Code of Practice, (3rd Revision), Bureau of Indian Standards, New Delhi, 2007

Codes/Tables

IS: CODES-

1. IS -800, 2007.
2. IS – 875.
3. Steel Tables.
4. IS 1367 (PART 3)

CONTROL COPY ATTESTED

Chairman

Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC **20CE607 Transportation Engineering Laboratory** 0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			
		PO1	PO2	PO4	PSO2
20CE608.1	Identify engineering properties of aggregate as per IS:2386-1-1963	3	2	2	1
20CE608.2	Identify the grade & properties of bitumen as per IRC-110	3	2	2	1
20CE608.3	Find out peak hour traffic & peak time for a given location on the road as per IRC:009-1972.	3	2	2	1
20CE608.4	Calculate design speed, maximum speed & minimum speed limits of a location through spot speed as per IRC codes.	3	2	2	1
20CE608.5	Draw parking accumulation curve and find out parking duration & turnover of parking lot/stretch as per IRC codes.	3	2	2	1

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

List of Experiments

1. Aggregate crushing value test
2. Aggregate Impact test
3. Specific gravity and Water absorption test
4. Attrition test
5. Abrasion test
6. Shape tests (Flakiness & Elongation Index)
7. Penetration test
8. Ductility test
9. Softening point test
10. Flash and fire point tests
11. Stripping test
12. Viscosity test

List of Augmented Experiments

1. Marshall stability test
2. Traffic volume study at mid blocks, Traffic volume studies (Turning movements) at intersection
3. Spot speed studies
4. Earthwork calculations for road works
5. Drawing of road cross sections

Text Books

1. Khanna, S. K., Justo, C. E. G. and Veeraraghavan, A., 'Highway Material Testing Manual', 2nd Edition, New Chand Publications, New Delhi, 2016
2. Rao, "Highway Material Testing & Quality Control", 1st Edition, Wiley India Pvt. Ltd., New Delhi, 2015

Reference Books

1. IRC-110 Codes of Practice
2. Asphalt Institute of America Manuals
3. Code of Practice of B.I.S.
4. https://www.iitk.ac.in/ce/test/IS-codes/is.2386.1.1963.pdf.
5. https://www.iitk.ac.in/ce/test/IS-codes/is.383.1970.pdf.

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC **20CE608 Environmental Engineering Laboratory** 0 0 3 1.5

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	
		PO4	PSO 2
20CE608.1	Demonstrate how to perform relevant tests in the laboratory to determine the major characteristics of water as per IS: 4251-2004	3	3
20CE608.2	Make use of various equipment/methods available for examining water and Wastewater as per IS:10044-1981.	3	3
20CE608.3	Identify the practical significance of the characteristics, the relevant codes ofpractice for examination and permissible limits for the characteristics of Wastewater following the standards as per IS:10044-1981.	3	3
20CE608.4	Assess the pollutant concentration in water and wastewater	3	3
20CE608.5	Choose various treatment techniques for water, wastewater and recycled water	3	3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos

List of Experiments

1. Determination of pH and electrical conductivity.
2. Determination and estimation of total hardness.
3. Determination of Calcium and Magnesium hardness.
4. Determination of alkalinity.
5. Determination of chlorides in water and soil.
6. Determination and estimation of total solids, dissolved solids.
7. Determination of Iron.
8. Determination of optimum coagulant dosage.
9. Determination of dissolved oxygen with DO Meter & Winkler 's Method.
10. Determination of BOD.
11. Determination of COD.
12. Determination of chlorine demand.
13. Determination of Fluorides.

List of Augmented Experiments

1. pH and electrical conductivity value of different samples
2. Estimation of total hardness of bore water
3. Determination of Calcium and Magnesium hardness of bore water
4. Determination of alkalinity and acidity of different samples
5. Determination of chlorides in water and soil
6. Estimation of total solids, dissolved solids in surface water and sub-surface water sample
7. Determination of dissolved oxygen of pond water with DO meter &Winkler's method

Text Books

1. Standard methods for examination of water and wastewater, 23rd Edition, APHA
2. Murali Krishna K. V. S. G., "Chemical Analyses of Water and Soil", 3rd Edition, Reem Publications, New Delhi, 2013

References

1. Barani Tharan Balamurali S., "Environmental Engineering Laboratory Manual", 1st Edition, Create space Independent Publishing Platform, 2016

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

SC 20CES04 Estimation and Costing 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs PO1	PO11	PO12	DoK
20CES04.1	Determine basic concepts of estimation in evaluating construction cost as per the Method of measurement of civil works framed by Board of Indian Standards	2	3	1	L1, L2, L3
20CES04.2	Apply standard specifications to carry out rate analysis and prepare bar bending schedule for different RC elements.	2	3	1	L1, L2, L3
20CES04.3	Prepare valuation of building using principles of valuation and estimate the quantities for Road work items	2	3	1	L1, L2, L3
20CES04.4	Explain construction organization, construction planning and scheduling of projects	2	3	1	L1, L2, L3
20CES04.5	Design networks using PERT and CPM compose resource planning and optimization	2	3	1	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK Depth of Knowledge

Unit I: Introduction **12 Hours**

General items of work in Building – Standard Units –Principles of working out quantities for detailed and abstract estimates – Methods of Estimates of Buildings – Detailed estimates of buildings.

Prime cost

Unit II: Rate Analysis **12 Hours**

Standard specifications for different items of building construction. Rate Analysis – Working out data for various items of work, overhead and contingent charges. Reinforcement bar bending schedule.

Schedule of rates

Unit III: Valuation of Buildings **12 Hours**

Purpose and Principles of valuation –Technical terms – Methods of valuation. Estimation of quantities for road work items.

Valuation Methods

Unit IV: Planning, Scheduling and Resource Management for Civil Engineering Project **12 Hours**

Objectives of planning – Its advantage to client and engineer – limitations – stages of planning by owner & contractor. Scheduling – definition – its preparation – uses and advantages – classification

Methods of scheduling – bar chart – Job layout – Gantt chart- work breakdown chart (WBC)

Definition – need for resource management – optimum utilization of resources – finance, materials, machinery, human resources – resources planning – resource leveling and its objectives – time –cost trade off crashing – need for crashing an activity – methods & tips for crashing – time vs. cost optimization curve – cost slope – its significance in crashing.

Tender notice, Responsibility of engineer

Unit V: Project Management through Networks **12 Hours**

Activity – Event – Dummies – basic assumptions in creating a network– rules for drawing networks – Fulkerson's rule for numbering the events, PERT – time estimates – earliest expected time – latest allowable occurrence time – slack, standard deviation, variance. Precedence networks: Creating network logic, Relationship Types – Finish to Start, start to start, finish to finish, start to finish, critical path method – ES, EF, LS, LF, Floats– significance of critical path.

Activity, Events, Time estimates

Text Books

1. Dutta, B. N., "Estimating and Costing", 10th Edition, UBS Publishers, 2000

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

2. Chakraborthi, M.; "Estimation, Costing and Specifications", 7th Edition, Laxmi Publications, 2008
3. Upadhyay, A. K., "Civil Estimating and Costing", 8th Edition, S.K. Kataria and Sons Publishers, 2010
4. Seetharaman, S., "Construction Engineering and Management", Umesh Publications, New Delhi, 2006

Reference Books

1. Birdie, G. S., "Estimating and Costing", 6th Edition, Dhanapati Rai Publishing Company, 2005
2. Standard Schedule of Rates and Standard Data Book by Public Works Department, 2014
3. National Building Code - 2010
4. IS. 1200 (Parts I to XXV – 1974, "Method of Measurement of Building and Civil Engineering works", B.I.S.)
5. IS. 1200 (Parts I to XXV – 1992, "Method of Measurement of Building and Civil Engineering works", B.I.S.)

Web References

1. https://www.youtube.com/watch?v=IcmigyqQcEw
2. https://www.youtube.com/watch?v=ofkpm4lhJcg
3. https://easyengineering.net/estimating-costing-book-b-n-dutta-free-downlaod/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	10	10
L2	20	20
L3	30	30
L4	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive LevelsL1: Remember

1. What do you mean by latest event time?
2. Write down the unit of 14 mm thick plastering work and reinforcement
3. Write down the basic essential to draw a network diagram
4. Enumerate the list of manpower requirement for reinforcement concrete work

L2: Understand

1. Analyze the rate for 3 cm thick cement concrete flooring with (1:4:8). One sq. unit, take 100 sq.m
2. Explain general item of work in building and write down its unit
3. What is the main objective of construction costing and management?
4. What do you mean by analysis of rate? Write down its objective?

L3: Apply

1. What is an estimate? Draw the standard measurement from for detail and abstract estimate and also write down the requirements for estimation
2. Explain general item of work in building and write down its unit
3. A room 300 cm×400 cm has a flat. There is one T beam in the center (C/S below the slab 20 cm× 40 cm) and the slab is 12 cm thick. Estimate the quantity required for reinforcement from the data given below. Main bars (8-19 mm diameter in 2rows of 4 each (All 4 in bottom being straight and other bent) stirrups (8 mm diameter and 18 cm c/c throughout) anchor bar (2- 12 mm diameter bar)

L4: Analyze

1. Estimate the quantity of brick masonry required for construction of a room of 4 m×3 m internal dimensions. Thickness of wall should be 250 mm.is to be provided to the room. Height between top of plinth beam and bottom of slab beam should be 4 m
2. For sanitary and water supply works, what percentage of the estimated cost of the building works are usually provided in an estimate?

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

MC 20MCX04 Indian Traditional Knowledge **2 0 0 0**

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20MCX04.1	Identify the concept of Traditional knowledge and its importance	-	L1, L2
20MCX04.2	Explain the need and importance of protecting traditional knowledge		L1, L2
20MCX04.3	Illustrate the various enactments related to the protection of traditional knowledge		L1, L2
20MCX04.4	Interpret the concepts of Intellectual property to protect the traditional knowledge		L1, L2
20MCX04.5	Explain the importance of Traditional knowledge in Agriculture and Medicine		L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create

UNIT-I: Introduction to traditional knowledge **04 hours**

Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge

UNIT-2: Protection of traditional knowledge **04 hours**

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT-3: Legal framework and TK: **04 hours**

The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.

UNIT-4: Traditional knowledge and intellectual property: **04 hours**

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge

UNIT-5: Traditional Knowledge in Different Sectors: **04 hours**

Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books:

1. Traditional Knowledge System in India, by Amit Jha, 2009.

Reference Books:

1. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

2. "Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.

Web Links:

1.https://www.youtube.com/watch?v=LZP1StpYEPM

2.http://nptel.ac.in/courses/121106003/

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HS 20HSX04 Professional Ethics 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		PO8	PO12	
20HSX04.1	Understand the ethics and apply ethics in society	3	1	L1, L2, L3
20HSX04.2	Discuss the ethical issues related to engineering and realize the responsibilities and rights in the society	3	1	L1, L2, L3
20HSX04.3	Know the code of ethics and industrial standards	3	1	L1, L2, L3
20HSX04.4	Understand the rights and responsibilities of an employee at workplace	3	1	L1, L2, L3
20HSX04.5	Understand environmental ethics and CSR of companies	3	1	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1 Remember | L2 Understand | L3 Apply | L4 Analyze | L5. Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Ethics 10 Hours

Need and importance of ethics, objectives, morals, values and ethics – integrity – work ethic – service learning – civic virtue – respect for others – living peacefully – honesty – courage – valuing time – cooperation – commitment – empathy – self-confidence.

Unit II: Engineering Ethics 10 Hours

Senses of 'engineering ethics' – variety of moral issues – types of inquiry – moral dilemmas – moral autonomy – consensus and controversy – models of professional roles – self-interest – self respect - customs and religion.

Unit III: Engineering as Social Experimentation 10 Hours

Engineering as experimentation – engineers as responsible experimenters – codes of ethics – industrial standards - a balanced outlook on law.

Unit IV: Safety, Responsibilities and Rights 10 Hours

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis - Safety lessons from Challenge - Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights.

UnitV: Global Issues 10 Hours

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers–Moral Leadershi p– Code of Conduct– Corporate Social Responsibility.

Text Books

1. Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003
2. Govindarajan M., Natarajan S., Senthil Kumar V. S., "EngineeringEthics", Prentice Hall of India, New Delhi, 2004

Reference Books

1. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for PersonalIntegrity and Social Responsibility" McGraw Hill Education, India Pvt. Ltd., New Delhi, 2013, Web References
2. World Community Service Centre, ' Value Education', Vethathiri Publications, Erode, 2011
3. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009

Web References

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	40	30
L3	40	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. List the human values and explain
2. Give an overview of Engineering Ethics
3. What is meant by Professional Responsibility?
4. What are the safety lessons one can learn in the Challenger case?
5. What are employee rights?
6. What is the engineer's role in weapon development?

L2: Understand

1. Illustrate the ethical aspect principle of caring or sharing, with an example
2. Explain various actions of an engineer leading to dishonesty
3. Justify the safety and other obligations of professional engineers
4. Discuss the problems with law in engineering practice
5. Explain in detail about the effect of information on risk assessments
6. Explain the role of engineers as 'expert witness' and 'advisors'

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531173.

Approved in 4th BoS

SO **20CES05 Finishing School for Civil Engineering** **0 0 4 2**

At the end of the course, students will be able to

Code	Course Outcomes
20CEH03.1	Determine the reduced level obtained by levelling and prepare contour maps and calculate the earth work volume and capacity of reservoirs and measuring the horizontal, vertical angles by using Total Station
20CEH03.2	Determining the strength of hardened concrete by non-destructive testing methods
20CEH03.3	Gain proficiency in creating plans and elevations of buildings & read the building plan for onsite execution
20CEH03.4	Be able to comply legal and project collaboration requirements
20CEH03.5	Provide the total observations in a report manner

Unit I: Total Station and Surveying **9 Hours**

Basic Terms Related to Levelling – Levelling Instruments – Fly and Check Levelling – Booking – Reduction Longitudinal and Cross Sections – Plotting. – Measurement of Horizontal and Vertical Angles – Heights and Distances

Unit II: Quality Control & Material Testing **9 Hours**

Properties of Concrete in Hardened State: Unit Weight, Strength Characteristics, Impermeability, Dimensional Changes. Non-Destructive Testing of Concrete - Importance, Methods - Rebound Hammer Test, Penetration and Pullout Test, Ultrasonic Pulse Velocity Test - Principles, Applications and Limitations, testing procedures of the materials using for the roadways.

Unit III: Responsibilities of the QC Engineer **9 Hours**

Responsibilities of respective staff involved in work, Materials details (If any), Methodology or procedure, Format shall be attached with method statement like RFI, ITP, Inspection Report, Pour Card, Approved Risk assessment (RA), Job hazard analysis (JHA). BOQ reference shall be available, Specification Reference, Compliance statement for the material ref with specifications, Vendor List approval if any available-Technical Data Sheet and MSDS for the material if available, Test reports, Company Profile for the material, Company ISO Certificates and government approval, Previous approval from other projects

Unit IV: BIM in Construction Operations **9 Hours**

Looks at a range of BIM approaches and applications for construction planning and operations, including simulating construction schedules and logistics, build ability forecasting and clash detection

Unit V: Report Writing **9 Hours**

Submission of the technical report with regard to the preliminary survey, survey report, Quality control aspects at the execution stage or the hardened structure, Output obtained from the software

Text Books

1. B C Punmia B. C., "Surveying", Volume I & II, 16th Edition, Laxmi Publications, New Delhi, 2016
2. Shetty M. S., "Concrete Technology", 7 th Edition, S. Chand & Company, 2006
3. Dr. dv. Harshul Savla, Dr. Chandrahauns Chavan Building Information Modeling: Global & Indian Perspective, Notin Press; 2021

Reference Books

1. A Guide To Building Information Modeling For Owners, Managers, Designers, Engineers And Contractors by Chuck Eastman, Paul Teicholz , Rafael Sacks, Kathleen Liston ; Wiley publications, March 2011, ISBN:9781118021699, 111802169X
2. Building Information Modeling by Karen Kensek. Published by Routledge, April 10, 2014 , ISBN 9780415717748

Web References

1. https://skill-lync.com/civil-engineering-courses/drafting-design-revit/about
2. https://www.udemy.com/topic/bim/#:~:text=Common%20BIM%20software%20includes%20Autodesk,help%20you%20learn%20about%20it.

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

IN	**Summer Internship #2**	0	0	0	1.5

At the end of the course, students will be able to

No.	Course Outcomes
1	Demonstrate the theoretical learning outcomes
2	Integrate theory and practice during graduation
3	Comprehend the industry practices in the relevant and allied field of study
4	Develop communication skills in terms of oral, written, and graphical communications
5	Develop problem solving skills
6	Develop work habits and teamwork in a multidisciplinary setting for a successful career after graduation

Note: All the above course outcomes are relatively mapped to all POs as it caters to all program outcomes

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE001 Advanced Concrete Technology

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE001.1	Categorize the various chemical compositions of cement		L1, L2
20CE001.2	Summarize the properties of construction material of fresh and hardened concrete		L1, L2
20CE001.3	Prepare the concrete mix design and recommend the use of construction materials as per IS code for building construction	-	L1, L2
20CE001.4	Discuss the performance-based specifications for durable concrete		L1, L2
20CE001.5	Analyze the thermal, mechanical and micro structural aspects of concrete		L1, L2

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create DoK: Depth of Knowledge

Unit I: Importance of Bogue's Compounds — 12 Hours

Importance of Bogue's compounds, Structure of a Hydrated Cement Paste, Volume of hydrated product, porosity of paste and concrete, transition Zone, Elastic Modulus, factors affecting strength and elasticity of concrete, Rheology of concrete in terms of Bingham's parameter.

Elasticity and chemical composition of cement

Unit II: Properties of Concrete — 12 Hours

Rheological behavior of concrete, requirements of workability of concrete, Durability & Effect of environmental conditions, Strength & maturity of hardened concrete, Impact, Dynamic and fatigue behavior of concrete, shrinkage and creep of concrete, behavior of concrete under fire.

Hydration in concrete

Unit III: Mix Design — 12 Hours

Principles of concrete mix design, Methods of concrete mix design, Standard deviation, Statistical quality control sampling and acceptance criteria.

Factors effecting of mix design, Types of mixes

Unit IV: Permeability and Durability of Concrete — 12 Hours

Permeability and Durability of concrete, Parameters of durability of concrete, chemical attack on concrete, Production of concrete; batching mixing, transportation, placing, compaction of concrete. Special methods of concreting and curing, Hot weather and cold weather concreting, Guniting (Shortcreting)

Abrasion, Deterioration

Unit V: Microstructural Analysis — 12 Hours

X- Ray Diffraction, Differential Thermal Analysis, Thermo gravimetry Analysis, Atomic Absorption Spectroscopy, Conduction Calorimetry, Potentiometric Methods, X-Ray Fluorescence Analysis, Neutron Activation Analysis, Mossbauer Spectroscopy, Nuclear UV Absorption Spectroscopy, Electron Microscopy, Surface Area, Helium Pycnometry, Microhardness, Mercury Porosimetry, other Techniques and Standards and Specifications.

Porosity, Interfacial Transition Zone

Text Books

1. Shetty, M. S., "Concrete Technology", 7th Edition, S. Chand & Company, 2006
2. Santha Kumar, A. R., "Concrete Technology", 2nd Edition, Oxford University Press, New Delhi, 2018
3. Orchard, D. F., "Concrete Technology", 4th Edition, Elsevier Science & Technology,1979

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

4. Neville, A. M., "Properties of Concrete", 5th Edition, Pearson Education, 2013
5. Gambhir, M. L., "Concrete Technology", 5th Edition, K. B. Center, 2010

Reference Books

1. Neville A.M. and Brooks J. J., "Concrete Technogy ", 2nd Edition, Trans Atlantic Publications, Philadelphia, USA, 2019
2. Gambhir M. L., "Concrete Technology ", 5th Edition, Tata McGraw Hill Education, New Delhi, 2017
3. IS 10262: 2009, "Recommended Guidelines for Concrete Mix Design ", 2nd Edition, BIS Publication, New Delhi, 2009

Web References

1. https://www.slideshare.net/justinthesecond/ingredients-and-mixing-concrete
2. https://www.slideshare.net/gauravhtandon1/concrete-mix-design-46415349
3. https://youtu.be/T4pjWFzd3rA
4. https://youtu.be/PpUnxU57vAM
5. https://www.slideshare.net/Shanmugasundaramnagaraj/special-concretes-239742583

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	30	20
L3	20	30
L4	20	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is the common classification of aggregates?
2. Compare chemical and mineral admixture
3. What is Light weight aggregates?
4. Define curing of concrete
5. Define workability
6. Define creep

L2: Understand

1. Explain in detail of any three tests for fresh concrete
2. Differentiate segregation & bleeding
3. Distinguish between plasticizers and super plasticizers
4. What are the factors affecting workability
5. Discuss the significance of quality control
6. Describe the procedure in adopting ACI method of concrete mix design
7. Explain the factors that influence the choice of mix design

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE002 Environmental Geo-technics

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE002.1	Understand the structure of soil and clay mineralogy	-	L1,L2
20CE002.2	Explain the properties of soil and composition of soil		L1, L2
20CE002.3	Describe the characteristics and classification of waste contamination		L2,L3
20CE002.4	Select the methods for disposal techniques/methods		L2, L3
20CE002.5	Implement the control systems and modifications of waste management		L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1. Remember | L2. Understand | L3. Apply | L4. Analyze | L5. Evaluate | L6. Create. DoK. Depth of Knowledge

Unit I: Clay Mineralogy and Soil Structure

9 Hours

Gravitational and surface forces-inter sheet and inter layer bonding in the clay minerals- Basic structural units of clay minerals- isomorphism substitution – kaolinite mineral- montmorillonite mineral- illite mineral- electric charges on clay minerals – Base Exchange capacity- diffused double layer- adsorbed water- soil structure- methods for the identification of minerals.

Identification of minerals, Soil structure

Unit II: Geotechnical Properties of Soils

9 Hours

Effect of drying on Atterberg limits.-Volume change behavior- factors controlling resistance to volume change- general relationship between soil type, pressure and void ratio.- importance of mineralogical composition in soil expansion. Activity- sensitivity-causes of sensitivity-influence of exchangeable cat ions, pH and organic matter on properties of soils. Permeability of soils- hydraulic conductivity of different types of soils – Darcy's law and its validity- factors affecting permeability.

Volume change behavior, Permeability of soil

Unit III: Wastes and Contaminants

9 Hours

Sources of wastes-types of wastes- composition of different wastes- characteristics and classification of hazardous wastes- ground water contamination- sources - transport mechanisms-potential problems in soils due to contaminants.

Sources of waste, Composition of waste

Unit IV: Disposal and Containment

9 Hours

Criteria for selection of sites for waste disposal- hydrological aspects of selection of waste disposal sites- disposal facilities- subsurface disposal techniques-disposal systems for typical wastes.

Disposal facilities

Unit V: Containment Control Systems

9 Hours

Liners and covers for waste disposal- rigid liners- flexible liners. Ground modification techniques in waste management – waste modification- mechanical modification-hydraulic modification- chemical modification.

Ground modification

Text Books

1. Mitchel J., " Fundamentals of soil behaviour", John Wiley and sons, New York, 1976
2. Lambe T. W & Whitman R. V., " Soil Mechanics ", John Wiley and Sons, New York, 1979
3. Gopal Ranjan & Rao A. S. R., " Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi, 1991
4. Wilson M. J., "A Hand Book of Determinative methods in Clay Mineralogy", Chapman and Hall, New York, 1987

Reference Books

1. Robert. M. Koerner, "Construction and Geotechnical methods in Foundation Engineering", Mc Graw Hill Book Co., New York, 1984
2. Yong R. N., " Principles of contaminant Transport in Soils, "Elsevier, New York, 1992

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

3. Ramanatha Iyer T. S., "Soil Engineering Related to Environment", LBS Centre 2000
4. Daniel B. E., "Geotechnical Practice for Waste Disposal", Chapman and Hall, London, 1993

Web References

1. https://nptel.ac.in
2. https://www.issmge.org

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive LevelsL1: Remember

1. Define the inter layer bonding in the clay minerals
2. Define base exchange capacity
3. Classify the clay minerals
4. List the sources of wastes

L2: Understand

1. Explain the factors controlling volume change
2. Explain the influence of pH and organic matter on soil properties
3. State Darchy's law

L3: Apply

1. Identify and locate the methods of disposal techniques.
2. Basing on what criteria selection of sites for waste disposal is selected.
3. How the ground modification techniques can be applied in the waste management.

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE003 Transportation Planning and Management

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE003.1	Understand the importance of transportation planning to provide the data required for transportation planning	-	L1, L2
20CE003.2	Demonstrate land use integrated travel demand models		L1, L2
20CE003.3	Understand optimization techniques for transportation systems		L1, L2
20CE003.4	Understand the policy, politics, planning, and engineering of transportation systems in urban areas		L1, L2
20CE003.5	Compare the techniques for planning methodology and transportsystem analysis		L1, L2

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction of Transportation planning

12 Hours

Introduction - unique importance of transportation, transportation planning methodology, hierarchical levels of planning and its relation to rural, urban areas. Long range planning, passenger and goods transportation, general concept and process of transport planning.

Need of transportation planning

Unit II: Land use and Interaction

12 Hours

Land-use transport interactions, socio - economic characteristics of land use, quick response techniques, Non - transport solutions for transport problems. Characteristics of urban structure. Town planning concepts.

Lowry derivative models, spatial interaction

Unit III: Transportation Systems

12 Hours

Multi modal transportation system - characteristics of mass transit systems including technical, demand operational and economic problems, fixed track facility, mass rapid transit system - elevated, surface and underground construction, Express bus system, integrated operating characteristics of terminal and transfer facilities.

Relationships between nodes, networks, and the demand

Unit IV: Urban Transportation Planning Studies

12 Hours

Urban travel characteristics, private and public behavior analysis, transportation demand surveys, delineation of the urban area, zoning, origin - destination studies, Home interviews, trip classification and Socio - economic variables in trip making projections.

Goals and objectives of urban transportation planning

Unit V: Planning Methodology and System Analysis

12 Hours

Study of existing network - trip generation techniques, category analysis, multiple regression techniques, modal split analysis, trip distribution techniques, growth factor model, gravity models, opportunity models and multiple regression models, minimum path tree - All or nothing assignment and capacity restraint techniques, analysis and evaluation technique.

Traffic assessment methods

Text Books

1. Hutchinson, B. G., "Principles of Urban Transport Systems Planning", Scripta, McGraw Hill, New York, 1974
2. Khisty C. J., "Transportation Engineering - An Introduction", Prentice Hall, India, 2002
3. Paquette, R. J., "Transportation Engineering Planning and Design", John Wiley & Sons, New York, 1982
4. Alan Black, "Urban Mass Transportation Planning", McGraw Hill, 1995

Reference Books

1. Kadiyali, L. R., "Traffic Engineering and Transport Planning", Khanna Publishers, 2011
2. Khanna, S. K. and Justo C. E. G., "Highway Engineering", New Chand Publications, 2008

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

3. Flaherty, C. A. O., "Transport Planning and Traffic Engineering", Butterworth Heinemann, Elsevier, Burlington, MA, 2006
4. Papacostas, C. S. and Prevedouros, P. D., "Transportation Engineering and Planning", Prentice Hall of India Pvt. Ltd., 2001

Web References

1. https://www.digimat.in/nptel/courses/video/105106058/L37.html
2. http://www.digimat.in/nptel/courses/video/105106058/L33.html\
3. https://users.pfw.edu/sahap/CE450%20Transport%20Policy%20and%20Planning/1.%20Lectures/Books,%20references,%20readings/Transportation%20Planning%20Handbook%20Forth%20Edition.pdf
4. https://youtu.be/pW-Qymxabsc

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is regional transport planning?
2. Define the early land use transport models
3. Describe the land use and transportation

L2: Understand

1. Mention about construction equipments and also indicate the place of use
2. Classify the transport planning methodologies
3. Explain the national urban transport policy

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE **20CE004 Water Resources Systems Planning and Management** 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CES04.1	Interpret the concepts of optimization	-	L1, L2
20CES04.2	Explain the concepts of linear programming		L2, L3
20CES04.3	Summarize the concepts of dynamic programming		L2, L3
20CES04.4	Explain the concepts of Non-linear programming		L2, L3
20CES04.5	Explain the concepts of Non-linear programming		L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction **9 Hours**

Concepts of systems analysis, definition, systems approach to water resources planning and management, role of optimizationmodels, objective function and constraints, types of optimization techniques.

Roles of optimization

Unit II: Linear Programming **9 Hours**

Formulation linear programming models, graphical method, simplex method, duality in linear programming, application of Linearprogramming in water resources

Applications of linear programming

Unit III: Dynamics Programming **9 Hours**

Belman's of principles of optimality forward and backward recursive dynamic programming, case of dimensionality, application of dynamic for resource allocation.

Resource allocation

Unit IV: Non-Linear Optimatization Techniques **9 Hours**

Clerical method of optimization, Kuch-Tucker condition, gradential based research techniques for simple unconstrainedoptimization.

Non Linear application

Unit V: Water Resources Management **9 Hours**

Planning of reservoir system, optimal operation of single reservoir system, allocation of water resources, optimal cropping pattern, conjunctive use of surface and sub-surface water resources.

Strategies for water resources impacts

Text Books

1. Vedula, S., and Majumdar, P. P., "Water Resources Systems – Modeling Techniques and Analysis", Tata McGraw Hill, 5th reprint, New Delhi, 2010
2. Rao, S. S., "Engineering Optimization, Theory and Applications", 3rd Edition, New Age International Publication, New Delhi, 2010

Reference Books

1. Taha, H. A., "Operation Research", McMillan Publication Co., New York, 1995
2. Chadurvedi, M. C., "Water Resource Systems Planning and Management", Tata McGraw Hill Inc., New Delhi,1997
3. Bhave, P. R., "Water Resources Systems", Narosa Publishing House, New Delhi, 2011

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. NPTEL :: Civil Engineering - Water Resources Systems Planning and Management
2. Introduction - YouTube
3. Linear Programming: Graphical method - YouTube

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	30	30
L3	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive LevelsL1: Remember

1. What is water resources management?
2. What is simulation and what are the steps in simulation?
3. What are the challenges of managing the water cycle?
4. What is a linear programming problem?
5. What are the five basic requirements of linear programming?

L2: Understand

1. Describe about the role of optimization models
2. Discuss the concept of systems analysis
3. Discuss the various applications of linear programming in water resources
4. Describe about backward recursion and forward recursion with neat diagrams
5. Explain the Kuhn-Tucker conditions and also specify the necessary (or) minimum

L3: Apply

1. Choose the different types of simulation and any one application of simulation in water resources
2. Articulate the following terms (i) Benefit Cost Analysis (ii) Pricing of water resources
3. Determining the optimal cropping pattern
4. Choose the various advantages of conjunctive use of surface and sub-surface water resources

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE005 Construction Equipment Automation

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE005.1	Understand the equipment & automation and key features of its performance	-	L1, L2
20CE005.2	Understand the feasibility of specific equipment in different project conditions	-	L1, L2
20CE005.3	Understand the equipment and appliances required for the different phases of concrete road construction	-	L1, L2
20CE005.4	Understand the automation techniques in construction industry	-	L1, L2
20CE005.5	Understand the innovations in automation systems in detail,including benefits of robotics versus conventional construction equipment	-	L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1 Remember | L2. Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create. DoK. Depth of Knowledge

Unit I: Construction Equipment

12 Hours

Introduction - Unique features of construction equipment, Need of construction equipment - specification reading, construction scheduling and estimating, Job layout and its importance. Study of equipments with reference to available types and their capacities, factors affecting their performance. feasibility, Owning and operating cost and productivity of different equipment – Excavators, pavers, Plastering Machines – Pre stressing Jacks and grouting equipment – Cranes and hoists etc.

Advantage of construction equipment, Excavators

Unit II: Construction Equipment Management

12 Hours

Equipment Management- Introduction, Differences between men and manpower, Extent of Mechanization, Equipment planning, Selection of equipment, Forward planning, Purchase of Equipment, Specifications for ordering equipment

Monitoring, scheduling

Unit III: Equipment for Concrete and Road laying

12 Hours

Aggregate production equipment- Different Crushers – Feeders - Screening Equipment -Handling Equipment - Batching and Aggregate Mixing Equipment - Asphalt Plant, Asphalt Pavers, Asphalt compacting Equipment – Ready mix concrete equipment, Concrete mixers, Concrete batching and mixing plant, Transportation of concrete mix, Concrete pouring and pumps, concrete compaction equipment.

Concrete manufacturing process, workability, factors

Unit IV: Automation in Construction Industry

12 Hours

Need and benefit of Automation – Applications, Automation in canal lining, Automation in Construction of Highway, Automation in concrete technology. Drones-Photogrammetric, drones to survey working areas, Structural health monitoring, under water survey.

Surveying, advantage of automation system

Unit V: Robotics In Construction

12 Hours

Introduction, Benefits of robots in construction industry with respect to time, cost, quality, safety. Use of robots for construction activities like – Brick laying, Demolition, Material handling, Structural steel cutting, Rebar tying or bending, form work, mould making, 3D printing, Automation in prefabrication of masonry and on site masonry construction, automated manufacture of brickwall masonry blocks, Automation in timber construction, Automation in production of steel components.

Automation in high-rise building construction, Advantages of robotics

Text Books

1. Peurifoy, R. L., Ledbetter, W. B. and Schexnayder, C., "Construction Planning, Equipment and Methods", McGraw Hill, Singapore, 2006
2. Sharma, S. C. "Construction Equipment and Management", Khanna Publishers, New Delhi, 1988

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

3. Deodhar, S. V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 1988

Reference Books

1. Mahesh Varma, "Construction Equipment and its planning and Application", Metropolitan Book Company, New Delhi, 1983
2. John E. Schaufelberger, Giovanni C. Migliaccio, "Construction Equipment Management", 2nd Edition, Published March 15, 2019
3. Bock Thomas, "Hybrid Construction Automation And Robotics", 24th International Symposium on Automation & Robotics in Construction (ISARC 2007) Construction Automation Group, I.I.T. Madras, 2007

Web References

1. http://cdn.intechopen.com/pdfs-wm/5555.pdf
2. (PDF) Construction plant and equipment management research: thematic review (researchgate.net)
3. NPTEL :: Civil Engineering - NOC: Construction methods and equipment management
4. https://www.slideshare.net/ShankarRamasamy3/ctep-unitv-construction-equipments-ppt

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive LevelsL1: Remember

1. What is need of construction management?
2. What are the benefits of robotics in construction industry?
3. Illustrate the uses of bulldozers on construction projects
4. Describe the selection factors for rear dump trucks
5. Describe the process of structural steel cutting by using automation technique

L2: Understand

1. Classify construction equipment on different basis with suitable examples
2. Classify the excavation equipment
3. Discuss objectives of construction management
4. Explain the process of timber construction with automation

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE006 Harbor Engineering

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE006.1	Understand the basics of harbor engineering and marineenvironment		L1, L2
20CE006.2	Explain the types of ports and harbors and the methods for estimation		L1, L2
20CE006.3	Interface between water and land infrastructure and harbor planning		L2, L3
20CE006.4	Determine the shape and size of harbor and turning basin		L2, L3
20CE006.5	Identify the harbor problems and management issues		L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1 Remember | L2 Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create. DoK: Depth of Knowledge

Unit 1: Introduction to oceanography

9 Hours

Introduction, Ocean Circulation, Tides, Waves, Currents, Tsunami and Storm surges – origin, generation, propagation and characteristics; Different materials for marine applications - metals, concrete, geo synthetic products and other materials for marine environment.

Oceanography, origin and generation

Unit 2: Types of ports and harbors

9 Hours

Types, harbor layout and terminal facilities - piers, break waters, wharves, jetties, quays; Spring fenders, dolphins and floating landing stage environmental issues in port planning and operations; Harbor oscillations, seiches; Inlets – siltation of inlets and harbors – remedial measures; Onshore and offshore sediment transport - transport rate – estimation methods.

Harbor layout, transport rate

Unit 3: Ports and harbors

9 Hours

Ports and harbors as the interface between the water and land infrastructure- an infrastructure layer between two transport media- History of port growth- factors affecting growth of port - Classification of harbor planning, justification, volume and commerce of aport.

Classification of harbor planning

Unit 4: Size and shape of harbor and turning basin

9 Hours

Type, location and height of Breakwaters – Location and width of entrance to harbor – Depth of harbor and navigational channel – Number, location and type of docks or berths or jetties- Shore facilities for Marine terminals and fishing harbors.

Marine terminals and fishing harbor

Unit 5: Coastal and harbor management issues

9 Hours

Population growth and urbanization-coastal use-resource exploitation-fisheries-forestrygas-mining-infrastructure-transportation-shore protection-defence-Impact of human use-pollution-industrial waste sewage-administration and legal issues, Marine corrosion and control. Physical modeling of coastal and offshore and harbor engineering problems

Impact of human use, industrial waste sewage

Text Books

1. Ozha & Ozha, "Dock and Harbor Engineering", 1st Edition, Charotar Books, Anand, 1990
2. Dean, R. G. and Dalrymple, R. A., "Water wave mechanics for Engineers and Scientists", Prentice-Hall, Inc., EnglewoodCliffs, New Jersey,1994
3. Ippen, A. T., "Estuary and Coastline Hydrodynamics", McGraw Hill Book Company, Inc., New York, 1978
4. Sorenson,R.M.,"Basic Coastal Engineering", A Wiley-Interscience Publication, New York, 1978

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology

Reference Books

1. Muir Wood, A. M., and Fleming, C. A.,"Coastal Hydraulics Sea and Inland Port Structures", 1st Edition, Hallstead Press,2002
2. Seetharaman, S., "Construction Engineering and Management", 4th Edition, Umesh Publications, New Delhi, 1999
3. Richand L. Silister, "Coastal Engineering Volume I & II", Elsevier Publishers, 2000
4. PeraBrunn, "Port Engineering", 1st Edition, Gulf Publishing Company, 2001

Web References

1. https://nptel.ac.in

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. List different materials used for marine applications.
2. Define transport rate.
3. List source of the special types of break water

L2: Understand

1. What is the most popular method of construction of wall breakwaters?
2. Discuss briefly about the classification of harbor planning
3. Explain about the physical modeling of harbor engineering problems
4. Discuss in detail about the environmental concern required for port operation

L3: Apply

1. Compare a port and a harbor. What would be the requirements of good port
2. Differentiate the harbors on broad basis and on the basis of utility
3. Classify harbor based on location.
4. Discuss the factors to be considered while selecting a suitable site for the construction of a port

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam

PE 20CE007 Pre stressed Concrete Structures

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE007.1	Understand the materials required and pre -stressing Systems as per the IS 7861-2:1981(R2002).		L1, L2
20CE007.2	Calculate the loss of pre-stress and analyze stresses in pre-stressed section as per the IS 7861-2:1981(R2002).		L1, L2
20CE007.3	Design the section for flexure and shear as per the IS 7861-2:1981(R2002).	-	L1, L2, L3
20CE007.4	Design basic elements of steel structure like tensionmembers, compression members as per the IS 7861-2:1981(R2002).		L1, L2, L3
20CE007.5	Analyze and design the composite structural members and principle techniques for the design of circular pre stressing as per the IS 7861-2:1981(R2002).		L1, L2, L3

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Principles of Pre stressing — 12 Hours

Types and Systems of Pre stressing, Need for High Strength Concrete and High Tensile Steel – Types of Tensioning - Analysis of Sections for Stresses by Stress Concept, Strength Concept and Load Balancing Concept – Short and long term Deflection – Lossesin pre stressing, Camber, Cable Layouts.

Stress-strain characteristics of materials and properties

Unit II: Analysis and Design of Flexural Members — 12 Hours

Behavior of Flexural Members - Determination of Ultimate Flexural Strength – IS: 1343 Codal Provisions - Design of Flexural Members, Design for Combined Bending, Shear and Torsion, Design of End block.

Anchorage zone reinforcement

Unit III: Indeterminate Structure — 12 Hours

Analysis and Design of Continuous Beams - Methods of Achieving Continuity – Concept of Linear Transformations, Concordant Cable Profile and Cap Cables.

Analysis of simple portal frames

Unit IV: Design of tension and Compression Members — 12 Hours

Design of Tension Members - Application in the Design of Pre stressed Pipes and Pre stressed Concrete Cylindrical Water Tanks - Design of Compression Members – Application in the Design of Columns and Piles.

Design of railway sleepers, Poles

Unit V: Design of Composite Members and Circular Pre stressing — 12 Hours

Composite Beams - Analysis and Design, Ultimate Strength - their Applications. Partial Pre stressing– its Advantages and Applications.

Prestressed concrete shells and folded plate structures

Text Books

1. Pandit, G.S., and Gupta, S. P., "Pre stressed Concrete", CBS Publishers and Distributors Private Limited., 2019
2. Krishna Raju, N., "Pre stressed concrete", 6th Edition, Mc Graw Hill Education (India) Private Limited., 2018
3. Dayaratnam, P., "Pre stressed Concrete Structures", Oxford and IBH, 2013
4. Lin, T. Y., "Design of Pre stressed Concrete Structures", 3rd Edition, Wiley India Pvt. Ltd., 2010

Reference Books

1. Mallic, S. K. and Gupta A. P., "Pre stressed Concrete", Oxford and IBH Publishing Co. Pvt. Ltd., 1997
2. Sinha, N. C. and Roy, S. K., "Fundamentals of Pre-stressed Concrete", 3rd Edition, S. Chand & Company Limited, 2011

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-53[illegible]3.

3. Rajagopal. N., "Pre stressed Concrete", Narosa Publishing House, 2nd Edition, 2005
4. IS 1343:2012, Code of Practice for Pre stressed Concrete, Bureau of Indian Standards, New Delhi, 2012
5. IS 3370- Part 4 (2008) Indian standard Code of practice for concrete structures for the storage of liquid- Design tables, code of practice, Bureau of Indian standards, New Delhi

Web References

1. https://nptel.ac.in/courses/105/106/105106118/
2. https://youtu.be/4KYPltsNAWs
3. https://youtu.be/IHWEHikKH_Q

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	30	30
L3	20	20
L4	30	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What are the advantages of PSC construction?
2. What is meant by pressure line?
3. Define bonded and unbounded pre stressing concrete
4. What is concordant pre stressing?
5. What are the grades of concrete to be used in pre tensioned and post tensioned works?

L2: Understand

1. Explain the axial pre stressing
2. Explain about the various methods of pre stressing the concrete
3. Discuss the measures to be adopted for counteracting elastic loss and friction loss in case of post tensioned members
4. Describe the term Hoyer effect on pre tensioned elements
5. Explain how the friction loss in curved tendons could be reduced in post tensioned members

L3: Apply

1. Sketch the strain and stress / force diagram of a pre stressed concrete beam section under collapse
2. Illustrate the various losses in pre stress
3. Demonstrate any two advantages in partial pre stressing
4. State the reasons for which high tensile concrete is necessary in pre stressed
5. Compare pretension and post tension
6. Mention the factors influencing deflection
7. Differentiate bonded and un bonded tendons
8. Contrast about concordant cable

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-5311

PE 20CE008 Environmental Impact Assessment 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE008.1	Understand the concept of Environmental Impact Assessment		L1,L2
20CE008.2	Select an appropriate EIA methodology		L1, L2
20CE008.3	Identify the impacts of developmental activities		L2,L3
20CE008.4	Outline the assessment on the the impacts of EIA components		L2, L3
20CE008.5	Identify the risks and impacts of a project		L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1. Remember | L2. Understand | L3. Apply | L4. Analyze | L5. Evaluate | L6. Create. DoK. Depth of Knowledge

Unit 1: Concept of EIA 9 Hours

Introduction, Elements of EIA, Factors affecting EIA, Stages in EIA, Life Cycle Analysis, Preparation of environmental base map, Classification of environmental parameters, Role of stakeholders in the preparation of EIA

Elements and factors affecting EIA

Unit 2: EIA Methodologies 9 Hours

Criteria for selecting EIA methodology, Methods of EIA, Adhoc method, Matrix method, Network method, Overlay method, Environmental media quality index, Cost benefit analysis, EIS & EMP

Cost benefit analysis

Unit 3: Impacts of Developmental Activities 9 Hours

Introduction, Land use, Assessment of soil and ground water, Delineation of study area, Identification of activities, Applications of RS & GIS for EIA.

Land use, Soil composition and properties

Unit 4: Assessment of Environmental Components 9 Hours

Introduction, Impact identification, Prediction and significance, Assessment of EIA with reference to surface water, Air environment, Biological environment, Vegetation, Wild life, Impacts of deforestation.

Components of EIA

Unit 5: Risk Assessment, EIA Notification 9 Hours

Risk assessment - Environmental risk assessment and management in EIA, Treatment of uncertainity, Key stages in risk assessment, Advantages of risk assessment. EIA notification - Provisions in EIA notification, Environment clearance, Evaluation of EIA report, Environment legislation, Evaluation of audit plan. Audit report preparation, Post audit activities, ISO, ISO 1400.

Risk and Hazards, Environmental clearance

Text Books

1. Larry. W. Canter, "Environmental Impact Assessment", 2nd Edition, MC Graw Hill Series, India, 1995
2. Anjaneyulu Y. "Environmental Impact Assessment Methodologies", 2nd Edition, CRC Press, 2011

Reference Books

1. Suresh K. Dhameja, "Environmental Science and Engineering", Reprint Edition, S K Kataria and Sons, 2013
2. David Laurance, "Environment Impact Assessment". Wiley Publications, 2003

Web References

1. https://nptel.ac.in
2. https://www.iitr.ac.in
3. http://www.gpcet.ac.in

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive LevelsL1: Remember

1. Define EIA
2. What are the criteria for selecting EIA method?
3. Define land use
4. List the components of EIA
5. Define Life Cycle Analysis

L2: Understand

1. Explain about risk assessment and management
2. Explain the methodology for air environment.
3. Explain the factors affecting EIA
4. Explain the significance of EIA
5. Explain about cost benefit analysis

L3: Apply

1. How do you identify key environmental issues during EIA studies
2. Some steps in the EIA process have proved to be more difficult to implement than others. From your initial reading, identify which these might be and consider why they might have proved to be problematic
3. Write down the sort of recommendations you would make to ensure that impact predictions will be auditable

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE **20CE009 Pavement Analysis and Design** 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE009.1	Outline pavement design principles and traffic consideration		L1, L2
20CE009.2	Explain about material characterization		L2
20CE009.3	Analyze and design flexible pavement		L2, L3
20CE009.4	Analyze and design concrete pavement		L2, L3
20CE009.5	Evaluate pavement evaluation techniques and overlay design		L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1 Remember | L2 Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create. DoK: Depth of Knowledge

Unit I: Principles of Pavement Design **12 Hours**

Types of Pavements, Concept of pavement performance. Structural and Functional failures of pavements. Different types of pavement performance criteria. Different pavement design approaches. General framework for pavement design.

Traffic Considerations in Pavement Design: Vehicle types. Axle configurations. Contact shapes and contact stress distributions.Concept of standard axle load. Vehicle damage factor. Axle load surveys. Lateral placement characteristics of wheels. Estimation of design traffic.

Unit II: Pavement Material Characterization **12 Hours**

Identification of different material inputs required for analysis and design of pavements. Selection of appropriate conditions (temperature, moisture content, loading time, etc) for characterizing pavement materials. Brief description of the principles of different laboratory and field methods adopted for characterizing pavement materials. Elastic, Non-elastic &Visco-elastic.

Unit III: Design of Flexible Pavements **12 Hours**

Selection of appropriate theoretical models for analysis of flexible and concrete pavements, analysis of layered flexible pavement systems using linear elastic layered theory. Discussion of the need for use of advanced analytical techniques for flexible pavements. Discussion of different softwares available for analysis of flexible pavements.

Flexible Pavement Design Methods: Detailed discussion of different methods of design of flexible pavements. Indian Roads Congress guidelines - IRC:37: American Association of State High and Transport Officials (AASHTO) - 1993 method. TRRL Design method, brief discussion of salient features of the AASHTO 2002 draft design guidelines for flexible pavements. Comparison ofdesign concepts adopted in different approaches. Comparison of original & revised versions of codes.

Unit IV: Analysis of Concrete Pavements **12 Hours**

Discussion of different theoretical models for analysis of different types of concrete pavements. Analysis of wheel load stresses, curling/ warping stresses due to temperature differential, critical stress combinations. Discussion of the need for use of advanced analytical techniques for concrete pavements.

Concrete Pavement Design Methods: Detailed discussion of different methods of design of concrete pavements. Indian RoadsCongress guidelines - IRC:58. American Association of State High and Transport Officials (AASHTO) - 1993 method, PCA method, Concept of Continuously Reinforced Concrete Pavement, Brief discussion of salient features of the AASHTO 2002 draft design guidelines for concrete pavements. Comparison of design concepts adopted in different approaches. Comparison of original & revised versions of codes.

Unit V: Pavement Evaluation Techniques **12 Hours**

Functional and structural evaluation of pavements, concept of roughness, international roughness index, measurement of roughness using different types of equipment,structural evaluation of in-service pavements using benkelman beam and falling weight deflectometer methods.

Pavement Overlay Design Methods: Overlay design as per Indian Roads Congress guidelines (IRC:81). Overlay design as perAASHTO-1993 guidelines.

Text Books

1. Yang H. Huang, "Pavement Analysis and Design", Pearson Education, 2004
2. Yoder, E. J. and Witczak, M. W., "Principles of Pavement Design", John Wiley & Sons, 1st Edition, 1975

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam

Reference Books

1. Animesh Das, "Analysis of Pavement Structures", 1st Edition, CRC Press. 2014
2. Khanna, S. K.and Justo, C. J., "Highway Engineering" Nemchand & Bros., 7th Edition, 2000
3. Kadiyali, L. R. and Lal, N. B., "Principles and Practices of highway Engineering", 2003

Web References

1. https://nptel.ac.in/content/storage2/courses/105104098/TransportationII/recap/6-recap.htm
2. https://nptel.ac.in/content/storage2/courses/105101087/downloads/Lec-19.pdf
3. https://www.youtube.com/watch?v=5zKC_aq4ypM&list=PLSitSeMkk1bndRgMKgGvtl64palLKUVuH

Indian Standard Codes

1. IRC Code for Rigid pavement-IRC-58-2002
2. IRC Code for Flexible pavement-IRC-37-2001

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	30	30
L3	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What are the main design factors to be considered for flexible pavement design?
2. What are the characteristics of good pavement?
3. What is the Serviceability Index of present pavements?
4. What is the structural condition of pavement?
5. What is the most common used concrete pavement?

L2: Understand

1. Explain the key principles of the ecosystem approach to conserving natural resources
2. What determines joint intervals in jointed uninformed concrete pavement?
3. Write comparison between flexible and rigid pavements

L3: Apply

1. A two lane two way carriageway carries a traffic load of 1500 cvd .The rate of growth of traffic is 5% per annum. The design life is 5 years. The vehicles damage factor is 2.5.CBR value of soil is 7%. Calculate a) Cumulative number of standard axles to be used in the design b) Total pavement thickness c) composition of the pavement
2. Calculate the stresses at interior, edge and corner regions, of a concrete pavement using Westergaards stress equation for the following data:
   Wheel load = 4100 kg/tyre
   Modulus of elasticity of concrete = 3.3×10^5 kg/cm^2
   Pavement thickness = 18cm, Modulus of sub grade reaction=2.5 kg/cm^3 Diameter of loaded area = 25 cm, Poisson's ratio of concrete= 0.15

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE010 Urban Hydrology

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE010.1	Recall the basics of the hydrology		L1, L2
20CEO10.2	Analyze urban storm water systems, urban precipitation and Storm water runoff		L1, L2
20CEO10.3	Identifying the quantity of impacts for the climate change on shortduration with high intensity rainfall in urban areas.	-	L1, L2, L3
20CEO10.4	Organizing the flood problems in Urban areas.		L1, L2, L3
20CEO10.5	An exposure to the urban water cycle is also provided.		L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective Pos
L1 Remember | L2: Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create. DoK Depth of Knowledge

Unit I: Introduction — 9 Hours

Review of basic hydrology, Strom water runoff generation, Return period, Hydrologic risk.

Storm water runoff generation

Unit II: Precipitation Analysis — 9 Hours

Frequency analysis, IDF relationships, Design storm, Open channel flow in urban watersheds, Interception storage.

Channel flow in watersheds

Unit III: Watershed Management — 9 Hours

Estimation of runoff rates from urban watersheds, Flow routing.

Runoff estimation

Unit IV: Management — 9 Hours

Storm water drainage structures, Storm water detention, Structural and non-structural control measures, Source control techniques.

Drainage Structures

Unit V: Master Drainage Plans — 9 Hours

Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, use of models in planning.

Water resource investigation and planning process.

Text Books

1. Butler, D. & Davies, J. W., "Urban Drainage", Spon Press, 2nd Edition, 2004
2. Akan A.O. and Hioughtalen R. J., "Urban Hydrology, Hydraulics and Stormwater Quality Engineering"

Reference Books

1. "Applications and Computer Modeling", John Wiley & Sons, 2003
2. Hall, M. J., "Urban Hydrology", Elsevier, 1984
3. Shaw, E. M., "Hydrology in Practice", 3rd Edition., Chapman & Hall, 1994

Web References

1. https://nptel.ac.in/courses/
2. https://www.youtube.com
3. https://www.ott.com/applications/urban-hydrology-3/

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	30	30
L3	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

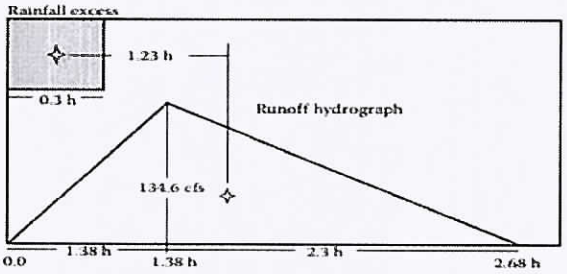
1. Define Length of waterway
2. What are the governing factors for the layout of a storm sewer system?
3. What is the purpose of the Man holes in the sewer pipe lines?

L2: Understand

1. Explain the procedure for determination of runoff using curve number method
2. Illustrate different flood control measures along with their suitability
3. Explain the objectives of watershed management

L3: Apply

1. Build the 5-min unit graph by the CUHP for the watershed with the following parameters: A = 0.38 mile², L = 1.28 mile, Lc = 0.52 mile, Ia = 44%, and S_o = 0.0102 ft/ft
2. Derive the SCS triangular unit graph for the rural watershed with the following parameters: D = 0.3 h, A = 0.38 mile², L = 1.28 mile, Lc = 0.52 mile, CN = 85 for south-west desert urban areas, and S_o = 0.0102 ft/ft



3. A water reservoir has the following characteristics:

Elevation (m)	Storage, S (106 x m³)	Outflow discharge, Q (m³ /s)
100.0	3.5	0
101.0	4.0	10
102.0	5.0	60
102.5	5.5	90
103.0	6.0	125

When the water level in the reservoir was at 101 m, a flood with the following input hydrograph entered the reservoir:

Time (h)	0	6	12	18	24	30	36	42
Discharge (m3 /s)	10	15	25	40	28	18	13	11

Route the flood by using the Goodrich method. Also, determine the attenuation in the peak flow rate and the lag in peak flow time

CONTROL COPY ATTESTED
Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE011 Sustainable Construction Methods

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CEO02.1	Understand the energy conservation methods and their factors		L1, L2
20CEO02.2	Understand the concept and strategies of environmental impact of building materials		L1, L2
20CEO02.3	Explain the innovative sustainable construction materials and their uses in construction	-	L1, L2
20CEO02.4	Summarize the various energy efficient materials and sustainableconstruction technology		L1, L2
20CEO02.5	Discuss the various energy efficient construction technologies		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1. Remember | L2 Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create DoK Depth of Knowledge

Unit I: Introduction and Energy Conservation methods — 12 Hours

Energy Conservation – Recourse Consumption – Introduction – Distribution of Energy use in India – Factors affecting the Energy use in Buildings – Pre-Building Stage, Construction Stage & Post Occupancy stages – Concept of Embodied Energy – Energy needs in Production of Materials – Transportation Energy – Concept of light footprint on Environment.

Energy efficiency

Unit II: Environmental Impact of Building Materials — 12 Hours

Measuring the impact of building materials; calculating embodied energy, recycling and embodied energy, processing and embodied energy, time and embodied energy, embodied energy of different building materials, low energy building and masonry materials, life cycle and analysis (life cycle analysis can be after embodied energy); Case studies and analysis.

Self healing materials

Unit III: Recyclable And Renewable Materials — 12 Hours

Concept of Recyclable materials – Sustainable Building Materials – Life Cycle Design of Materials – Biodegradable & Non- Biodegradable Materials – Green rating and Building Materials — Concept of Resource reuse, Recycled content, regional materials, rapidly renewable materials – Fly ash bricks, Cement – Recycled Steel, Bamboo based products.

Uses of renewable resources

Unit IV: Sustainable Construction — 12 Hours

Design issues relating to sustainable development including site and ecology, community and culture, health, materials, energy, and water- Domestic and Community buildings use self-help techniques of construction - adaptation, repair and management - portable architecture.

Environmental land use classification

Unit V: Energy Efficient Technologies — 12 Hours

Energy Efficient Construction Technology – Filler Slab – Rat trap Bond –Traditional Building Construction Technologies – Introduction to other Technological interventions to save Energy – Intelligent Buildings – Energy Conservation through Technological intervention – Saving Energy used for lighting by design innovation – Case studies.

Renewable energy

Text Books

1. "Sustainable Building Design Manual – Volume II", Published by TERI, New Delhi, 2004
2. Jagadeesh, K. S., Venkatta Rama Reddy, B. V. and Nanjunda Rao, K. S., "Alternative Building Materials and Technologies", New Age International Publishers
3. Kibert, C. J., "Sustainable Construction: Green Building Design and Delivery", John Wiley & Sons, 2013

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Steven V. Szokolay, "Introduction to Architectural Science – The Basis of Sustainable Design", Elsevier, 2007
2. Sandy Halliday, "Sustainable Construction", Routledge, Taylor & Francis Group, 2013
3. Dejan Mumovic and Mat Santamouris, "A Handbook of Sustainable Building Design and Engineering", Earthscan Publishing, 2009
4. Osman Attmann, "Green Architecture: Advanced Technologies and Materials", McGraw Hill, 2010

Web References

1. https://youtu.be/LdHMjhaBWxw
2. https://youtu.be/snYRU0QGXH0
3. https://www.slideshare.net/arundathipinky1/sustainable-architecture-55140947
4. https://www.slideshare.net/McNaughtonArchitecturalInc/green-building-sustainable-architecture-redlands-ca-mcnaughton architectural-inc

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive LevelsL1: Remember

1. What is Ecology?
2. What do you mean green building
3. What is meant by "LEED" building?
4. Define sustainability

L2: Understand

1. Explain the dissertation ideas on sustainable construction
2. Discuss the construction resources for environmentally sustainable technologies
3. Discuss in detail the major objectives and fundamental principles in green building concept and describe any one GlobalGreen rating system

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE012 Advanced Structural Analysis 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CEO02.1	Analyze Plane Trusses & Arches with the concept of Influence lines for forces		L3, L4
20CEO02.2	Analyze cable and suspension bridges		L3, L4
20CEO02.3	Application of matrix flexibility method	-	L3, L4
20CEO02.4	Application of matrix stiffness Method		L3, L4
20CEO02.5	Analyze structures using Kani's method, Plastic analysis and mechanism method		L3, L4

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1: Remember | L2 Understand | L3 Apply | L4 Analyze | L5: Evaluate | L6. Create. DoK: Depth of Knowledge

UnitI: Influence Lines for Forces in Plane Trusses and Arches — 12 Hours

N type truss - Pratt truss with parallel chords - Pratt truss with inclined chords - Warren truss with inclined chords. Symmetrical arches: Influence lines for horizontal thrust - Influence lines for B.M - Influence lines for S.F, B.M and normal thrust for moving concentrated loads and UDL- Muller Breslau principle

Types of trusses

Unit II: Cables and Suspension Bridges — 12 Hours

Components and their Functions - Analysis of cable under concentrated loads and UDL - Shape of cable under self weight - Anchorage of suspension cables - Bending Moment and Shear Force in suspension bridges with three hinged stiffened girders - Max Bending Moment due to moving single concentrated load and UDL - Influence lines for Bending Moment and Shear Force - Analysis of suspension bridges with two hinged stiffening girders.

Temperature stresses in the cable

Unit III: Matrix Flexibility Method — 12 Hours

Introduction - Computation of flexibility matrices - Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of static indeterminacy.

Flexibility Matrix

Unit IV: Matrix Stiffness Method — 12 Hours

Introduction - equilibrium and compatibility - Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of kinematic indeterminacy.

Stiffness Matrix

Unit V: Miscellaneous — 12 Hours

Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of static indeterminacy by Kani's method. Plastic analysis of structures - Assumptions - Moment redistribution - Analysis of fixed and continuous beams and portal frames by mechanism method.

Kani's Method

Text Books

1. Vazirani, V. N. and Ratwani, M. M., "Analysis of structures", Volume I & II, 4th Edition, Khanna publications, 2009
2. Pandit, G. S. and Gupta, S. P., "Matrix Methods of Structural Analysis", 2nd Edition, Tata McGraw Hill, 2000

Reference Books

1. Prakash Rao D. S.,"Structural Analysis", 3rd Edition, Sagar Books, 2008
2. BhaviKatti S. S., "Structural Analysis", Volume I & II, 4th Edition, Vikas Publications, 2010
3. Devdas Menon, "Advanced Structural Analysis", Narosa Publishing House Pvt. Ltd., 2012

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-53

Web References

1. https://nptel.ac.in/courses/105/106/105106050/
2. https://www.youtube.com/watch?v=s4CN6aVKhPo&list=PLEE5D02698EAAF2C0

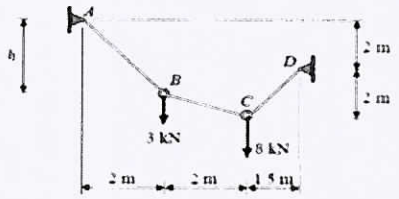
Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L3	50	50
L4	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L3: Apply

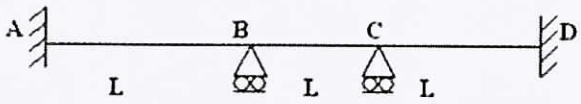
1. Distinguish between Flexibility method and Stiffness method
2. A three hinged parabolic arch hinged at the crown and springing has a horizontalspan of 12 m and a central rise of 2.5 m. it carries a udl of 30 kN/m run over the left hand half of the span. Calculate the resultant at the end hinges
3. Explain the matrix approach to structural analysis of continuous beams
4. A simply supported beam has a span of 10 m. A uniformly distributed live load of 10 kN/m 6 m long moves on the girder from left to right. Find the shear force and bending moment at the mid section by influence line diagrams, when the head of the load is 1 m from the right end
5. Determine the tension in each segment of the cable shown in the figure below. Also,what is the dimension h ?



L4: Analyze

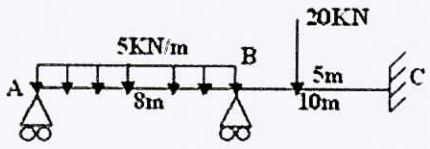
1. A three - hinged parabolic arch has a span of 40 m and rise of 8 m. Draw the influence lines for the following
   i. Horizontal thrust
   ii. Bending moment at a section 15 m from the left end
   iii. Normal thrust at the above section
   iv. Radial shear at the above section

2. Using the displacement method, analyse the continuous beam shown in figure , ifspans AB & BC carry a u.d.l. of p/unit length. Hence calculate bending moments at B & C. EI is constant



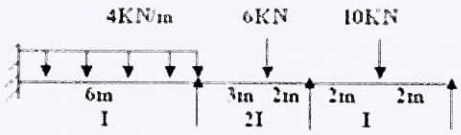
3. A 3-hinged arch is circular, 25 m in span with a central rise of 5m. It is loadedwith a concentrated load of 10 kN at 7.5 m from the left hand hinge. Find thei) Horizontal thrust ii) Reaction at each end hingeiii) Bending moment under the load

4. Using the force method, analyse the continuous beam shown in figure, treating thebending moments at B & C as redundants. Hence calculate support reactions.EI is constant



Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

5. Analyse the Continuous beam shown in figure using Kani's method



CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE013 Repair and Rehabilitation of Structures 3 0 0 3

Pre-Requisite: The students have to know about basic components of building & their function and basic knowledge of different types of defects in structures.

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CEO02.1	Identify the causes for deterioration of structures and able to give the preventive measures	-	L1, L2
20CEO02.2	Analyze the maintenance and repair strategies		L1, L2, L3, L4
20CEO02.3	Explain different types of special materials used for repair techniques		L1, L2
20CEO02.4	Identify different types of strengthening techniques used for existing structures		L1, L2
20CEO02.5	Recognize the mechanisms of deterioration of structures and conduct preliminary forensic assessment of deteriorated concrete structures		L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1 Remember | L2 Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create. DoK. Depth of Knowledge

Unit I: Serviceability and Durability of Structure — 9 Hours

Effects due to Temperature, climate, Chemicals, Wear and Erosion, Effects of Cover Thickness and Cracking, Design and Construction Errors, Corrosion Mechanism, Methods of Corrosion Protection, Corrosion Inhibitors, Corrosion Resistant Steels, Coatings, Cathodic Protection.

Damage of structures due to fire

Unit II: Maintenance and Repair Strategies — 9 Hours

Maintenance, Repair and Rehabilitation - significance of Maintenance - Preventive Measures on Various Aspects Inspection, Evaluation Procedure for Evaluating a Damaged Structure - Causes of Deterioration - Testing methods.

Various damages to masonry structures

Unit III: Repair Materials — 9 Hours

Sustainable Development, Fundamentals concerning Environment and Sustainable Development, Economy, Poverty, Human Settlement Issues, Land Resources, Forests, Mountains, Agriculture, Biodiversity, Protection of Oceans, Industry and Business.

Protective coatings for Concrete and Steel

Unit IV: Repair Techniques and Protection Methods — 9 Hours

Rust Eliminators and Polymers Coating for Rebar's During Repair Foamed Concrete, mortar and Dry Pack, Vacuum Concrete, Gunite and Shotcrete, Epoxy Injection, Mortar Repair for Cracks, Shoring and Underpinning.

Jacketing and Strengthening

Unit V: Rehabilitation & Retrofitting of Structures — 9 Hours

Repairs to overcome low member strength, Deflection, Cracking, Chemical Disruption, Weathering Wear, Fire, Leakage, Marine Exposure. Engineered Demolition Techniques for Dilapidated Structures – Case Studies.

Health Monitoring of Structures, Use of Sensors, Building Instrumentation

Text Books

1. Shetty, M. S., "ConcreteTechnology-Theory and Practice",S.Chandand Company, 6th Edition, 2008
2. Vidivelli, B., "Rehabilitation of Concrete Structures Standard Publishes Distribution",1st Edition, 2009
3. Varghese, P.C., "Maintenance Repair and Rehabilitation and Minor Works of Building", 1st Edition, Prentice Hall India Pvt. Ltd., 2014

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Dov Kominetzky, M. S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001
2. Ravishankar, K. Krishnamoorthy, T. S., "Structural Health Monitoring", "Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004
3. Hand Book on "Seismic Retrofit of Buildings", CPWD and Indian Buildings Congress, Narosa Publishers, 2008
4. Hand Book on "Repair and Rehabilitation of RCC Buildings-Director General Works CPWD", Govt of India, New Delhi, 2002

Web References

1. cpwd.gov.in/Units/handbook.pdf
2. tp://www.alljntuworld.in/wp-content/uploads/2016/01/Rehabilitation-and-RetrofittingofStructuresNotes.pdf
3. http://www.tn.gov.in/tsunami/digitallibrary/ebooksweb/04%20REPAIR_RESTORATION_AND_RET ROFITTIN.pdf
4. https://books.google.co.in/books/about/Case_Studies_of_Rehabilitation_Repair_Re.html?id=zraEplyE pCYC
5. https://books.google.co.in/books/about/Retrofitting_Design_of_Building_Structur.html?id=5XhbZW6 JS4YC&redir_esc=y
6. https://books.google.es/books/about/Concrete_Repair_Rehabilitation_and_Retro.html?hl=es&id=nwb NBQAAQBAJ

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	20	30
L3	30	30
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Rehabilitation
2. What do you mean by structural cracks?
3. What are the objectives of maintenance?
4. How deterioration occurs due to corrosion?
5. What are the factors that affect cracking?

L2: Understand

1. Describe the steps in the assessment procedure for evaluate damage in a structure
2. Explain the various causes for deterioration of concrete structure
3. Explain the difference between wear and erosion
4. Discuss the effect of temperature on concrete
5. Explain the various corrosion protection methods

L3: Apply

1. Contrast about cathodic protection
2. Differentiate shoring and underpinning
3. Compare structural cracks and non-structural cracks

L4: Analyze

1. Classify cracks based on its thickness
2. Analyze the factors influencing cracks
3. Attribute the nature of cracks

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE014 Solid Waste Management

3 0 0 3

Pre-Requisite: Environmental Engineering, Environmental Science

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE014.1	Understand the basics of solid waste management	---	L1,L2
20CE014.2	Execute the relevant methods of collection, transportation and storage of waste		L2,L3
20CE014.3	Execute and implement the disposal methods for different types of solid waste		L2,L3
20CE014.4	Understanding and implement the waste management systems		L1, L3
20CE014.5	Implement the rules and laws regarding solid waste management		L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Fundamentals of SWM

9 Hours

Definition, types of SW, sources and classification of SW, Characteristics of municipal solid waste, impact on environment, management techniques, factors affecting SW generation.

Sources and characteristics of SW

Unit II: Storage, Collection and Transportation of SW

9 Hours

Storage of SW, Collection, transportation of solid waste, transport vehicles with their capacity working, organization pattern of SW management system, practices according to population of the city or town.

Storage and collection

Unit III: Disposal of Municipal Solid Waste

9 Hours

Composting – process, principal, methods and factors affecting it. Incineration – Intro, types of incinerators, products of incineration process and their uses, advantages and disadvantages. Land filling and its methods, advantages and disadvantages, Biogas from landfills. Recycling of SW.

Composting, landfills

Unit IV: Waste Management, Health and Public Involvement

9 Hours

Bio-mediical waste management – Definition, sources, classification, generation, management techniques, health aspects and public involvement. Industrial waste management – types, collection, disposal and recycling. E-Waste management – Definition, types, effects, recycling and disposal.

Waste management techniques

Unit V: Legal Aspects of SWM

9 Hours

Legal aspects, present scenario, waste management rules 2016 (Bio-Medical E-waste, plastic waste, solid waste management, construction demolition), role of central pollution control board.

Solid waste management rules

Text Books

1. Ramanathan Jagbir Singh A. L., Solid waste Management: Present and Future Challenges, 1st Edition, Wiley Publications, 2019
2. George Tchobanoglous and Frank Kreith,Handbook of Solid Waste Management, 2ndEdition, McGraw-Hill Book Company,2002
3. Jayarama Reddy P., Municipal Solid waste Management,B.S.Publications,2018
4. Swara Bombade, Dhanashri Joshi , Solid Waste Management, Tech-Neo Publications LLP, Pune,2020
5. Rao M. N., Razia Sultana, Solid and Hazardous Waste Management, 2nd Edition, BS Publications, 2020

Reference Books

1. Sasi Kumar K., Solid Waste Management, PHI Learning, New Delhi, 2009
2. Rao C.S., Environmental Pollution Control Engineering, New Age International, New Delhi,2006
3. Hosetti B.B., Prospect and Perspectives of solid Waste Management ,New Age International Publishers, New Delhi,2006

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://nptel.ac.in

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	40	40
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Explain different types of solid wastes
2. Define composting
3. List any four sources of municipal solid waste

L2: Understand

1. What is the process of Land fills and incineration?
2. Discuss briefly about the classification of solid waste
3. Explain about the characteristics municipal solid waste
4. Discuss in detail about the effects of various solid waste
5. Discuss the factors to be considered while selecting a suitable site for disposal

L3: Apply

1. How can we implement the disposal methods for solid waste?
2. Compile the major features of municipal solid waste rules and regulations
3. Suggest the relevant methods for disposal and recycling of given type of solid waste
4. Suggest the existing legal framework to regulate the given type of solid waste with justification

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE015 Traffic Engineering

3 0 0 3

Pre-Requisite: Transportation Engineering

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE015.1	Understand the relationships b/w the traffic parameters and traffic flow mechanics		L1, L2
20CE015.2	Understand and apply the knowledge on traffic studies and principles		L1, L2, L3
20CE015.3	Understand and apply the knowledge on parking studies and surveys effectiveness.	---	L1, L2, L3
20CE015.4	Apply the traffic control regulations and designs		L2, L3
20CE015.5	Understand the traffic safety principles and measures		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Basic concepts of traffic engineering — 9 Hours

Components and characteristics, relationship among traffic parameters and empirical relationship, mechanics of traffic flow, macro and micro scope approach and human factors approach.

Traffic parameters and characteristics

Unit II: Traffic measurement and traffic studies — 9 Hours

Traffics volume studies, concept of PCU, data collection and presentation speed studies, origin and destination studies, traffic forecasting principles and techniques

PCU studies and origin and destination studies

Unit III: Parking and delay studies — 9 Hours

Types of parking facilities, parking inventory study, parking survey, and delay studies, level of service, factors effecting loss, measure of effectiveness and performance characteristics of highway capacity

Parking survey, delay survey

Unit IV: Traffic signs, road marking and traffic control — 9 Hours

Traffic problems, importance of traffic control and regulations, channelization, traffic signals, signal design by webster method pedis trial requirements, traffic regulatory measures, types of traffic signs and marking

Traffic control and regulations

Unit V: Design regulations and highway safety — 9 Hours

Dimensions and weights of vehicles, road lighting principles of road lighting and factors in design of road lighting, problems of highway safety, types of road accidents and measures, principles of road safety audit

Road safety and accident studies

Text Books:

T1: LK Kadiyali , Traffic Engineering and Transportation Planning, khanna publications,

T2: Fundamentals of transportation engineering -C.S.papacostas, Prentice Hall (india)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

References:

R1: Transporation engineering -An introduction C-J-Khisty,prentice Hall

R2: Fundamentals of transporation engineering -C.S.papacostas, Prentice Hall (india)

R3: Highway engineering and traffic analysis -Mannering and Kilareshi ,John Wiley Punlications

R4: Priniciples of transporation engineering -parthachakroborthy ,animas das- prentice Hall of india

Web References: (Provide additional references apart from prescribed text books, if any)

1. **www.nptel.com**
2. **www.iare.ac.in**
3. **https://nacto.org**

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define the term traffic engineering.
2. List out the factors affecting Level of service
3. State the principles of road lighting

L2: Understand

1. Explain the concept of PCU
2. Discuss briefly the rules and regulations of traffExplainthe parking facilities

L3: Apply

1. Out line the webster method of traffic signal design
2. Demonstrate various methods for determining traffic studies

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE016 Hydraulic Structures

3 0 0 3

Pre-requisites: Nil

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CEO16.1	Introduce hydrologic cycle and its relevance to Civil engineering	---	L1, L2
20CEO16.2	Make the students understand physical processes of precipitation abstractions from precipitation		L1, L2, L3
20CEO16.3	Be Able to Estimate Irrigation Water Requirements		L1, L2, L3
20CEO16.4	Ability To Design Irrigation Canals and Canal Network		L1, L2, L3
20CEO16.5	Analyze Stability of Gravity And Earth Dams		L1, L2, L3, L4

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1 Remember | L2: Understand | L3: Apply | L4 Analyze | L5 Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction of Hydrology& Precipitation — 9 Hours

Engineering Hydrology, Hydrology applications, Hydrological cycle-forms of Precipitations, Measurement of Precipitations, Rain gauge network of Precipitations, Problems on rain gauge stations

Hydrology, precipitation and rain gauge

Unit II: Abstraction from Precipitation& Hydrograph — 9 Hours

Initial abstractions, Evaporation Factors affecting- Evaporation-Measurement- Evapo-transpiration-factors affecting Infiltration, factors affecting Infiltration- Infiltration indices- Problems on Infiltration indices- unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations- principle of superposition and S-hydrograph methods

Losses and evaporation

Unit III: Ground Water&Irrigation — 9 Hours

Occurrence, types of aquifers, aquifer parameters, porosity- specific yield, permeability, transmissivity- steady radial flow to wells in confined and steady radial flow to wells in unconfined Irrigation-Necessity And Importance- Principal Crops and Crop Seasons, Estimation Of Consumptive Use, Duty And Delta, Factors Affecting Duty- Depth And Frequency Of Irrigation, Standards Of Quality For Irrigation Water, Crop Rotation.

Irrigation efficiency

Unit IV: Canals& Canal Structures — 9 Hours

Classification, Design of Non-Erodible Canals- Economics of Canal Lining, Methods Of Economic Section and Maximum Permissible Velocity, Design Of Erodible Canals- Kennedy's Silt Theory, Lacey's Regime Theory, Balancing Depth Offcutting.
Falls: Types And Location, Design Principles Of Sarda Type Fall, Regulators: Head Regulators& Cross Regulators, Design Principles, Cross Drainage Works – types, selection -design principles of Aqueduct

Falls: Types And Location

Unit V :Diversion Head Works & Reservoir Planning — 9 Hours

Types Of Diversion Head Works, Weirs And Barrages, Causes And Failures Of Weirs On Permeable Foundations
Bligh's Creep Theory, Reservoir Planning - Site Selection, Zones Of Storage- Types Of Dams, Selection Of Site For A Dam- Forces Acting On A Gravity Dam, Causes Of Failure Of A Gravity Dam, Limiting Height Of A Dam, Stability Analysis, Drainage Galleries Grouting earth dams- types, causes of failures, criteria for safe design, seepage, measure for control of seepage filters - spillways -types, design principle ogee spillways, types of spillway thrust gates, energy dissipation below spillways its appurtenances.

Text Books

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., New Delhi, 2013
2. Punmia B. C. Pande, Lal B. B., Ashok Kumar Jain and Arun Kumar Jain, S.,Irrigation and Water Power Engineering, Lakshmi Publications (P)Ltd.
3. Sharma, S. K.,"Irrigation Engineering", S. Chand Publishers, New Delhi, 2016

Reference Books

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-53...

4. Engineering Hydrology Subramanya K., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2013
5. Irrigation Engineering and Hydraulic Structures, Santosh Kumar Garg, Khanna Publishers
6. Chow V.T., Maidment and Mays L.W., "Applied Hydrology", Tata Mc Graw-Hills Education Pvt. Ltd., New Delhi
7. Mays L.W, Wiley India Pvt. Ltd., "Water Resources Engineering" Wiley India Pvt. Ltd., 2013

Web References

1. Introduction to Engineering Hydrology (slideshare.net)
2. Abstraction From Precipitation | Evaporation | Water Vapor (scribd.com)
3. Runoff Hydrograph: Meaning, Components and Factors | Geography (geographynotes.com)
4. Lec.28-30.pdf (uap-bd.edu)
5. Ground Water Hydrology (slideshare.net)

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	20	30
L3	30	30
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write a note on scope of Hydrology
2. Write short notes on Infiltration indices
3. Define Instantaneous Unit hydrograph
4. Write a brief note on components of runoff

L2: Understand

1. Describe the method of estimating a T-year flood using Log-Pearson type-III distribution
2. Explain various methods for the control of floods
3. Explain recuperation test and derive the equation used in the test
4. Describe any one hydrological model

L3: Apply

1. Enumerate and briefly discuss the various factors which affect the runoff from a catchment
2. Discuss the various problems encountered during the operation of flood control reservoirs
3. List of various methods of determining runoff from the catchment. Give the various empirical formulae for determining the runoff indicating the area for which each of these formulae is applicable
4. How do you derive Instantaneous Unit Hydrograph from S-curve?

L4: Analyze

1. Discuss in detail the various causes and effects of Floods
2. Discuss the applications of flow mass curve and flow duration curve
3. A well penetrates fully on 10m thick water bearing stratum of medium sand having coefficient of permeability of 0.005m/s. the well radius is 10cm and is to be worked under a drawdown of 4m at the well face. Calculate the discharge from the well. What will be the % increase in the discharge if the radius of the well is doubled?

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CEO17 Construction Cost Analysis

3 0 0 3

Pre-requisites: None

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE017.1	Understand the Various types of costs related to the construction		L1, L2
20CE017.2	Apply the techniques of appraisal for the economy related to the construction		L1, L2,L3
20CE017.3	Understand the performance statement of a construction company	----	L1, L2
20CE017.4	Apply the techniques for decision making of depreciation &Budget		L1, L2,L3
20CE017.5	Understand the cost control techniques		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1 Remember | L2: Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create. DoK: Depth of Knowledge

Unit I: Construction Costs

9Hours

Make-up of construction costs; Classification of costs, time cost trade-off in construction projects, compression and decompression.

General Costs of project, Direct and in direct costs

Unit II: Project Appraisal

9 Hours

Project appraisal, government and private project evaluators, significance of social benefit –national economic profitability, measurement of direct and indirect benefit and costs. Calculation of benefit cost ratio.

Cost analysis, Commercial profitability

Unit III: Engineering economics

9 Hours

Time value of money, discounted cash flow, decision making among the alternatives, replacement analysis, break even analysis, estimation of minimum capital required, internal rate of return (IRR), estimation of annualized cost.

Cash flow of a project

Unit IV: Depreciationand Budgetary control

9 Hours

Importance and advantages of depreciation, types – straight line method(simple problems).
Elements of, Budget types of budget – 0 base budget and master budget, preparation of cash budget. (Simple problems)

Overhead cost

Unit V: Cost Control

9 Hours

Cost audit, Advantages of Cost audit, areas and scope of CA, Cost audit in India.

Capital gearing ratio, debentures,

Text Books

1. M Pandey, Financial Management, Vikas Publishing house pvt ltd9th Edition
2. Donald Newnan, Engineering Economics analysis, Oxford University Press.
3. R Panneer selvam, Engineering Economics, PHI Learning Pvt. Ltd.
4. Frank Harris & Ronald Mc Caffer Modern Construction Management Blackwell science4th Edition.

Reference Books

1. 'Roy Pilcher Principles of Construction Management, Mc Graw Hill London.
2. United Nations Guidelines for Project Evaluation Oxford & IBH Publishing Co. Pvt. Ltd.
3. A.H. Taylor & H Shearing, Financial & Cost Accounting for Management Mac Donald & Evans.

Web References

1. https://www.youtube.com/watch?v=Kjcm_x9BICQ NASA Remote Sensing Tutorial - http://rst.gsfc.nasa.gov/
2. https://dl.icdst.org/pdfs/files4/51e56f03dd861bfbbb5ce45cfabe7eb7.pdf
3. https://www.digimat.in/nptel/courses/video/112107209/L01.html
4. http://www.digimat.in/nptel/courses/video/109107119/L02.html

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What allowances are included?
2. What contingency is included?
3. Illustrate the controllable costs?
4. Describe the uncontrollable costs?

L2: Understand

1. Classify the law of supply and demand with suitable example?
2. Interpreting the goals of economy?
3. Discuss about Economic efficiency?
4. Explain the law of supply and demand?

L3: Apply

1. Determining the factors in fluency demand?
2. Integrating the economy efficiency?
3. Determining the concept of break-even analysis with clear diagram?

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
-531173.

PE 20CE018 Coastal Zone Management 3 0 0 3

Pre-requisites: None

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE018.1	Understand Coastal and littoral zones, shore zone process, coastal wetlands		L1, L2
20CE018.2	Understand coastal hazard and human activity and coastal environment, provide examples of strategies for managing human activities in the coastal zone		L1, L2
20CE018.3	Apply Remote Sensing application in Coastal Management	----	L1, L2, L3
20CE018.4	Explain the significance of current research on important concepts in the coastal policy process		L1, L2, L3
20CE018.5	Summarize important measures in coastal zone management		L1, L2,L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1 Remember | L2. Understand | L3 Apply | L4 Analyze | L5 Evaluate | L6 Create. DoK: Depth of Knowledge

Unit I: Coastal and Littoral Zones – Coastal Wetlands **9 Hours**

Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore
Shore zone processes – waves, tides and currents, Coastal landforms; River deltas and dynamics of the delta-fringe coasts, coastal classification
Coastal wetlands – Mangrove swamps, marshes, lagoons, tidal channels/creeks and their significance in coastal stability and economic importance
Continental margins – forms and processes; territorial waters and Exclusive Economic Zone
Sea level changes – factors involved; effects of sea level oscillations on coastal zones

Unit II: Coastal Hazard& Human activity and Coastal Environment **9 Hours**

Coastal Hazards: Storm surges and Tsunamis; Origin, propagation and run-up of tsunamis; Tsunami impact – role of coastal topography and vegetation, Global warming and Sea-level rise - impact on coastal zones; coastal vulnerability assessment
Coastal hazard preparedness – coastal protection, education and awareness of coastal communities
Human activity and coastal environment – deforestation, agriculture/aquaculture, pollution and coastal structures, and their effect on coastal zones, Coastal vegetation; shelter belts; coastal aquifers

Unit III: Remote Sensing for Coastal Management **9 Hours**

Data Input, Data Management, Data Quality-Remote Sensing for Coastal Management.
Data quality in remote sensing, Application of remote sensing in CEM, Application of remote sensing in CZM, Role of Remote Sensing to integrated coastal zone management, Data collection and input overview in GIS, Data processing in remote sensing

Unit IV: Environmental Policies for Coastal Regulation Zone9Hours

Coastal Regulation Zone (CRZ) Act, Coastal regulation zones for mainland and islands– Environmental policies, planning, administrative and regulations': Environmental policies India past and present, Environmental policies India, Fisheries legal regimes
CRZ mapping.

Unit V: Coastal Zone Management – Concepts, Models and Information Systems **9 Hours**

Coastal zone management – concepts, models and information systems
Integrated Coastal Zone Management (ICZM); concept, application and case studies.
Integrated coastal zone management, Coastal zone management in India, CRZ concept, goals, CRZ case study, CRZ Kerala case study

Text Books

1. DavisA.R., "Coastal Sedimentary Environments", (Jr.), Springer-Verlag, 1985
2. King C.A.M., "Beaches and Coasts" Edward Arnold, 1972
3. King C.A.M., "Introduction to Marine Geology and Geomorphology", Edward Arnold, 1974

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
...m, Visakhapatnam-531...

4. Martin K., "Applications in Coastal Zone Research Management", St. (Ed), U.N. Institute for Training and Research, 1993
5. Sain B.C., and Knecht, R. W., "Integrated Ocean and Coastal Management", UNESCO Publication, 1998

Reference Books

1. Sudarshan, "Subtle Issues in Coastal Management", IIRS, Dehradun, 2000
2. Satake K., "Tsunamis – Case Studies and Recent Developments", Springer, 2005
3. Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scientific Publishing Co., 1999

Web References

1. Video link on Application of Remote Sensing and GIS for Coastal Zone Management
2. Video link on NASA ARSET: Overview of Coastal Ecosystems and Remote Sensing
3. Video link on Data Quality in GIS
4. Video link on Environmental Impact of Tourism
5. Video link on Sustainable use of coastal areas in Zanzibar

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	20	30
L3	30	30
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write a note on Coastal zones
2. Write short notes on coastal hazards
3. What is CZM?
4. Write two applications of remote sensing in CZM.

L2: Understand

1. Describe the application of remote sensing for coastal zone management.
2. Differentiate coastal zones, littoral zones and coastal wetland
3. Explain the impact of human activity on coastal environment
4. Describe in detail Coastal zone management in India.

L3: Apply

1. Enumerate and briefly discuss the various factors which affectct the sea level changes and also discuss the effects of sea level oscillations on coastal zones
2. Discuss in detail coastal vulnerability assessment.
3. List of various coastal zone management strategies.
4. How do you give awareness to protect coastal zone

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)
Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
...yam, Visakhapatnam-...

PE 20CEO19 Special Concrete

3 0 0 3

Pre-requisite: Concrete structures

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE017.1	Understand the basic technique of self-healing concrete and their types	–	L1, L2
20CE017.2	Understand the applications and component types of Self-healing concrete		L1, L2
20CE017.3	Understand the properties of self-healing concrete		L1, L2
20CE017.4	Understand the various applications and properties of living building materials		L1, L2
20CE017.5	Understand the applications and various case studies of self-healing concrete		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Fundamental aspects of Self-Healing Concrete — 9Hours

Introduction, Types of Self-Healing Concrete, Need of Self-healing concrete, Objectives of SHC, Properties, Autogenous Healing-Applications, Durability aspects, Physical, Mechanical performance of composites, Process of SHC, Bacteria Selection, Advantages& Disadvantages of SHC

Characteristics of Self-healing concrete

Unit II: Stimulated Autogenous Healing — 9 Hours

Introduction, Use of mineral additions, Use of crystalline Admixtures, Use of superabsorbent polymers, Applications, Autonomous self-healing- Applications, Microencapsulation, Vascular healing, Self-healing bio concrete, Applications, uses.

Durability, performance aspects of SHC

Unit III: Self-healing Materials — 9 Hours

Introduction, Thermal, electrical, Acoustical properties, Role in repair aspects as cementitious materials, Biomimetics, self-healing polymers and elastomers- applications, Self-healing fibre reinforced polymer composites - Applications, Self-healing coatings-Applications,

Common types of Self-healing materials, properties

Unit IV: Living Building materials — 9 Hours

Introduction, Self-replacing concrete- Applications, properties, uses, Calcium carbonate bio cement- Applications, uses, Mycelium composites- Properties, Uses, Self-healing cementitious materials, Self-healing ceramics, Self-healing organic dyes, Self-healing of ice.

Building insulation materials, Smart building, materials

Unit V: Applications and Case study of Self-healing concrete — 9 Hours

Efficiency assessment of self-healing concrete, Large size buildings and roads, Structural Crack prevention - highways, Oil and gas industries, Marine structures, Freeze and thawing conditions, Irrigation works, Tunnel lining, dams.
Case study: Applications of Microbial self-healing concrete

Applications in Pier crack prevention, side walks

Text Books

1. Self-Healing Concrete (Materials Research Foundations) by david J. fisher
2. Self-Healing Materials From Fundamental Concepts To Advanced Space And Electronics Applications 2019 Edition by Brahim Aïssa, Emile Haddad , Institution of Engineering and Technology

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)

3. concrete technology 2E Paperback – 1 April 2018by A.R. Santha Kumar (Author)

Reference Books

1. Self-Healing Composite Materials by Khan Anish, Woodhead, Published November 2019
2. Self-Healing Materials- An Alternative Approach to 20 Centuries of Materials Science, Springer Series in Materials Science (SSMATERIALS, volume 100), 2007.

Web References

1. https://pubs.rsc.org/en/content/articlelanding/2015/ra/c5ra20858k
2. https://www.youtube.com/watch?v=He49aLkGi3k
3. https://www.engineeringcivil.com/self-healing-concrete.html
4. https://en.wikipedia.org/wiki/Self-healing_concrete

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is the process of self-healing concrete?
2. What are the applications of self-healing concrete?
3. Illustrate the functions of SHC?
4. Illustrate the components of SHC?

L2: Understand

1. Discuss objectives of SHC
2. Inferring the prevention for cracks by using SHC
3. Interpret the various functions of SHC
4. Classify the applications of Self-healing concrete

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE020 Hazardous Waste Management

3 0 0 3

Pre-requisite: Environmental science, Environmental Engineering
At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE020.1	Understand the basics of hazardous waste		L1,L2
20CE020.2	Understand the basics of Hazardous waste management		L1,L2
20CE020.3	Execute and implement the Treatment technologies of Bio-medical waste	---	L2,L3
20CE020.4	Execute and implement the Treatment technologies of E- waste		L2,L3
20CE020.5	Understand and implement the secured landfills		L1,L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit 1: Introduction to Hazardous Waste **9 Hours**

Hazardous waste definition – Physical and Health hazards wastes - Handling Rules – Characterization of hazardous wastes – Analytical– Analytical methods –Hazardous waste inventory- Source reduction of hazardous wastes

Source reduction, Waste inventory

Unit2: Hazardous Waste Management **9 Hours**

Handling, storage and transport of Hazardous wastes –Waste Compatibility Chart - Manifest system – Transboundary movement of wastes – Basal Convention – Hazardous waste treatment technologies – Physical, chemical and thermal treatment of hazardous waste – Solidification – Chemical fixation – Encapsulation – Incineration

Handling and storage, chemical fixation

Unit 3: Biomedical Waste Management **9 Hours**

Biomedical waste- Regulatory aspects of Biomedical Waste. Sources-Classification-Waste Handling and Collection-Segregation and labelling- Treatment – autoclaving, Incineration

Incineration, Handling and collection

Unit 4:E-Waste Management **9 Hours**

Regulatory aspects of E- Waste management, Waste characteristics- Generation– Collection -Transport- Treatment and disposal. Recycling and Recovery – Intergraded e-waste management

Handling and disposal

Unit 5 :Secure Landfills **9 Hours**

Hazardous waste landfills – Site selections – landfill design and operation – Regulatory aspects - Leachate Collection and Management – Environmental Monitoring System- Landfill Closure and post closure care

Site selection, landfills

Text Books

1. Michael D. LaGrega, Phillip L. Buckingham, Jeffrey C. Evans, Hazardous Waste Management,2nd Edition, Waveland Press,2010
2. Lagrega,Hazardous Waste Management,2nd Edition,Medtech,2015
3. John pichtel, Waste Management Practices: Municipal, Hazardous, and Industrial,CRC Press, 2nd Edition,2014
4. Rao M. N., Razia Sultana,Solid and Hazardous Waste Management, 2nd Edition, BS Publications, 2020

Reference Books

1. Rao C.S., Environmental Pollution Control Engineering,New Age International,New Delhi,2006
2. Rao M. N., Razia Sultana,Solid and Hazardous Waste Management: Science and Engineering, Butterworth-Heinemann, 2016
3. William C. Blackman, Jr., Basic Hazardous Waste Management, 3rd Edition,CRC Press,2016

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://nptel.ac.in

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	40	40
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define hazardous waste
2. Define solidification
3. List any four sources of hazardous waste

L2: Understand

1. What is the process of Landfills and incineration?
2. Discuss briefly about the classification of hazardous waste
3. Explain about the characteristics hazardous waste
4. Discuss in detail about the effects of various hazardous waste

L3: Apply

1. How can we implement the disposal and treatment methods?
2. Compile the major features of hazardous waste

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE021 Urban Transportation and Planning 3 0 0 3

Pre-requisite: Transportation Engineering

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CEO21.1	Understand issues regarding urban transportation and generate remedies	-----	L1, L2
20CEO21.2	Building data for efficient transportation and planning		L1, L2, L3
20CEO21.3	Understand different stages of transportation and planning		L1, L2, L3
20CEO21.4	Analyzing Traffic and transportation problems in India		L1, L2, L3
20CEO21.5	Organising and analysing different surveys		L1, L2, L4

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Issues on Urban Transportation & Solutions **9 Hours**

Urban Issues, Travel Characteristics, Supply and Demand, Problem Definition, Solution Generation

demand, supply and generation

Unit II: Collection of Data &Inventories **9 Hours**

Data Collection, Organising and Analysing Surveys, Road Side Interviews, Home Interview Surveys, Commercial Vehicle Surveys, Economic data – Income – Population – Employment – Vehicle Owner Ship.

Income, population, employment

Unit III: Trip Generation and Trip Distribution **9 Hours**

Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction model strip Distribution: Gravity Model, Growth Factor Methods of Trip Distribution, Uniform Factor Method

Gravity, distribution, growth

Unit IV: Traffic Assignment **9 Hours**

Traffic Assignment: Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment

coding , network, skimming

Unit V : Case studies **9 Hours**

Brief Case studies of Comprehensive Traffic and Transportation problems of Indian towns /cities.

Text Books:

1. Traffic Engineering and Transport Planning - Kandivali L.R., Khanna Publishers 1 January 1999.
2. Lecture notes on UTP - Prof. S. Raghava Chari, R.E.C.Warangal.
3. C.S. Papacostas and P.D. Prevedouros, Transportation Engineering and Planning, Prentice Hall of India Pvt. Ltd2001.

References:

1. Introduction to Urban System Planning - B.G.Hutchinson; McGraw Hill
2. Metropolitan transportation planning – John W. Dickey, Tata McGraw Hill, New Delhi, 1975.
3. Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London.

Web References: (Provide additional references apart from prescribed text books, if any)

1. https://archive.nptel.ac.in/courses/105/107/105107067/
2. https://supernet.isenberg.umass.edu/courses/FOMGT341-Fall09/lecture1.pdf

Head of the Department
Dept. of Civil Engineering
M.S. Raju Institute of Technology(A)
Kanduru, Visakhapatnam-531173.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	20	30
L3	30	30
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Explain the interrelationship between income population and employment.
2. Explain various urban transportation problems.
3. Write a note on
   i. Road side interviews
   ii. Commercial vehicle survey
   iii. Home interview survey

L2: Understand

1. Explain various factors governing trip generation.
2. What is trip distribution and mention methods of trip generation.
3. Define trip assignment and explain various application of trip assignment

L3: Apply

1. Write a note on study area and zoning. List the factors affecting zoning.
2. The following information was obtained from a transportation survey of a town. Develop a linear regression (of type y=a+bx) model for estimating the trips generated from a zone. If the population in particular zone increases to 40,000 predict the expected trip generation from the zone.

Zone no	1	2	3	4	5	6	7	8
Population in zone(thousands)	26	28	31	33	22	30	20	25
Total trip generated (in hundreds)	12	11	17	15	12	15	9	13

L4: Analyze

1. What is trip distribution? Briefly explain average factor method mention the dis advantages of this method
2. What are the applications of Traffic assignment?
3. Write a note on
   i. All or nothing assignment
   ii. Capacity restraint assignment

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE022 Hydro Power Engineering 3 0 0 3

Pre-requisite: Nil

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE022.1	Describe the different concepts relevant to hydropower engineering		L1,L2
20CE022.2	Understanding of different types of hydropower schemes and their purposes.		L1,L2
20CE022.3	Design essential elements of hydropower plant	---	L2,L3
20CE022.4	Concepts and aspects of Location, components Structures involved in a Hydropower plant		L2,L3
20CE022.5	Understanding of various appurtenances used in any Hydro project		L1,L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2. Understand | L3. Apply | L4. Analyze | L5. Evaluate | L6. Create. DoK: Depth of Knowledge

Unit I: Basic Hydro Power Concepts — 9 Hours

Introduction: Prospects of hydropower, sources of energy, hydropower potential, distribution and development, basin-wise development of hydropower, constraints in hydro power development; Stream Flow Data and Hydropower Potential: Flow and load duration curves, estimation of flow duration curve at ungauged site, primary and secondary power, storage and pondage, load factor, capacity factor, utilization factor, diversity factor.

Unit II: Types of Hydro Power Plants & Intake Structures — 9 Hours

Types of Hydro Power Plants: Base and peak load Hydro-power plants, run-off river plants, valley dam plants, diversion canal plants, high head diversion plants, pumped-storage power plants; Intake Structures: Functions of intake structures, its location types, trash rack dimensions, design, spacing of bars, methods of cleaning; design of transition.

Unit III: Conveyance System — 9 Hours

Conveyance System: Power canal-location, site, surges in canals, penstocks types, design and layout, economical diameter of penstock, hydraulic losses, branches, air vent, forebay.

Unit IV: Hydraulic Transients — 9 Hours

Hydraulic Transients: Basic equations of Unsteady flow through conduits, method of characteristics, boundary conditions, single-pipeline applications for various valve opening conditions, functions of surge tank and its location, types and design of surge tank, introduction to transient software's like HAMMER and HYTRAN etc.

Unit V: Hydraulic Turbines — 9 Hours

Hydraulic Turbines: Types of turbines, characteristics and efficiency of turbines, selection of turbines, selection of turbines, cavitations, casing, draft tubes, tail trace and their hydraulic design; Small Hydropower Development: Benefits and potential of small hydropower plants, components of small hydropower plants, trench weir, desilting tank, and turbines.

Text Books

1. Nag P.K., "Power Plant Engineering" Tata McGraw Hill, 2nd edition, 4th reprint 2003.
2. Rai-Khanna. G.D., "An introduction to power plant technology" Publishers, Delhi, 2013

Reference Books

1. Barrow, H.K., "Water Power Engineering", Tat McGraw-Hill
2. Varshney, R.S., "Hydro Power Structures", Nem Chand & Bros.
3. Choudhary, M.H., "Applied Hydraulic Transients, Van Nastrand Reinhold
4. Warnick, C.C., "Hydropower Engineering", Prentice-Hall
5. "Hydropower Development", Vol.3,4,5,&6, Norwegian Institute of Technology, Division of Hydraulic Engineering
6. Sharma P.C., Kataria S. K. & Sons, "Power Plant Engineering", 2009

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)

Web References

1. NPTEL Powerplant Engineering (iitr.ac.in)

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	20	30
L3	30	30
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What do you mean by run off river plants?
2. Define specific speed.
1. For what purpose relief valve is provided.
2. Write any two advantages of pumped storage plant.

L2: Understand

3. What is the necessity to determine future demand of load? Explain in detail?
4. Describe the general layout of runoff river plants.
5. What is difference between storage and pondage?
6. Describe surge tank and its types. What are the functions of surge types.

L3: Apply

1. What are different types of turbines? Discuss the general criterion for the selection of turbine?
2. Discuss the design theory of daft tubes.
3. For rigid and elastic pipe. derive the expression for water hammer pressure
4. Explain different types of power houses Also describe the function of different componentsbriefly.

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
M.S. Raju Institute of Technology(A)
[illegible]

PE 20CE023 Safety Engineering 3 0 0 3

Pre-requisite: Nil

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE023.1	To list out and describe the various functions and activities of safety engineering department	---	L1, L2
20CE023.2	To carry out safety audit and prepare a report for the audit		L1, L2,L3
20CE023.3	To prepare an accident investigation report		L1, L2,L3
20CE023.4	To evaluate the safety performance of an organization		L1, L2,L3
20CE023.5	To identify various agencies involved in training		L1,L2

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge

Unit I: Concepts and techniques 9 Hours

History of safety movement -Evolution modern safety concept-general concepts of management-line and staff functions for safety-budgeting for safety policy. incident recall technique (IRT), disaster control, job safety analysis, safety survey, survey inspection safety sampling, evaluation of performance of supervisors on safety

Incident recall technique

Unit II: Safety audit 9 Hours

Components of safety audit, types of audit, audit methodology, on conformity reporting (NCR), audit check list and report -review of inspection, remarks by governing agencies, consults, experts,- perusal of accidents and safety record formats -implementation of audit indication- liaison with departments to ensure coordination- check list- identification of unsafe acts on workers and un safe conditions in the shop floor -IS 14489 1998 code of practice on occupational safety and health audit

Non conformity reporting

Unit III: Accident investigation and reporting 9 Hours

Concept of an accident, near miss incident, reportable and non-reportable accidents-reporting to statutory authorities- principles of accident presentation -accident investigation and analysis-records for accidents, departments accidental reports documentation of accidents- unsafe act and condition -domino sequence -supervisory role -role of safety committee -cost of accident

Accident investigation and analysis

Unit IV: Safety performance monitoring 9 Hours

Recommended practices for compiling and measuring work injury experience -permanent total disabilities, permanent partial disabilities, temporary total disabilities- calculation of accidents indices, frequency rate, severity rate frequency severity incidence, incident rate, accident rate safety t score safety activity rate, total injury lines, incidence rates, lost workday cases incidence rates (LWDI), number of lost working days rate-problems

Calculation of accident indices

Unit V: Safety education and training 9 Hours

Importance of training -identification of training needs-training method- programmes seminars, conferences, competitions-methods of promoting safe practice -motivation -communication-role of government agencies and private consulting agencies in safety training DGFASLI, NSC, ASSE, HSE, OSHA, NEBOSH- creating awareness, award celebrations, safety displays, safety pledge safety incentive scheme, safety campaign

Training methods and training needs

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text books:

1. Ray Asfan C indusrial safety and health management -Pearson prentice hall 2003
2. Blakke R.B Industrial safety. prentice haling new jersey 1973

References:

1. Heinrich H.W. industrial accident presentation Mc Graw-Hill company, New York 1980
2. Krishnan N.V. safety management in industry Aico publishing house, Bombay 1997.

Web References: (Provide additional references apart from prescribed text books, if any)

1. https://mrcet.com
2. https://www.studocu.com

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	40	40
L3	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define safety sampling
2. List the techniques of safety management.

L2: Understand

1. Explain the concept of accident investigation.
2. Discuss the recommended practices for compiling and measuring work injury
3. Describe about emergency planning during accidents

L3: Apply

1. How the equipment life circle is useful for deciding maintains activities
2. What are the principles of accident prevention?

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PE 20CE024 Ocean Engineering

3 0 0 3

Pre-requisite: NIL

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE024.1	Understand ocean environment and ocean flow characteristics		L1,L2
20CE024.2	Describe the spatial and temporal variability of physical properties of the ocean.		L1,L2
20CE024.3	Explain conservation equations and transport processes	-	L2,L3
20CE024.4	Classify different water masses of world oceans using T-S diagrams.		L2,L3
20CE024.5	Classify different types of ocean structures and system		L1,L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective Pos
L1 Remember | L2: Understand | L3 Apply | L4: Analyze | L5: Evaluate | L6 Create. DoK Depth of Knowledge

Unit I: Introduction to Ocean Environment — 9 Hours

Brief introduction to ocean environment and ocean floor characteristics, waves, tides, currents, seawater properties; Waves and Tides: General aspects of ocean waves, wave characteristics, sea and swell, deep and shallow water waves, storm surges and tsunamis- Tides and tide generating forces; their causes, variation and types, Tidal currents.

Unit II: Introduction to Oceanography — 9 Hours

General introduction, major expeditions-Dimensions of the ocean, Geographical features of ocean - Physical properties of sea water-distribution of temperature, salinity, density and oxygen in space and time, mixed layer and barrier layer, Acoustic properties of sea water- sound velocity profile- SOFAR channel and shadow zone- Optical characteristics of sea water – Color of the sea. Different materials for marine applications - metals, concrete, geo- synthetic products and other materials for marine environment; Marine corrosion and control; Introduction to physical modelling of coastal and offshore and harbour engineering problems.

Unit III: Ocean circulation — 9 Hours

Ocean circulation – Conservation equations and transport processes, momentum balances, geostrophic, large scale circulation, wind-driven circulation, abyssal ocean circulation, boundary currents, friction and Ekman layers; Waves – Origin and evolution, characteristics, classification, Tsunami, Tides – Origin, characteristics, tidal generation forces, equilibrium tide, tidal analysis and prediction.

Unit IV:Circulation and Water masses — 9 Hours

Circulation and Water masses: General circulation of the atmosphere – wind driven currents in the world ocean – Equatorial current systems – Wyrtki Jet Under currents- Circulation in the Arabian Sea and Bay of Bengal- Somali current – wind stress Ekman spiral– Upwelling – Indian Ocean Dipole (IOD)- El Nino and La Nina. Formation and classification of water masses- T-S diagram- water masses of the world ocean – thermohaline circulation - Identification of water masses.

Unit V:Ocean Structures & System — 9 Hours

Different types of ocean structures and systems (fixed, floating, semi-submersibles, submersibles, pipelines, etc.) for exploitation and production of oil and gas, minerals and energy. Brief outline of planning, design and construction.Towing, launching and installation.

Text Books

1. Reddy M. P. M., "Descriptive Physical Oceanography", Oxford & IBH, New Delhi,2000
2. Stewart R. H.,"Introduction to Physical Oceanography", E - Book, 2005
3. Sverdrup H.U.,"The Oceans, their Physics, Chemistry and General Biology", Prentice Hall, 1969
4. JohnA.K., and Newell G.,"IntroductiontoPhysicalOceanography",3rdEdition,Waveland Press, Inc., 2017

Reference Books

1. Sussman, J.M.,Pickard G.L., EmeryW.J, "Perspectives Descriptive Physical Oceanography: An Introduction, 1992
2. McLellan, Hugh J., "Elements of Physical Oceanography", Pergamon Press (New York), 1965
3. Steele, John H, "Elements of Physical Oceanography: A Derivative of the Encyclopedia of Ocean Sciences", Academic Press, 2010.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. http://nptel.iitm.ac.in
2. Ocean Structures and Materials by Dr. Srinivasan Chandrasekaran, Department of Ocean Engineering, IIT Madras. For more details on NPTEL visit http://nptel.iitm.ac.in

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	20	30
L3	30	30
L4	20	20
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write a any two wave characteristics.
2. What is SOFAR channel?
3. Define El Nino and La Nina.
4. Write a short note on floating structures.

L2: Understand

5. Describe the Conservation equations and transport processes.
6. Explain wind driven currents in the world ocean
7. Explain wind stress Ekman spiral.
8. Describe fixed, semi-submersibles system.

L3: Apply

9. Enumerate and briefly discuss the various types of ocean structures and systems. for exploitation and production of oil and gas,
10. Discuss the Equatorial current systems.
11. List different materials for marine applications. Explain them in detail.
12. How do you design and construct floating structures.

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20CEO01 Urban Environmental Services 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO6	PO7	PO12	
20CEO01.1	Identify urban – health relationships	3	3	1	L1, L2
20CEO01.2	Demonstrates the connection between urban built form and health outcomes	3	3	1	L1, L2
20CEO01.3	Discuss the distribution of health risks of urban transportation grid	3	3	1	L1, L2
20CEO01.4	Assess and plan for community needs in health-care infrastructure	3	3	1	L1, L2
20CEO01.5	Identify preliminary opportunities for advancing urban health outcomes	3	3	1	L1, L2

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Health and Planning — 9 Hours

Introduction, The Historical Link, Dividing Health and Planning, Urban Health – Basic Conceptions in the Literature, Urban Form, Physical Activity.

Health Promotion

Unit II: Built Urban Form and Health — 9 Hours

Renewing the Health-Urban Link, The Urban form, The Metropolitan Sprawl Index, Using Measured Urban Forms to Assess Health Effects, Environmental Factors and Physical Activity

Alternatives to Metropolitan Sprawl Index

Unit III: Transportation Systems — 9 Hours

Transport Planning, Private Motor Vehicles as Health Risks, Private Motor Vehicles and Obesity, Public Transport, Mixed-use Medium-density and Pedestrian Travel, Proximity and Individual Factors.

Residential and Travel Preferences

Unit IV: Spatial Access to Health Services — 9 Hours

Introduction, The Concept of Access, Dimensions of Spatial Access, Primary Care Supply and Access, Spatial Access and Travel Behaviour, Access and Mortality.

Access to health care Aligned with Transport

Unit V: Challenges and Opportunities — 9 Hours

Introduction, Challenges, Conceptual Frameworks, Investigative Methods and Data Collection, Limited Policy Capacity, Fragmented Initiatives, Opportunities, Interdisciplinary Engagement, Major Conceptual Programs, Priorities for future Research.

Promotion of physical activity in daily routines

Text Books

1. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 3rd Edition, University Grants Commission, 2021
2. George Luber and Jay Lemery, "Global Climate Change and Human Health", 1st Edition Jossey-Bass, 2015

Reference Books

1. Pataki, Diane E., et al. "Coupling biogeochemical cycles in urban environments: ecosystem services, green solutions, and misconceptions" Frontiers in Ecology and the Environment, 2011
2. Frank, L., Engelke, P., and Schmid, T., "Health and Community Design: The Impact of The Built Environment on Physical Activity", Island Press, Washington, D.C., 2003
3. Eiichi Taniguchi, Tien Fang Fwa and Russell G Thompson, "Urban Transportation and Logistics", CRC Press, 2014

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://www.oecd.org/health/health-systems/32006565.pdf
2. https://www.pdfdrive.com/urban-environment-proceedings-of-the-10th-urban-environment-symposium-e157051203.html

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. How is natural environment different from urban environment?
2. How does the urban environment affect health and well-being?
3. How can urban areas improve health?

L2: Understand

1. Explain the most important problem related to health in urban area
2. Describe the differences between physical activity for transportation and physical activity for recreation
3. Consider a study that evaluates the health of people in two communities, one with sidewalks and one without. The study authors find that the rate of lung cancer is higher in the community without sidewalks, and conclude that sidewalks protect against lung cancer. What concerns would you have about accepting this conclusion?

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20CSO01 Data Structures and Algorithms 3 0 0 3.0

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CSO01.1	Understand the advanced data structures and algorithms	-	L1, L2, L3
20CSO01.2	Demonstrate through abstract properties of various data structures such as stacks, queues and lists to implement efficient programs using data structures.	-	L1, L2, L3
20CSO01.3	Demonstrate through various searching & sorting techniques	-	L1, L2, L3
20CSO01.4	Apply data structures and algorithms to solve real world problems.	-	L1, L2, L3
20CSO01.5	Apply algorithm analysis techniques to evaluate the performance of an algorithm.	-	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Data Structures & Algorithms **9 hours**

Introduction to Data Structure, Data Organization, Abstract Data Types, Elementary data types; Basic concepts of data Structures; performance measures for data structures, Time and Space Complexity. Introduction to Algorithms, Asymptotic notations and common functions, Algorithm Specifications: Performance Analysis and Measurement

Efficiency of an Algorithm

Unit II: Arrays and Linked Lists **9 hours**

Arrays- Definition, Different types of Arrays, Application of arrays, Sparse Matrices and their representations. Linked lists- Definition, Implementation of Singly Linked Lists, Doubly Linked List, Operations on a Linked List, Insertion, Deletion and Traversal. Stack-Basic Concept of Stack, Stack as an ADT and operations in stack. Queue-Basic Concept of Queue, Queue as an ADT and Operations in Queue

Generalized Linked List, Applications of Stack and Queue **9 hours**

Unit III: Trees and Graphs

Trees- Basic concept of Binary tree, Operations in Binary Tree, Tree Height, Level and Depth, Binary Search Tree, Insertion, Deletion, Traversals, Search in BST, 2-4 trees. Graph-Matrix Representation Of Graphs, Elementary Graph operations(Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree)

Applications of Tress and Graph

Unit IV: Algorithm Design Techniques I **9 hours**

Divide and Conquer-General method, Merge sort, Quick sort. Brute force- approach, bubble sort, Linear Search techniques.

Preferences of Merge and quick sort techniques.

Unit V: Algorithm Design Techniques II **9 hours**

Greedy Technique, General method, Knapsack problem, Job sequencing with deadlines, Minimal cost spanning tree algorithms (Prim's and Kruskal's), Dynamic Programming: General method, 0/1 knapsack problem, All pair shortest path algorithm

Usages of Greedy algorithms.

Text Books

1. Reema Thareja, "Data Structures Using C", Second Edition, Oxford, 2014
2. Horowitz, Sahni and Anderson Freed, "Fundamentals of Data Structures in C", Second Edition, 2008
3. Mark Allen Weis , "Data Structures and Algorithm Analysis in C", Second edition, Pearson, 1997

Reference Books

1. Salaria R.S., "Data Structures and Algorithms using C", Fifth Edition, Khanna Publishing, 2018
2. Richard F Gilberg, "Data Structures: A PseudoCode Approach With C++" Fifth edition, Thomson Press(India), 2004
3. Amitava Nag and Jyothi Prakash Singh, "Data Structures and Algorithms Using C", Second Edition, Vikas Publishing, 2009

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://www.springboard.com/library/software-engineering/data-structures-and-algorithms/
2. https://www.geeksforgeeks.org/data-structures/
3. https://www.programiz.com/dsa

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	20
L2	40	40
L3	20	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Describe Data Structure and Algorithm
2. Illustrate some applications of stack
3. Describe about a Queue
4. List two applications of Data Structures

L2: Understand

1. Classify data structures
2. Explain about asymptotic notations
3. Differentiate Linked List, Stack and Queue
4. Explain about different sorting algorithms

L3: Apply

1. Implement the append method, which should add a new element onto the tail of the linked list
2. Implement stack using arrays and linked lists
3. Implement Queue using arrays and Linked Lists
4. Illustrate the importance of recursion

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20AIO01 Machine Learning for Engineers

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20AIO01.1	Describe different types of learnings		L1, L2
20AIO01.2	Explain different supervised learning algorithms		L1, L2
20AIO01.3	Explain different unsupervised learning algorithms	-	L1, L2
20AIO01.4	Describe various types of machine learning models		L1, L2
20AIO01.5	Choose appropriate machine learning model and algorithm for given task		L1, L2

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to learning **9 hours**

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron – Design a Learning System – Perspectives and Issues in Machine Learning – Concept Learning Task – Concept Learning as Search – Finding a Maximally Specific Hypothesis – Version Spaces and the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – Linear Separability – Linear Regression

Examples of regression

Unit II: Linear Models **9 hours**

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation – Radial Basis Functions and Splines – Concepts – RBF Network – Curse of Dimensionality – Interpolations and Basis Functions – Support Vector Machines

Applications of perceptron

Unit III: Trees and Probabilistic Models **9 hours**

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification and Regression Trees – Ensemble Learning – Boosting – Bagging – Different ways to Combine Classifiers – Probability and Learning – Data into Probabilities – Basic Statistics – Gaussian Mixture Models – Nearest Neighbour Methods – Unsupervised Learning – K means Algorithms – Vector Quantization

Self-Organizing Feature Map

Unit IV: Dimensionality Reduction and Evolutionary Models **9 hours**

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – Factor Analysis – Independent Component Analysis – Locally Linear Embedding – Isomap – Least Squares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - Genetic Operators – Using Genetic Algorithms

Markov decision process

Unit V: Graphical Models **9 hours**

Markov Chain Monte Carlo Methods – Sampling – Proposal Distribution – Markov Chain Monte Carlo – Graphical Models – Bayesian Networks – Markov Random Fields – Hidden Markov Models

Tracking Methods

Text Books

1. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2nd Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014.
2. Tom M Mitchell, "Machine Learning", 1st Edition, McGraw Hill Education, 2013

Reference Books

1. Peter Flach, "Machine Learning: The Art and Science of Algorithms that Make Sense of Data", 1st Edition, Cambridge University Press, 2012.
2. Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", 1st Edition, Wiley, 2014

Head of the Department
Dept. of Civil Engineering
M.S. Ramaiah Institute of Technology(A)

3. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning Series)", 3rd Edition, MIT Press, 2014

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Machine Learning.
2. List the types of Machine Learning.
3. State Bayes Theorem.
4. What is Regularization?

L2: Understand

1. Demonstrate Linear Regression.
2. Explain Back Propagation Algorithm.
3. Illustrate Decision Tree Induction process
4. Explain Genetic Operations with examples

Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE- AIML)

OE Introduction to Database Management Systems

3 0 0 3.0

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with Pos	DoK
20DSO01.1	Describe the basic concepts of DBMS And different data models	-	L1,L2
20DSO01.2	Apply Constrains on relations		L2,L2,L3
20DSO01.3	Apply SQL commands on relations		L1,L3
20DSO01.4	Understand PL/SQL operations		L1,L2,L3
20DSO01.5	Understand the principles of database normalization and Transaction management system.		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create DoK: Depth of Knowledge

Unit I: Introduction to Databases **9 Hours**

Overview of Data Base Systems, Database System Applications, File System VS Database System, Data Abstraction, Levels of Abstraction, Data Independence Instances and Schemas, Different Data Models, Database Languages, Data Base Users and Administrator, Database System Structure, N-tier Architecture, Database design and ER diagrams, Design Entities, Attributes and Entity sets, Relationships and Relationship Sets, Advanced Features of ER Model

History of DBMS

Unit II: Relational Model, Relational Algebra and Relational calculus **9 Hours**

Relational Model: Introduction to the Relational Model, Integrity Constraint and key constraints over relations, Logical data base Design, Views, Destroying / Altering Tables and Views - Relational Algebra: Selection and Projection, Set Operations, Aggregate Operations, Renaming, Joins,
Division, Additional Relational Algebraic operations - Relational calculus: Tuple Relational Calculus, Domain Relational Calculus

Expressive Power of Algebra and Calculus

Unit III: Structured Query Language **9 Hours**

SQL: Concept of different Database Languages over SQL - DDL, DML, DCL., Set operations, SQL Commands, Nested queries, Aggregate Functions, Null Value, Referential Integrity Constraints, views.

Compare all Database Languages

Unit IV: Schema Refinement and Normalization **9 Hours**

Understand PL/SQL block, components of PL/SQL block, Control statements and conditional statements in PL/SQL Embedded SQL, Triggers, Cursors, Stored procedures packages

Compare all Normal Forms

Unit V: Normalization **9 Hours**

Understand the principles for Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure Set of
Functional Dependencies, Closure Set of Attributes. - Normalization: 1NF, 2NF, 3NF, BCNF, Lossless Join and Dependency Preserving decomposition,
4NF and 5N. Transaction Concept, ACID Properties, States of Transaction, Implementation of Atomicity & Durability, Schedules,

Concurrency Control without Locking

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books

1. Abraham Silber Schatz, Henry F Korth, S Sudarshan, "Database System Concepts", 6th Edition, McGraw-Hill International Edition, 2013
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", 8th Edition, PearsonEducation, 2006
3. Raghurama Krishnan, Johannes Gehrke, "Data base Management Systems", 3rd Edition, TATA McGraw Hill, 2008

Reference Books

1. Elmasri Navrate, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2016
2. Peter Rob & Carlos Coronel, "Data base Systems design, Implementation, and Management", 10th Edition, Pearson Education, 2013

Web References

1. https://www.javatpoint.com/dbms-tutorial
2. https://www.geeksforgeeks.org/introduction-of-dbms-database-management-system-set-1/?ref=lbp

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	30	40
L3	40	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. List types of database users
2. List out all types of data models present
3. Give syntaxes to Create and Alter a table
4. What is Redundancy?
5. List out the properties of transactions

L2: Understand

1. Compare the database system with conventional file system
2. Demonstrate the use of DISTINCT keyword in SQL select statement
3. Explain the following SQL constructs with examples:

(1) Order by (2) group by and having (3) as select (4) schema

4. Explain the difference among Entity, Entity Type & Entity Set
5. Illustrate ACID properties

L3: Apply

1. Choose a relation R with 5 attributes ABCDE and the following FDs: A ->B, BC->E, and ED ->A. Is R in 3NF? Justify?
2. Apply Normalization technique for the following relation up to 3NF:

Bank (acno, cust_name, ac_type, bal, int_rate, cust_city, branchId, branch_nm, br_city)

3. Construct a transaction state diagram and describe each state that a transaction goes through during its execution?
4. Demonstrate serializability concept

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE - DS)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20ECO01 Architectures and Algorithms of IoT

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20ECO01.1	Demonstrate the Architecture and applications of IoT		L1, L2
20ECO01.2	Explain the protocol concept and data bases of IoT		L1, L2, L3
20ECO01.3	Construct the IoT device design space and Platform design		L1, L2, L3
20ECO01.4	Explain the IoT network model and Event analysis		L1, L2, L3
20ECO01.5	Demonstrate the Industrial Internet of Things and its Architecture		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: The IoT Landscape **12 Hours**

What Is IoT?, Applications , Architectures , Wireless Networks, Devices, Security and Privacy , Event-Driven Systems.

Ethernet

Unit II: IoT System Architectures **10 Hours**

Introduction, Protocols Concepts, IoT-Oriented Protocols, Databases, Time Bases, Security.

Message Queuing Telemetritransport (MQTT)

Unit III: IoT Devices **12 Hours**

The IoT Device Design Space, Cost of Ownership and Power Consumption, Cost per Transistor and Chip Size, Duty Cycle and Power Consumption.

Platform Design

Unit IV: Event-Driven System Analysis **14 Hours**

IoT Network Model - Events, Networks, Devices and Hubs, Single-Hub Networks, Multi-hub Networks, Network Models and Physical Networks, IoT Event Analysis - Event Populations, Stochastic Event Populations, Environmental Interaction Modeling.

Event Transport and Migration

Unit V: Industrial Internet of Things **12 Hours**

Introduction, Industrie 4.0, Industrial Internet of Things (IIoT), IioT Architecture, Basic Technologies, Applications and Challenges.

Integrated IIoT

Textbooks

1. Dimitrios Serpanos and Marilyn Wolf, "Internet-of-Things (IoT) Systems Architectures, Algorithms, Methodologies", Springer, Cham, 2018
2. Vijay Madisetti and Arshdeep Bahga, " Internet of Things (A Hands-on Approach)", Universities Press, 2015

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", John Wiley and Sons Ltd, UK, 2014
2. Olivier Hersent, David Boswarthick and Omar Elloumi, "The Internet of Things: Key Applications and Protocols", John Wiley and Sons Ltd., UK, 2012

Web Resources

1. https://books.google.co.in/books?isbn=1119969093
2. https://books.google.co.in/books?isbn=135123093X

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	35	35
L3	35	35
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is IoT?
2. List any three applications of IoT
3. Define protocol concept of IoT
4. Define data base
5. What is Duty cycle?

L2: Understand

1. Explain the Architecture of IoT
2. Explain the Security and privacy of IoT
3. Illustrate the Protocol Concept of IoT
4. Explain the Date bases of IoT
5. Demonstrate the IoT Device Design Space

L3: Apply

1. Identify the Wireless Networks for IoT
2. Model the Event-Driven Systems for IoT
3. Construct the IoT-Oriented Protocols
4. Construct the Platform Design for IoT

CONTROL COPY ATTESTED

Chairman
Board of Studies (ECE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20EEO01 Introduction to Renewable Energy Sources

3 0 0 3.0

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with PO's PO1	PO7	DoK
20EEO01.1	Understand the significance of solar energy	2	2	L1, L2
20EEO01.2	Provide the importance of Wind Energy	2	2	L1, L2
20EEO01.3	Understand the role of ocean energy in the Energy Generation	3	2	L1, L2
20EEO01.4	Explain the utilization of Biogas plants and geothermal energy	2	2	L1, L2
20EEO01.5	Explain the concept of energy Conservation	2	2	L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Unit I: Solar Energy — 12 Hours

Solar Radiation, Measurements of Solar Radiation, Flat Plate And Concentrating Collectors, Solar Direct Thermal Applications, Solar Thermal Power Generation, Fundamentals of Solar , Photo Voltaic Conversion, PV Characteristics Solar Cells, Solar PV Power Generation, Solar PV Applications.

Thermal analysis of flat plate collectors

Unit II: Wind Energy — 12 Hours

Wind Energy Estimation, Types of Wind Energy Systems, Performance, Site Selection, Wind Turbine Generator

Betz Criteria

Unit III: Ocean Energy — 12 Hours

Ocean Thermal Energy Conversion (OTEC), Principle of operation, development of OTEC plants, Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants

Open and closed OTEC Cycle

Unit IV: Bio Mass — 12 Hours

Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gasdigesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.

I.C Engine Operation

Unit V: Geo Thermal Energy and Energy Conservation — 12 Hours

Resources, types of wells, methods of harnessing the energy, scope in India. Principles of energy conservation, the different energy conservation appliances, cooking stoves, Benefits of improved cooking stoves over the traditional cooking stoves

Hydro Thermal, Geo-pressured, Hot dry rocks

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books

1. R K Gupta and S C Bhatia "Renewable Energy" Woodhead publishing India Pvt. Ltd.,2019
2. Gilbert M. Masters, "Renewable and Efficient Electric Power Systems", Second Edition, IEEE Press, Wiley, 2013
3. Ranjan Rakesh, Kothari D. P.& Singal K. C., "Renewable Energy Sources And Emerging Technologies", 2 nd Edition, PHI, 2013
4. Mukund R. Patel, "Wind and Solar Power Systems – Design, Analysis and Operation", 2nd Edition, Taylor & Francis, 2006

Reference Books

1. S Sukhatme, J Nayak, "Solar Energy: Principles of Thermal Collection and Storage", 3rd Edition, Tata Mcgraw Hill , 2003.
2. Tiwari and Ghosal, "Renewable energy resources", 2nd edition, Narosa Publishing house, 2001
3. B H Khan, "Non conventional energy resources", 2 nd Edition, Tata Mcgraw Hill, 2001

Web References

1. https://nptel.ac.in/courses/121/106/121106014/
2. https://www.edx.org/learn/renewable-energy
3. https://www.coursera.org/learn/renewable-energy-resources-and-technologies

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	30
L2	60	70
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is meant by Solar Thermal Energy?
2. Give the classification of small hydro power stations.
3. What are the various losses occurring in the fuel cell?
4. List various Biomass resources.
5. What is the basic principle of Tidal Power?

L2: Understand

1. Explain in detail about flat plate collectors and give its advantage and disadvantages.
2. Explain the principle of working of a H2 - O2 fuel cell.
3. Explain about Dry, Wet and Hot water Geo thermal systems.
4. Compare between Geo thermal power plant and Conventional thermal power plant.
5. Explain about the site requirements to construct a Tidal Power Plant.

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

Head of the Department
Dept. of Civil Engineering
M.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20MEO01 Nano Technology

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	DoK
20MEO01.1	*Describe* the fundamental science of nanomaterials	L2
20MEO01.2	Demonstrate the preparation of nanomaterials	L1,L2
20MEO01.3	Explain of the challenges on safe nanotechnology	L1,L2
20MEO01.4	Develop knowledge in characteristic nanomaterial	L1,L2,L3
20MEO01.5	Apply Nanoscience for industrial applications	L1,L2,L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction — 11+1 Hours

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties.

Introduction to properties and motivation for study (qualitative only)

Unit II: General Methods Of Preparation — 11+1 Hours

Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation.

Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE

Unit III: Nano materials — 11+1 Hours

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays-functionalization and applications-Quantum wires.

Quantum dots-preparation, properties and applications

Unit IV: Characterization Techniques — 11+1 Hours

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA.

SIMS-Nano-indentation

Unit V: Applications — 11+1 Hours

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition.

Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery

TEXT BOOKS:

1. Edelstein A.S and Cammearata R.C, Eds., "Nanomaterials: Synthesis, Properties And Applications", Institute Of Physics Publishing, Bristol And Philadelphia, 1996.
2. John Dinardo N, "Nanoscale Characterization Of Surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000
3. Murthy B.S and Shankar P, " Nanoscience and NanoTechnology" , 1st Edition, Springer Publications,2013
4. Louis Hornyak and Tibbals H F, " Introduction to Nanoscience and NanoTechnology" , 1stEdition,Tailor Francis CRC Press,2008

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

REFERENCE BOOKS:

1. Timp G, "Nanotechnology", AIP press/Springer, 1999.
2. Akhlesh Lakhtakia, "The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations". Prentice-Hall of India (P) Ltd, New Delhi, 2007.

Web references:

1.http://www.nano.gov
2.http://mrsec.wisc.edu/edetc/IPSE/links.html
3.http://nptel.ac.in/courses/112105182/9
4.IOPSCIENCE—Nanotechnology

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	60	20
L2	40	40
L3	-	40
L4	-	-
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1.What is Nano technology?
2.How does Nano Technology Works?
3.What are Nano Materials?
4.Who is Developing Nano technology?

L 2: Understand

1. What Are Some Of The Most Interesting Nanoparticles Found In Nature (Not Manufactured In The Lab)?
2. Given The Nano-Size Of The Particles, Are There Any Effective Respirator Filters To Guard Against Inhalation?
3. What Do You Feel The Repercussions Are For Extended Life Through Utilization Of Nanotechnology?
4. What Is The Risk Of Not Developing Nanotech (In Health Care, Environmental Protection, Economic Development)?

L 3: Applying

1.How are safety tests carried out in nano tech?
2. Seems that (nano)tech is moving fast. Is there a risk that results of safety testing will be out-of-date as soon as printed? How to keep up pace?
3. Discuss about targeted drug delivery using nanoparticles.

CONTROLCOPYATTESTED

Chairman
Board of Studies (ME)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20SHO01 Women and Society

3 0 0 3

Code	Course Outcomes	Mapping with POs	DoK
20SHO01.1	This course aims to generate awareness on various factors that constructs and shapes gender identity and perpetuates gender discrimination.		L1,L2
20SHO01.2	This course aims to generate awareness on various factors that constructs and shapes gender identity and perpetuates gender discrimination.		L1,L2
20SHO01.3	The course will examine how feminist analysis & methodology redefines traditional categories and disciplinary concepts through its attention to gender as a social category		L1,L2
20SHO01.4	The course further aims to sensitize students on emerging areas of gender discrimination and its possible resolution		L1,L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Objectives:

This course aims to generate awareness on various factors that constructs and shapes gender identityand perpetuates gender discrimination.

UNIT -I WOMEN AND SOCIETY **9 Hours**

Understanding Sex- Gender, Gender shaping Institutions, Theories of Gender construction Understanding Sexism and Androcentrism, Understanding Patriarchy and Theories of Patriarchy, Privateand Publicdichotomy, Sexual Division of Work, Patriarchy practices in different institutions and Text Books.

UNIT -II FEMINIST THEORY **9 Hours**

Rise of Feminism, Introduction to various stands of Feminism- Liberal Feminism, Radical Feminism, Marxist Feminism, Socialist Feminism, Cultural Feminism, Eco-Feminism, Post-Colonial Feminism, and Post Modern Feminism. Waves of Feminism.

UNIT -III WOMEN'S MOVEMENT **9 Hours**

The socio-economic conditions of women during the age of Industrial revolution the Call for Women's Rights 1848, Women's rights movement 1848-1920, Historical Developments of Social Reform Movements in India, Women's groups and organizations, Women's Movement Movements for UniformCivil code and ShahBano case, Dalit women and the question of double marginality.

UNIT -IV GENDER ROLES AND PSYCHOLOGY OF SEX **9 Hours**

Difference Conceptualization of gender roles and gender role attitudes, Gender: Aggression, Achievement, Communication, Friendship and Romantic, Relationships Sex Differences in Mental Health Trauma relating to Rape, Taboo, Childhood Sexual Abuse, Domestic Violence, Sexual Harassment at Work Place, Educational Institutions, Eve Teasing etc.

UNIT – V GENDER AND REPRESENTATION **9 Hours**

Gender and Mass Media- Print Media, Gender and Mass Media-Electronic Media, Gender and Films, Advertisements, Mega Serials, Stereotyping and breaking the norms of women's roles Women's Representation in Literary Texts.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Suggested reading:

1. Basabi Chakrabarti, Women's Studies: Various Aspects. Urbi Prakashani, 2014
2. Arvind Narrain.Queer:Despised Sexuality Lawand Social Change.Book for Change.2005
3. Chandra Talpade Mohanty, Feminism without Borders:DecolonizingTheory, Practicing Solidarity. Duke University Press.
4. Flavia Agnes.Lawand Gender Inequality:The Politics of Women's Rights in India.Oxford University Press,2001
5. Sonia Bathla, Women, Democracy and the Media: Cultural and Political Representations in the Indian Press,Sage,NewDelhi,1998.

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE (S&H)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20CEO02 Ecology, Environment and Resource Management 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO6	PO7	PO12	
20CEO02.1	Discuss the role that humans play in affecting the characteristics of the environment	3	3	1	L1, L2
20CEO02.2	Understand the interrelationships between land, sea, the atmosphere and the living things that occupy these environments	3	3	1	L1, L2
20CEO02.3	Distinguish between economic growth and economic development and outline the nature of a sustainable economy	3	3	1	L1, L2
20CEO02.4	Identify the environmental attributes to be considered for the EIA study	3	3	1	L1, L2
20CEO02.5	Develop a thorough understanding of Environmental Policies and legislations practiced in India	3	3	1	L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2. Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction — 9 Hours

Meaning, scope and evolution of ecology. Man, environment and ecosystem. Components of nature, Structue and Function, Flow of material, Ecological Succession, Trophic levels, Food chain, Food web, Ecological pyramids.

Adaptation, Environmental Zones

Unit II: Ecosystem and its relevance to Environment — 9 Hours

Resources and human settlements impact of advanced agricultural methods, Impact of urbanization and industrialization on nature. Urban ecosystem approach evolution and significance. Settlement planning.

Energy Conservation

Unit III: Resource Management and Sustainable Development — 9 Hours

Sustainable Development, Fundamentals concerning Environment and Sustainable Development, Economy, Poverty, Human Settlement Issues, Land Resources, Forests, Mountains, Agriculture, Biodiversity, Protection of Oceans, Industry and Business.

Planning for environmentally sensitive areas

Unit IV: Environmental Impact Assessment — 12 Hours

Meaning, Significance and framework. Methodologies, Checklist, Matrices, Network and social cost-benefit analysis. Sources and acquisition of environmental information. Environment impact studies of development projects.

EIA Case Studies

Unit V: Environmental Policies and Legislations in India — 9 Hours

Major environment policies and legislations in India - The Ministry of Environment & Forests, The Central Pollution Control Board. Policies to protect environment in India – Environment Protection Act, 1986, National Conservation Strategy and Policy Statement on Environment and Development, 1992, Policy Statement for the abatement of Pollution, 1992, National Environment Policy, 2006, Vision Statement on Environment and Health. Legislations and Rules for the protection of Environment in India.

Five year plans in relation to environmental aspects

Text Books

1. Erach Bharucha, "Textbook of Environmental Studies for Undergraduate Courses", 3rd Edition, University Grants Commission, 2021
2. Walter E. Westman, "Ecology, Impact Assessment and Environmental Planning", John Wiley & Sons, 1985
3. Chadwick A., "Introduction to Environmental Impact Assessment", Taylor & Francis, 2007

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Charles H. Southwick D., "Ecology and the Quality of Our Environment", Van No strand Co New York, 1976
2. Barthwal, R.R., "Environmental Impact Assessment", New Age International, New Delhi, 2002

Web References

1. http://iced.cag.gov.in/?page_id=256
2. http://econdse.org/wp-content/uploads/2016/07/chapter-1-gupta.pdf
3. https://www.researchgate.net/publication/341521590_Chapter_5_Environmental_Policy_in_India
4. https://www.preventionweb.net/files/15417_nationalenvironmentpolicyandstrateg.pdf

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is Ecology?
2. List any three ways in which humans directly influence environmental conditions
3. What is the goal of sustainable development?
4. List the three sequential phases of EIA
5. Enlist any four principles of National Environmental Policy of India

L2: Understand

1. Explain the key principles of the ecosystem approach to conserving natural resources
2. Explain the impact of urbanization on nature
3. How does sustainable development make economic sense for society?
4. Discuss the importance of EIA activities for developing countries
5. Discuss the objectives and founding principles of India's National Environmental Policy

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20CSO02 Designing the Internet of Things

3 0 0 3.0

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CSO02.1	Illustrate the IoT in different contexts	-	L1, L2
20CSO02.2	Outline the Design Principles for Connected Devices	-	L1, L2
20CSO02.3	Explain the Internet Principles & Application Layer Protocols	-	L1, L2
20CSO02.4	Apply the Prototyping concepts in IoT	-	L1, L2
20CSO02.5	Analyse the Prototyping Embedded Devices	-	L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Overview of Internet of Things **9 hours**

The flavour of the Internet of Things, The "Internet" of "Things", Technology of IoT, Enhanced Objects, Who is making the Internet of things.

Applications of IoT

Unit II: : Design Principles for Connected Devices **9 hours**

Calm & Ambient Technology, Magic as Metaphor, Privacy: Keeping secrets, Web Thinking for Connected Devices

Examples of Connected Devices

Unit III: : Internet Principles **9 hours**

Internet Communications-IP,TCP, The IP protocol suite(TCP/IP), UDP, IP Addresses-DNS, static IP Address assignment, Dynamic IP Address assignment, IPV6, MAC Addresses, TCP & UDP Ports, Application Layer Protocols

HTTPS: Encrypted HTTP

Unit IV: Thinking About Prototyping **9 hours**

Sketching, Familiarity, Costs versus Ease of prototyping, Prototypes & Production, Open Source versus Closed Source

Embedded Platforms

Unit V: Prototyping Embedded Devices **9 hours**

Electronics, Embedded Computing Basics, Arduino, Raspberry Pi, BeagleBone Black, Electric Imp

Aurdino Components

Textbooks

1. Adrian, McEwen & Hakim Casimally, "Designing The Internet of Things", John Wiley and Sons, 2014
2. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things: Key Applications and Protocols", Wiley, 2019

Reference Books

1. Rajkumar Buyya, Amir Vahid Dastjerdi, "Internet of Things Principles and Paradigms", Morgan Kaufmann,2016
2. Rajesh Singh, Anita Gehlot, Lovi Raj Gupta, Bhupendra Singh, Mahendra Swain, "Internet Of things With Raspberry Pi And Arduino", CRC Press/Taylor & Francis Group, 2019

Web Resources

1. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/
2. https://tutorialspoint.dev/computer-science/computer-network-tutorials/the-new-internet-internet-of-everything
3. https://www.javatpoint.com/iot-internet-of-things

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	30	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define IoT
2. What are the Enhanced objects for IoT?
3. What is a Prototype?
4. Define Sketching
5. Define DNS

L2: Understand

1. Explain the following terms related to Protocols: UDP, TCP
2. Discuss in detail about MAC Addresses
3. Define Prototyping? Describe the Embedded Computing Basics
4. Explain Application Layer Protocols
5. Discuss the Costs versus Ease of prototyping

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE **20AIO02 Fundamentals of Deep Learning** 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20AIO02.1	Describe the fundamental concept of artificial neural networks		L1, L2
20AIO02.2	Describe the function of different deep neural networks		L1, L2
20AIO02.3	Explain different deep learning algorithms	-	L1, L2
20AIO02.4	Describe the functioning of convolution and recurrent neural networks		L1, L2
20AIO02.5	Choose appropriate deep neural network for given application		L1, L2

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit 1: Introduction to Deep Learning **9 hours**

Basics: Biological Neuron, Idea of computational units, McCulloch–Pitts unit and Thresholding logic, Linear Perceptron, Perceptron Learning Algorithm, Linear separability. Convergence theorem for Perceptron Learning Algorithm.

Logic gates with perceptron

Unit 2: Feedforward Networks **9 hours**

Feedforward Networks: Multilayer Perceptron, Gradient Descent, Backpropagation, Empirical Risk Minimization – Regularization, autoencoders

Applications of multilayer perceptron

Unit 3: Convolution Networks **9 hours**

Convolutional Networks: The Convolution Operation - Variants of the Basic Convolution Function - Structured Outputs – Data Types - Efficient Convolution Algorithms - Random or Unsupervised Features- LeNet, AlexNet

Applications of CNN

Unit 4: Recurrent Neural Networks **9 hours**

Recurrent Neural Networks: Bidirectional RNNs - Deep Recurrent Networks Recursive Neural Networks –The Long Short-Term Memory

Applications of RNN

Unit 5: Applications of Deep Neural Networks **9 hours**

Applications: Large-Scale Deep Learning - Computer - Speech Recognition - Natural Language Processing

Healthcare applications

Text Books

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, UK, 2017
2. Antonio Gulli and Sujit Pal, "Deep Learning with Keras ", Packt Publishing Ltd, Birmingham, UK, 2017

Reference Books

1. Deng & Yu, "Deep Learning: Methods and Applications", Now Publishers, 2013.
2. Michael Nielsen, Neural Networks and Deep Learning, Determination Press, 2015.

Web References

1. https://www.coursera.org/specializations/deep-learning

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. List any 4 benefits of artificial neural networks
2. List any 4 features of ANN
3. What are deep neural networks?
4. Define supervised and unsupervised learning
5. Define generalization

L2: Understand

1. Explain the design parameters of deep neural networks
2. Describe the dimensionality reduction techniques
3. Explain backpropagation algorithm
4. Describe any 2 applications of deep networks for image processing
5. Write about any 5 applications of deep networks

CONTROL COPY ATTESTED
Chairman
Board of Studies (CSE- AI & ML)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

OE 20DSO02 Introduction to Data Science

3 0 0 3.0

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20DSO02.1	Understand Fundamentals of Data Science Terminology.		L1, L2
20DSO02.2	Demonstrate different computing tools involved in data handling.		L1, L2
20DSO02.3	Understand Knime Tool.	-	L1, L2
20DSO02.4	Understand Machine Learning Concepts		L1, L2
20DSO02.5	Apply domain expertise to solve real world problems using data science		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Data Science **9 Hours**

Analysing the Pieces of the Data Science Puzzle, Exploring the Data Science Solution Alternatives, Defining Big Data by the Three Vs, Grasping the Difference between Data Science and Data Engineering, Making Sense of Data in Hadoop, Identifying Alternative Big Data Solutions, Converting Raw Data into Actionable Insights with Data Analytics, Distinguishing between Business Intelligence and Data Science, Defining Business-Centric Data Science

Identifying Data Science Users; Data Engineering in Action: A Case Study

Unit II: Computing for Data Science - 1 **9 Hours**

Using Python for Data Science, Using Open Source R for Data Science.

Sorting Out the Python Data Types; R's Basic Vocabulary

Unit III: Computing for Data Science - 2 **9 Hours**

Using SQL in Data Science, Doing Data Science with Excel and Knime

Basic SQL Commands; Knime Basics

Unit IV Machine Learning, Probability and Statistical Modelling **9 Hours**

Defining Machine Learning and Its Processes, Considering Learning Styles, Seeing What You Can Do, Exploring Probability and Inferential Statistic, Quantifying Correlation, Reducing Data Dimensionality with Linear Algebra, Modeling Decisions with Multi-Criteria Decision Making, Introducing Regression Methods

Linear Regression

Unit V Applying Domain Expertise to Solve Real-World Problems Using Data Science **9 Hours**

Data Science in Journalism,Delving into Environmental Data Science, Data Science for Driving Growth in E-Commerce, Using Data Science to Describe and Predict Criminal Activity

Applying statistical modeling to natural resources in the raw; Deploying web analytics to drive growthh

Text Books

1. Lillian Pierson and Jake Porway,"Data Science For Dummies", 2nd Edition,For Dummies, 2017

Reference Books

1. Joel Grus, "Data Science from Scratch", 2nd Edition, O'Reilly Media, 2015
2. Chirag Shah, "A Hands-On Introduction to Data Science", Cambridge University Press, 2020

Web Resources

1. https://www.simplilearn.com/tutorials/data-science-tutorial/
2. https://www.w3schools.com/datascience/

Head of the Department
Dept. of CSE (DS) Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is data science? Identify three areas or domains in which data science is being used
2. Give three examples of structured data formats
3. Name three measures of centrality and describe how they differ
4. What is supervised learning? Give two examples of data problems where you would use Supervised learning

L2: Understand

1. How do data analysis and data analytics differ?
2. Relate likelihood of a model given data, and probability of data given a model. Are these two the same? Different? How?

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE-DS)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20ECO02 IoT for Smart Grids

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20ECO02.1	Demonstrate the Smart Grid concept ,Need for smart grid		L1, L2
20ECO02.2	Explain the Energy Management System functions		L1, L2, L3
20ECO02.3	Describe how modern power distribution system functions		L1, L2
20ECO02.4	Explain the Advanced metering infrastructure and AMI protocols		L1, L2, L3
20ECO02.5	Identify suitable communication networks for Smart Grid applications		L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Smart Grid **12 Hours**

Introduction - Evolution of Electric Grid, Smart Grid Concept - Definitions and Need for Smart Grid – Functions – Opportunities – Benefits and challenges, Difference between conventional & Smart Grid.

Technology Drivers

Unit II: Energy Management System **12 Hours**

Energy Management System (EMS) - Smart substations - Substation Automation – Feeder Automation, SCADA – Remote Terminal Unit – Intelligent Electronic Devices – Protocols, Phasor Measurement Unit – Wide area monitoring protection and control, Smart integration of energy resources – Renewable, intermittent power sources.

Energy Storage

Unit III: Distribution Management System **12 Hours**

Distribution Management System (DMS) – Volt / VAR control – Fault Detection, Isolation and Service Restoration, Outage management System, Customer Information System, Geographical Information System, Effect of Plug in Hybrid Electric Vehicles.

Network Reconfiguration

Unit IV: Smart Meters **12 Hours**

Introduction to Smart Meters – Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives, Demand side management and demand response programs, Demand pricing and Time of Use, Real Time Pricing.

Peak Time Pricing

Unit V: Communication Networks & IoT **12 Hours**

Elements of communication and networking – architectures, standards, PLC, Zigbee, GSM, BPL, Local Area Network (LAN) - House Area Network (HAN) - Wide Area Network (WAN) – Broadband over Power line (BPL) - IP based Protocols - Basics of Web Service and CLOUD Computing.

Cyber Security for Smart Grid

Textbooks

1. Stuart Borlase, "Smart Grid: Infrastructure, Technology and Solutions", CRC Press, 2012
2. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu and Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley, 2012

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Mini S. Thomas and John D McDonald, "Power System SCADA and Smart Grids", CRC Press, 2015
2. Kenneth C. Budka, Jayant G. Deshpande and Marina Thottan, "Communication Networks for Smart Grids", Springer, 2014

Web Resources

1. https://books.google.co.in/books?isbn=1119969093
2. https://books.google.co.in/books?isbn=135123093X

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	30
L2	35	35
L3	35	35
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define a Smart grid
2. List any three Benefits of Smart grid
3. What is SCADA?
4. List any three Intelligent Electronic Devices
5. Define a Fault Detection

L2: Understand

1. Explain the need of Smart Grid
2. Demonstrate the Smart Grid Concept
3. Explain the Energy Management System (EMS)
4. Classify and explain the Smart integration of energy resources
5. Illustrate Effect of Plug in Hybrid Electric Vehicles

L3: Apply

1. Identify the Outage management System
2. How to utilize the Distribution Management System (DMS)? explain

CONTROL COPY ATTESTED

Chairman
Board of Studies (ECE)

Head of the Department
Dept. of Civil Engineering
M.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20EEO02 Electrical Safety and Management 3 0 0 3.0

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with PO's	DoK
20EEO02.1	Understand the Indian electricity rules and their significance		L1, L2
20EEO02.2	Explain the safety standard in residential, commercial, and agricultural		L1, L2
20EEO02.3	Learn about electrical safety installation, testing and commission		L1, L2
20EEO02.4	Understand about electrical safety in distribution system		L1, L2
20EEO02.5	Explain flash-overs and corona discharge		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Unit I: Indian Electricity Regulations and Acts and their Significance 12 Hours

Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage – earthing of system neutral – Rules regarding first aid and fire fighting facility.

The Electricity Act2003 (Part 1,2,3,4 & 5) and Control Authority Safety Regulations

Unit II: Electrical Safety in Residential, Commercial and Agriculture Installations 12 Hours

Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

System grounding and Equipment grounding

Unit III: Safety During Installation, Testing and Commissioning, Operation and Maintenance 12 Hours

Preliminary preparations – safe sequence – risk of plant and equipment –safety documentation – field quality and safety - personal protective equipment – safety clearance notice – safety precautions – safeguards for operators – safety

Magnetic Hot sticks, protective clothing and industrial clothing

Unit IV: Electrical Safety in Hazardous Areas 12 Hours

Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours.

Hazards associated with currents and voltages

Unit V: Electrical Safety Shocks and their Prevention 12 Hours

Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

Objectives of Safety and Security Measures

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books

1. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988.
2. Pradeep Chaturvedi, "Energy Management Policy, Planning and Utilization", Concept Publishing Company, 1997
3. John M Madden, "Electrical Safety and Law, Planning and Utilization", 5th Edition, Routledge, 2017

Reference Books

1. Nagrath, I.J. and Kothari, D.P., "Power System Engineering", Tata McGraw Hill, 1998.
2. Martha J Boss and Gayle Nicoll, "Electrical Safety", 1st Edition, CRC Press, 2014
3. Gupta, B.R., "Electrical Safety", 1st Edition, American Technical Publishers, 2018

Web References

1. https://nptel.ac.in/courses/108/104/108104087/
2. https://ocw.mit.edu/courses/physics/8-311-electromagnetic-theory-spring-2004/syllabus/
3. https://www.edx.org/course/electricity-and-magnetism-maxwells-equations

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	40
L2	70	60
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Give the classification of electrical installations.
2. State the disadvantages of low power factor.
3. What is safety documentation system?
4. State preliminary preparations before commencing the installation.

L2: Understand

1. Write the objectives and scope of Indian Electricity Act and Indian Electricity Rule.
2. Explain the importance of earthing system neutral.
3. Write a note on Do's and Don't for safety in the use of domestic electrical appliances.
4. Explain the classification of equipment/enclosure for hazardous locations.

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20MEO02 Fundamentals of Automobile Engineering 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	DoK
20ME302.1	Introduction to fundamentals of automobiles, lubrication, Tires and safety.	L1, L2
20ME302.2	Classify and identify the steering system	L2, L3
20ME302.3	Classify and identify the Transmission system	L2, L3
20ME302.4	Define and compare the suspension, breaking and electrical system.	L2,L4
20ME302.5	Identify and Interpret the specifications and safety precautions..	L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge

Unit I: Introduction **11+1 Hours**

Componentsoffourwheelerautomobile–chassisandbody–powerunit–typesofautomobileengines,engineconstruction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps–crank case ventilation–. Types – wheels and tyres. Safety Introduction, safety systems-seat belt, airbags, bumper, anti lock brake system (ABS), windshield, suspension sensors, traction control, mirrors, central locking and electric.

windows, speed control.

Unit II: TRANSMISSION SYSTEM **11+1 Hours**

Power transmission–rear wheel drive, front wheeldrive,4wheeldrive Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchromesh gear boxes, epicyclic gear box, over drive torque converter. propeller shaft – Hotch – Kiss drive.

Torque tube drive, universal joint, differential rear axles.

Unit III: STEERING SYSTEM **11+1 Hours**

Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism ,steering gears, –types

Steering linkages.

Unit IV: SUSPENSION, BREAKING AND ELECTRICAL SYSTEM **11+1 Hours**

SUSPENSION SYSTEM: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system. BRAKING SYSTEM: Mechanical brake system, hydraulic brake system, master cylinder, wheel cylindertandemmaster cylinder requirement of brake fluid

ELECTRICAL SYSTEM: Charging circuit, generator, current – voltage regulator – starting system, bendixdrivemechanismsolenoidswitch,lightingsystems,horn,wiper,fuelgauge–oilpressuregauge,enginetemperatureindicatoretc.

Pneumatic and vacuum brakes.

Unit V: ENGINESPECIFICATION AND MAINTENANCE **11+1 Hours**

Introduction-engine specifications with regard to power, speed, torque, no.of cylinders and arrangement, lubrication and cooling etc. engine service, reboring, decarburization ,Nitriding of crankshaft. service details of engine cylinder head, valves and valve mechanism, piston-connecting rod assembly, cylinder block, crank shaft and main bearings, engine reassembly-precautions. Types of pollutants, mechanism of formation, concentration measurement, methods of controlling-enginemodification,exhaustgastreatment-thermalandcatalyticconverters-useof alternative fuels for emission control

National and International pollution standards .

Head of the Department
Dept. of Auto Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books

1. Automotive Mechanics–Vol.1&Vol.2/KirpalSingh/standardpublishers
2. Automobile Engineering/WilliamCrouse/TMHDistributors
3. Automobile Engineering/P.SGill/S.K.Kataria&Sons/NewDelhi.
4. Automobile Engineering/CSrinivasan/McGrawHill

Reference Books

1. AutomotiveEnginesTheoryandServicing/JamesD.HaldermanandChaseD.MitchellJr.,/Pearsoneducationinc.
2. AutomotiveEngineering/KNewton,W.Steeds&TKGarrett/SAE
3. AutomotiveMechanics: PrinciplesandPractices/ JosephHeitner/VanNostrandReinhold

Web References

1. https://nptel.ac.in/noc

Internal Assessment Pattern

Cognitive Level	Internal Assessment#1(%)	Internal Assessment#2(%)
L2	40	30
L3	40	30
L4	20	40
Total(%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What are the differences between two and four stroke engines.
2. Define the Octane number & Cetane number
3. Explain the significance of governor in automobiles?
4. What is an automotive differential and how does it work?
5. Why are car steering wheels round?
6. Why entropy decreases with the increase in temperature?

L2: Understand

1. Describe the Atkinson cycle..
2. Explain the flywheel with neat sketch.
3. What is an injector pressure in heavy vehicles? Why it is used?
4. Discuss the service the piston – connecting rod assembly with neat sketch.
5. Discuss the magneto ignition.
6. What is 3-way converter?

L3: Classify

1. .Name the different cooling methods with neat sketches.
2. Describe with P-V diagrams the two used cycles for internal combustion engines.

L4: Interpret

1. In a 4-stroke, 4-stroke cylinder diesel engine running 5000 r.p.m., how many times the fuel will be injected per second.
2. Name the car with engine having 4-valves and 5- valves per cylinder.gas at a pressure of1.5Mpa,the gas expands according to the process Which represented by a straight line on a pressure volume. The final pressure is 0.15MPa. Calculate the work done on a gas by the piston

CONTROLCOPYATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (ME)

OE 20CEO03 Disaster Risk Mitigation and Management

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CEO03.1	Identify various types of disasters, their causes, effects & mitigation measures		L1, L2
20CEO03.2	Understand various phases of disaster management cycle and create vulnerability and risk maps		L1, L2
20CEO03.3	Understand the approaches of risk and vulnerability		L1, L2
20CEO03.4	Explain the concept of disaster management and emerging approaches		L1, L2
20CEO03.5	Understand the mitigation measures		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

UNIT I: Natural Disasters — 9 Hours

Natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.
Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation.

Ozone Depletion

Unit II: Disaster Management Principles — 9 Hours

Evolution of disaster risk management concept Disaster management cycle – Prevention, Preparedness, Mitigation, Rescue and Recovery Integrated and Comprehensive disaster risk reduction approach, Strategies and Policies.

Disaster management cycle

Unit III: Risk and vulnerability — 9 Hours

Hazard, risk and vulnerability: Physical, social and economic dimensions, Vulnerability in changing climate, Climate change and Disasters, Risk Analysis Techniques, Risk: Identification, reduction and transfer, Approaches to mapping social vulnerability, Participatory disaster risk assessment, Action plans, Strategy for survival.

Vulnerability in changing climate

UNIT IV: Disaster Management — 9 Hours

Preparedness through (IEC) Information, education & communication, pre-disaster stage (mitigation), Effect to mitigate natural disaster at national and global levels. International strategy for disaster reduction.
Emerging approaches in Disaster Management-Concept of disaster management, national disaster management framework, financial arrangements, role of NGOs, community –based organizations and media.

National disaster management framework

UNIT V: Risk Mitigation — 9 Hours

Definition, Concept, Importance, Guiding Principles, Tools, Approaches, Strategies Sustainable Development, Sustainable Land Use Planning, Technology and the Environment. Emerging Technologies in Disaster Mitigation, Remote Sensing, GIS, Disaster Mapping, Aerial Photography, Land Use Zoning

Emerging technologies in disaster mitigation

Text Books

1. Khanna, B. K., "Disasters: All you wanted to know about", New India Publishing Agency,New Delhi, 2005
2. Edwards, B., " Natural Hazards", Cambridge University Press, U.K., 2005
3. Chakraborty, S. C., "Natural Hazards and Disaster Management", Pargatishil Prokashak,Kolkata, 2007

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Sahni, P., "Disaster Mitigation Experiences and Reflections", Prentice Hall of India, NewDelhi, 2002
2. Prashant K. Srivastava, Sudhir Kumar Singh, Mohanty, U. C., Tad Murty, "Techniques for Disaster Risk Management and Mitigation", 2020

Web References

1. https://books.google.com
2. http://cbseacademic.nic.in

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define climatic change
2. List any four effects of natural disasters
3. Define disaster Management

L2: Understand

1. Explain about risk assessment
2. Outline the principles of disaster management
3. Differentiate between hazard, risk and vulnerability

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
M.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

PC 20CS404 Operating Systems

3 0 0 3.0

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CS404.1	Describe the structure, components and functionalities of operating system		L1, L2
20CS404.2	Describe the process management activities of operating system		L1, L2
20CS404.3	Illustrate the use of process synchronization tools	-	L1, L2
20CS404.4	Describe the various memory management and allocation techniques		L1, L2
20CS404.5	Demonstrate different secondary storage management strategies and file system		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Operating System Concepts — 9 Hours

What Operating System Do, Operating System Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments, Operating Systems Services, System Call, Types of System Call, Operating System Generation, System Boot

The Shell, Mobile Operating System, Choice of Interface

Unit II: Process Management — 9 Hours

Process Concept: The Process, Process State, Process Control Block, Threads, Process Scheduling: Scheduling Queues, Schedulers, Context Switch, Operations on Processes, Inter Process Communication, Multithread Programming: Overview, Benefits, Multithreading Models, Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

Process Termination, Multiprocess Architecture

Unit III: Synchronization — 9 Hours

Background, The Critical-section problem, Peterson's Solution, Synchronization hardware, Semaphores, Classic Problems of Synchronization, Monitors, Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Transactional Memory, Two Phase Locking

Unit IV: Memory Management — 9 Hours

Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table, Virtual Memory Management: Background, Demand paging, Page replacement, Thrashing, Mass-Storage Structure: Overview of Mass-Storage Structure, Harddisk Drives, Volatile Memory, HDD Scheduling-FCFS Scheduling, SCAN Scheduling of a Disk-Scheduling Algorithm.

Buddy System, Prepaging

Unit V: File system Interface — 9 Hours

File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File Sharing, Protection, Implementing File Systems: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Consistency Checking, Malware, Denial of service

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", Tenth Edition, John Wiley and Sons Inc., 2018
2. William Stallings, "Operating Systems - Internals and Design Principles", Ninth Edition, Pearson, 2018

Reference Books

1. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson, 2015
2. Charles Crowley, "Operating Systems: A Design-Oriented Approach", First Edition, Tata McGraw Hill Education, 2001

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

3. Dhananjay M. Dhamdhere, "Operating Systems: A Concept-Based Approach", Third Edition, McGraw Hill Higher Education, 2017

Web Resources

1. http://nptel.ac.in/downloads/106108101/
2. https://www.coursera.org/learn/iot/lecture/MrgxS/lecture-3-1-operating-systems
3. https://www.geeksforgeeks.org/operating-system-introduction-operating-system-set-1/
4. https://www.unf.edu/public/cop4610/ree/Notes/PPT/PPT8E/CH12-OS8e.pdf
5. https://in.udacity.com/auth?next=/course/introduction-to-operating-systems--ud923

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	40
L2	50	60
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Operating System
2. What are operating system services?
3. List any four types of system calls
4. What is a process? List any four fields of process control block
5. What are the necessary conditions for a deadlock?
6. Differentiate between binary and counting semaphore.
7. What are the various attributes that are associated with an opened file?

L2: Understand

1. Discuss the essential properties of operating systems -Batch, Interactive, Timesharing Real time and Distributive
2. Explain how multiprogramming increases the utilization of CPU
3. Why system calls are needed in operating system?
4. Distinguish between logical address and physical address
5. What is the difference between a process and thread?
6. How does the system detect thrashing? What can the system do to eliminate this problem?
7. Consider the following four processes represented as (Process, Arrival Time, Burst Time) with the length of CPU burst in milliseconds.
   { (P1, 0, 10), (P2, 1, 7), (P3, 2, 13), (P4, 3, 11) }. Using preemptive SJF scheduling: (i) Draw Gantt chart
   (ii) Calculate average waiting time.
8. Why semaphores are important? Suggest the solution for bounded buffer problem with semaphores
9. Explain the steps involved in handling a page fault with a neat sketch

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (CSE)

OE **20AIO03 Fundamentals of AI** 3 1 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20AIO03.1	Describe the foundational principles of artificial intelligence		L1, L2
20AIO03.2	Formalise the given problem using different AI methods		L1, L2
20AIO03.3	Explain different concepts of logic	-	L1, L2
20AIO03.4	Describe the different methods of knowledge representation		L1, L2
20AIO03.5	Explain the principles and applications of expert systems		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit 1: Introduction to Artificial Intelligence **9+3 Hours**

Introduction – History - Intelligent systems - Foundations of AI – Applications – Tic-Tac-Tie game playing - Development of AI languages - Current trends in AI

Unit II: Problem Solving **9+3 Hours**

Problem solving: State-Space search and Control strategies: Introduction - General problem solving - Characteristics of problem - Exhaustive searches - Heuristic search techniques – Iterative deepening A* - Constraint satisfaction - Problem reduction and game playing: Introduction - Problem reduction - Game playing – Alpha beta pruning - Two-player perfect information games

Unit III: Logic concepts **9+3 Hours**

Introduction -Propositional calculus - Proportional logic - Natural deduction system - Axiomatic system - Semantic tableau system in proportional logic - Resolution refutation in proportional logic

Unit IV: Knowledge Representation **9+3 Hours**

Introduction - Approaches to knowledge representation - Knowledge representation using semantic network - Extended semantic networks for KR - Knowledge representation using frames - Advanced knowledge representation techniques: Introduction - Conceptual dependency theory - Script structure - Cycltheory - Case grammars

Unit V: Expert Systems **9+3 Hours**

Expert system and applications: Introduction - Phases in building expert systems - Expert system versus traditional systems - Rule-based expert systems - Blackboard systems - Truth maintenance systems - Application of expert systems

Text Books

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modem Approach", Fourth Edition, Pearson Education, 2020
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007

Reference Books

4. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
5. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
6. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013

Web Resources

6. https://nptel.ac.in

CONTROL COPY ATTESTED

Head of the Department
Dept. of CSE (AI&ML)
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies CSE (AI&ML)

OE 20DSO03 Introduction to Big Data 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20DSO03.1	Identify the Knowledge of Big Data		L1, L2
20DSO03.2	Demonstrate Hadoop Framework for handling Big Data		L1, L2
20DSO03.3	Illustrate the Architectural Concepts of HDFS in Hadoop Ecosystem	-	L1, L2
20DSO03.4	Illustrate MapReduce Framework		L1, L2
20DSO03.5	Explain Spark & RDD		L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Big Data **9 Hours**

What is Big Data, Evolution of Big Data, Types of Big Data, Sources of Big Data,5Vs of Big Data, Big Data Analytics, Big Data Applications, Google File System

Uses of Big Data in Retail Industry

Unit II: Introduction to Hadoop **9 Hours**

Introducing Hadoop, Hadoop History, Hadoop-definition, Comparing SQL Databases and Hadoop, Hadoop Cluster, Hadoop Modes, Hadoop Features, The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, Job Tracker, Task Tracker

Hadoop Cluster

Unit III: Hadoop Ecosystem &HDFS **9 Hours**

Hadoop and its Ecosystem, Hadoop Ecosystem Components, Hadoop Ecosystems Tools, Hadoop Distributed File System, Concept of Block in HDFS Architecture, Features of HDFS, HDFS Read and Write Mechanism, Rack awareness in HDFS, Introducing HBase, Hive, Pig

HDFS Read/Write

Unit IV: Introduction to MapReduce **9 Hours**

Hadoop MapReduce Framework, Architecture, Phases, MapReduce Job Types, Uses of MapReduce, Techniques to Optimize MapReduce Jobs, Limitations of MapReduce.

MapReduce Phases

Unit V: Introduction to Spark and RDD **9 Hours**

Introduction to Spark, DataFrames - DataFrames role in Spark, Introduction to RDD, RDD operations, Creating RDDs, RDD Operations, Working with Key/Value Pairs.

DataFrames

Text Books

1. DT Editorial Services, "Big Data – Hadoop2, MapReduce, Hive, YARN, Pig, R and Data Visualization", Black Book, DreamTech Press, 2019.
2. Sridhar Alla, "Big Data Analytics with Hadoop 3" - Packt Publications, 2018.
3. Holden Karau, Andy Konwinski, Patrick Wendell & MateiZaharia, "Learning Spark" O'reilly Publications, 2015.

Reference Books

1. Chuck Lam, "Hadoop in Action", 1st Edition, MANNING Publications, 2016.
2. Balamurugan Balusamy, Nandhini Abirami R, SeifedineKadry, Amir H. Gandomi, "Big Data: Concepts, Technology, and Architecture" 1st Edition, Wiley Publications, 2021.
3. Thomas Erl, Wajid Khattak, Paul Buhler, "Big Data Fundamentals: Concepts, Drivers &Techniques", 1st Edition, Pearson Publications, 2016.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web Resources

1. https://hadoop.apache.org/
2. https://spark.apache.org/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Big Data.
2. List the characteristics of Big Data.
3. Define Hadoop.
4. What are Hadoop components?
5. What are RDD operations?

L2: Understand

1. Explain HDFS Read & Write mechanism.
2. Explain Rack awareness in HDFS.
3. Explain MapReduce workflow in detail.
4. Describe the working with Key/value pairs in RDDs.

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE(DS)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20ECO03 Privacy and Security in IoT

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20ECO03.1	Understand the basic knowledge of cryptography, networking and web security		L1, L2, L3
20ECO03.2	Explain Architecture of IoT and its Applications		L1, L2, L3
20ECO03.3	Understand the Attacks against IoT System	-	L1, L2, L3
20ECO03.4	Explain Secure Bootstrapping for IoT System		L1, L2, L3
20ECO03.5	Understand the IoT system security and Trust zone		L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction to Cryptography and Network Securities — 9 Hours

Cryptography , networking, Web Security: Secure socket layer and transport layer security, System Security: Intruders , Viruses and related threads, trusted systems.

Secure Shell (SSH)

Unit II: Introduction to IoT — 9 Hours

Internet of Things (IoT), Need of IoT, Applications, Architecture, Enabling technologies, IoT security and privacy.

IoT protocols

Unit III: Attacks against IoT — 9 Hours

Attacks against IoT system (hardware + software), Attacks against IoT network protocols, Attacks against industry IoT

Attacks against Web systems

Unit IV: Secure Bootstrapping for secure IoT system — 9 Hours

Trusted boot, Secure boot, TPM and its usages, Remote attestation, tamper resistant-proof-response hardware and its usage

Bootstrapping for IoT

Unit V: IoT System Security and TrustZone — 9 Hours

System security, TrustZone hardware architecture, TrustZone software architectures.

Web security

Text Books

1. Syed Rameem Zahra, Mohammad Ahsan Chishti ,"Security and Privacy in the Internet of Things " 1st Edtion ,Chapman & Hall, 2020
2. Fei Hu ,"Security and Privacy in Internet of Things (IoTs) Models, Algorithms, and Implementations", 1st Edition CRC Press

Reference Books

1. Ravi Ramakrishnan, Loveleen Gaur "Internet of Things Approach and Applicability in Manufacturing " , 1st Edtion ,Chapman & Hall, 2019
2. Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", UniversityPress,2015

Web Resources

1. https://lss.at.ufl.edu/help.shtml
2. http://cms.uflib.ufl.edu/ask

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	20
L2	40	30
L3	40	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is cryptography ?
2. List the applications of IoT
3. What is Attacks against IoT system ?

L2: Understand

1. Explain about networking
2. Explain Enabling technologies of IoT
3. Explain Attacks against IoT network protocols

L3: Apply

1. Discus about web security
2. Write about Architecture of IoT
3. Explain Attacks against industry IoT

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (ECE)

OE 20EEO03 Low Cost Automation

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20EEO03.1	Understanding automation of assembly lines	-	L2
20EEO03.2	Automation Using Hydraulic Systems		L2
20EEO03.3	Describe Automation Using Pneumatic Systems		L2
20EEO03.4	Explain Automation Using Electronic Systems		L2
20EEO03.5	Explain Assembly Automation		L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Kn owledge

UNIT I :Automation Of Assembly Lines — 9 Hours

Concept of automation-mechanization and automation - Concept of automation in industry - mechanization and automation - classification, balancing of assembly line using available algorithms -Transfer line-monitoring system (TLMS) using Line Status - Line efficiency - Buffer stock Simulation in assembly line

Transfer line-monitoring system (TLMS) using Line Status ,Line efficiency

UNIT II: Automation Using Hydraulic Systems — 9 Hours

Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. - Selection of hydraulic fluid, practical case studied on hydraulic circuit design and performance analysis - Servo valves, electro hydraulic valves, proportional valves and their applications.

Servo valves, electro hydraulic valves, proportional valves and their applications.

UNIT III: Automation Using Pneumatic Systems — 9 Hours

Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods – step counter method - compound circuit design - combination circuit design. Pneumatic equipments - selection of components - design calculations -application - fault finding – hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

Low cost automation - Robotic circuits

UNIT IV: Automation Using Electronic Systems — 9 Hours

Introduction - various sensors – transducers - signal processing - servo systems - programming of microprocessors using 8085 instruction - programmable logic controllers

Programming of microprocessors using 8085 instruction - programmable logic controllers

UNIT V: Assembly Automation — 9 Hours

Types and configurations - Parts delivery at workstations - Various vibratory and non-vibratory devices for feeding - hopper feeders, rotary disc feeder, centrifugal and orientation - Product design for automated assembly.

Product design for automated assembly.

Text Books

1. Anthony Esposito, "Fluid Power with applications", Prentice Hall international, 2009.
2. Mikell P Groover-"Automation, Production System and Computer Integrated Manufacturing", Prentice Hall, Publications, 2007

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Kuo .B.C, "Automatic control systems", Prentice Hall India, New Delhi, 2007.
2. Peter Rohner, "Industrial hydraulic control", Wiley Edition, 1995.
3. Mujumdar.S.R, "Pneumatic System", Tata McGraw Hill 2006.

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is automation?
2. What is Pneumatic fundamentals?
3. What is transducers?
4. What is switching circuits?
5. What is Buffer stock Simulation?

L2: Understand

1. Explain Line efficiency.
2. Explain Selection of hydraulic fluid.
3. Explain Pneumatic equipments
4. Explain programmable logic controllers.
5. Explain Parts delivery at workstations.

Head of the Department
Dept. of Civil Engineering

CONTROL COPY ATTESTED
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (EEE)

OE 20MEO03 Industrial Automation

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20MEO03.1	Identify various concepts of automation and work part transport mechanisms.	-	L2
20MEO03.2	Illustrate the assembly systems and their applications.	-	L3
20MEO03.3	Describe the importance of handling systems and identification systems.	-	L3
20MEO03.4	Apply the concepts of part families and machine cells into various production systems	-	L2
20MEO03.5	Recognize the importance of automated inspection and to distinguish the various control systems	-	L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create,DoK: Depth of Knowledge

Unit I: Manufacturing and Automation-Over View — 9 Hours

Production systems, Automation in production systems, Automation principles and strategies, Reasons for Automation, Manufacturing operations, Functions in Manufacturing, Information processing in Manufacturing plant layout, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers. Automation for machining operations.

Unit II: Assembly Systems and Line Balancing — 9 Hours

Process-Assembly lines-manual single stations assembly, Manual assembly line, automated assembly system-Line balancing. Automated Assembly Systems – Design for automated assembly-Types of automated assembly systems-Parts feeding devices

Unit III: Automated Material Handling Systems — 9 Hours

Automated Material Handling and storage system: Material Handling and Identification Technologies: Material handling, equipment, Storage systems, performance and location strategies, Automated storage systems, AS/RS, types. Functions, material handling equipment-Conveyors, AGVS, Industrial Robots-Anatomy, Robot configurations, work volume-AS/RS. Automatic identification methods, Barcode technology, RFID

Unit IV: Manufacturing Cells — 9 Hours

Manufacturing Systems and Automated Production Lines: Manufacturing systems: components of a manufacturing system, Single station manufacturing cells, Automated production lines, Applications, Transfer lines

Unit V: Control Systems — 9 Hours

Control Systems-Process Industries Versus Discrete Manufacturing Industries, Continuous Versus Discrete Control: Continuous Control Systems, Discrete Control Systems, Computer Process Control: Control Requirements, Capabilities of Computer Control.

Text Books

1. Milkell P. Groover, Automation, Production Systems and Computer Integrated Manufacturing, Kindle Edition, Prentice Hall of India, 2016.

Reference Books

1. C. Roy, "Robots and Manufacturing Automation", Asfahl John Wiley & Sons
2. Krishna Kant, "Computer Based Industrial Control", EEE-PHI, 2nd edition, 2010

Web References

1. www.nptel.iitm.ac.in
2. www.btechguru.com

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Internal Assessment Pattern

Cognitive Level	InternalAssessment#1(%)	InternalAssessment#2(%)
L1	40	30
L2	40	30
L3	20	40
Total(%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is industrial automation?
2. What are the different costs included in industry in designing the particular product ?
3. What is production volume?
4. List the categorization of production system.
5. What are the types of automation?
6. What are the features of Flexible Automation?
7. What is factory type of Integral automation?
8. Define process.
9. What are process variables?
10. What is meant by control system in automation?

L2: Understand

1. Explain Automation principles and strategies
2. Compare Manual assembly line, automated assembly system
3. Illustrate Material handling, equipment, Storage systems, performance and location strategies
4. Demonstrate components of a manufacturing system
5. Compare Continuous Control Systems, Discrete Control Systems

L3: Apply

1. Apply the basic elements of an automated system for industrial automation
2. Apply different types of automated assembly systems for moderate plants
3. Apply the Barcode technology, RFID for industrial automation
4. Discuss Automated production lines, Applications, Transfer lines
5. Design the capabilities of computer control systems

CONTROLCOPYATTESTED

Chairman
Board of Studies (ME)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

OE 20SHO02 Design Thinking

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20SHO02.1	Explain the fundamentals of Design Thinking and innovation		L2
20SHO02.2	Empathize and analyse model action plan		L2
20SHO02.3	Describe the principles of innovation and idea generation for product design	-	L2
20SHO02.4	Apply design thinking techniques for given tasks		L2
20SHO02.5	Apply the design thinking techniques for solving problems in various sectors		L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge

Unit I: Introduction to Design Thinking — 9 Hours

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry

Unit II: Design Thinking — 9 Hours

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development

Unit III: Innovation — 9 Hours

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Product Design: problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications

Unit IV: Design Thinking for Strategic Innovation — 9 Hours

An exercise in design thinking – implementing design thinking for better process. Implement design thinking process in various Industries. Design thinking for Start-ups

Unit V: Design thinking in Various Sectors — 9 Hours

Case studies in Information Technology, Finance, Education, Management and Retail sector. Analyze and Prototyping, Usability testing, Organizing and interpreting results

Case study learning outcomes:

1. Make use of practical design thinking methods in every stage of problem with the help of method templates
2. Apply design thinking to a problem in order to generate innovative and user-centric solutions
3. Empathize with end user and initiate a new working culture based on user-centric approach
4. Prototype and run usability tests for unbiased examination of the product in order to identify problem

Text Books

1. Tim Brown, Harper Bollins, Change by Design, 2009
2. David Lee, Design Thinking in the Class Room, Ulysses Press

Reference Books

1. Design the Future, Shrrutin N Shetty, Norton Press
2. William Lidwell, Kritina Holden, Jill Butter, Universal Principles of Design
3. Chesbrough H., The Era of Open Innovation
4. Chitale A. K. and Gupta R. C., Product Design and Manufacturing, Prentice Hall

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://nptel.ac.in/courses/110106124
2. https://onlinecourses.nptel.ac.in/noc19_mg60/preview
3. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
4. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
5. www.bizfilings.com › Home › Marketing › Product Development
6. https://www.mindtools.com/brainstm.html
7. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
8. www.vertabelo.com/blog/documentation/reverse-engineering https://support.microsoft.com/en-us/kb/273814
9. https://support.google.com/docs/answer/179740?hl=en
10. https://www.youtube.com/watch?v=2mjSDIBaUIM
11. thevirtualinstructor.com/foreshortening.html
12. https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf
13. https://dschool.stanford.edu/use-our-methods/ 6.
14. https://www.interactiondesign.org/literature/article/5-stages-in-the-design-thinking-process 7.
15. https://www.nngroup.com/articles/design-thinking/ 9.
16. https://designthinkingforeducators.com/design-thinking/ 10.
17. www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

http://dschool.stanford.edu/dgift/

Internal Assessment Pattern

Cognitive Level	Internal Assessment # 1 (%)	Internal Assessment # 2 (%)
L1	20	20
L2	50	50
L3	30	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What do you mean by design thinking?
2. How design thinking works within a product development process

L2: Understand

1. Explain the elements and principles of design
2. Differentiate between creativity and innovation

L3: Apply

1. How design thinking helped financial sector to gain the consumer 'trust'?

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HO 20CEH01 Cognitive Management of IoT for Smart Cities

4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH01.1	Understand the system of smart materials implemented in structures
20CEH01.2	Understand the techniques and its implementation.
20CEH01.3	Understand the concepts of Internet of Things and to Know basic communication protocols in IoT
20CEH01.4	Develop planning, scheduling of development activities.
20CEH01.5	Develop work break down structure, scheduling and project management of smart cities

Unit I: Introduction to Smart Materials — 9 Hours

Introduction to Smart Materials– Instrumented structures functions and response –Sensing systems – Self-diagnosis – Signal processing consideration – Actuation systems and effectors.

Unit II: Actuators — 9 Hours

Techniques – Actuator and actuator materials – Piezoelectric and Electro strictive Material – Magneto structure Material – Shape Memory Alloys – Electro rheological Fluids– Electromagnetic actuation – Role of actuators and Actuator Materials.

Unit III: Internet of Things — 9 Hours

Introduction: Internet of Things Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications.

Unit IV: Smart Cities Planning and Development — 9 Hours

Understanding smart cities - Dimension of smart cities - Global Standards and performance benchmarks, Practice codes - Smart city planning and development - Financing smart cities development - Governance of smart cities

Unit V: Project management in Smart Cities — 9 Hours

Phases, Stages of project and work break down Structure - Project organization structure, Planning, Scheduling and CPM - Project cost analysis, resource allocation & levelling, Line of balancing technique - Project monitoring and control, Project risk management.

Text Books

1. Brain Culshaw – Smart Structure and Materials Artech House – Borton. London-1996
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, ISBN: 0: 0996025510, 13: 978-0996025515
3. Honbo Zhou, "The Internet of Things in the Cloud: A Middleware Perspective", CRC Press, 2012.ISBN : 9781439892992
4. Giffinger, Rudolf; Christian Fertner; Hans Kramar; Robert Kalasek; Nataša Pichler-Milanovic; Evert Meijers (2007). "Smart cities – Ranking of European medium-sized cities". Smart Cities. Vienna: Centre of Regional Science

Reference Books

1. Neural Networks and Fuzzy Systems by Bart. Kosko, Prietence hall of India, 1994. 2. Artificial Neural Networks by Robert J. Schalokoff.
2. "Draft Concept Note on Smart City Scheme". Government of India - Ministry of Urban Development (http://indiansmartcities.in/downloads/CONCEPT_NOTE_- 3.12.2014__REVISED_AND_LATEST_.pdf)

Web References

1. NPTEL :: Civil Engineering – Smart Materials and Smart Structures
2. Internet of Things (iitb.ac.in)
3. Smart Materials and Smart Structures (iitb.ac.in)

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HO 20CEH02 Energy Efficient Buildings

4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH02.1	Describe awareness among stakeholders and promote green agenda and green initiatives in theirworking environments leading to green movement.
20CEH02.2	Recognize objectives of green building and roads
20CEH02.3	Understand and know the utility of solar energy in buildings and know about Green composites in buildings
20CEH02.4	Understand the Urban environment and Green Buildings
20CEH02.5	Identify the Nanomaterials used in Green Building Systems

Unit I: Energy Sources — 9 Hours

Introduction to nexus between Energy, Environment and Sustainable Development; Energy transformation from source to services; Energy sources, sun as the source of energy; biologicalprocesses; photosynthesis; food chains, classification of energy sources, quality and concentration of energy sources; fossil fuel reserves - estimates, duration; theory of renewability, renewable resources; overview of global/ India's energy scenario.

Unit II: Energy Efficient and Sustainable Development — 9 Hours

The inseparable linkages of life supporting systems, biodiversity and ecosystem services and their implications for sustainable development; global warming; greenhouse gas emissions, impacts, mitigation and adaptation; future energy Systems-clean/green energytechnologies; International agreements/conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCC); sustainable development.

Unit III: Green Building and Roads — 9 Hours

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Green Composites for buildings: Concepts of Green Composites. Water Utilizationin Buildings.

Unit IV: Waste Management — 9 Hours

Energy Approaches to Water Management. Management of Solid Wastes. Managementof Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment. Green roads and its construction procedure.

Unit V: Green Nanotechnology — 9 Hours

Introduction to nanomaterials: Nanoparticles preparation techniques, Nanomaterials for "Green" Systems: Green materials, including biomaterials, biopolymers, bioplastics, and composites Nanotech Materials for Truly Sustainable Construction: Windows, Skylights, and Lighting. Paints, Roofs, Walls, and Cooling.

Text Books

1. Umberto Desideri, Francesco Asdrubali, "Handbook of Energy Efficiency in Buildings - A Life Cycle Approach", 1st Edition, Elsevier B.V, 2018
2. José Manuel Andújar, Sergio Gómez Melgar, "Energy Efficiency in Buildings", MDPI, 2020 https://doi.org/10.3390/books978-3-03928-703-1

Reference Books

1. Ristinen, Robert A. Kraushaar, Jack, J. AKraushaar, Jack, P. Ristinen, 2nd Edition, John Wiley, "Energy and the Environment", ISBN: 9780471172482, Wiley, New York, 2006
2. World Energy Assessment, "Energy and the Challenge of Sustainability", UNDP, NewYork, 2000
3. Nebojsa Nakicenovic, ArnulfGrubler and Alan McDonald, "Global Energy Perspectives", Cambridge University Press, 1998
4. Robert Bent, "Energy: Science, Policy, and the Pursuit of Sustainability", ISBN13: 9781559639118, ISBN10: 1559639113, Island Press, 2002
5. Jagadish K. S., Venkatarama reddy B. U. and Nanjundarao K. S., "Alternative Building Materials and Technologies", New Age International, 2014
6. Ursula Eicker, "Low Energy Cooling For Sustainable Buildings", John Wiley and Sons Ltd., 2009

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://nptel.ac.in/courses/105/102/105102175/
2. https://pdf4pro.com/view/lecture-notes-on-energy-efficiency-in-building-construction-4923d1.html

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

HO 20CEH03 Structural Health Monitoring 4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH03.1	Diagnose the distress in the structure understanding the causes and factors
20CEH03.2	Assess the health of structure using static field methods
20CEH03.3	Assess the health of structure using dynamic field tests
20CEH03.4	Suggest repairs and rehabilitation measures of the structure
20CEH03.5	Formulate and analyse a case study of structural health monitoring

Unit I: Structural Health **9 Hours**

Factors affecting Health of Structures, Causes of Distress, Regular Maintenance

Unit II: Structural Health Monitoring and Structural Audit **9 Hours**

Concepts, Various Measures, Structural Safety in Alteration. Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Unit III: Static Field Testing **9 Hours**

Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

Unit IV: Dynamic Field Testing **9 Hours**

Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

Unit V: Introduction to Repairs and Rehabilitations of Structures **9 Hours**

Case Studies (Site Visits), piezo–electric materials and other smart materials, electro–mechanical impedance (EMI) technique, adaptations of EMI technique.

Text Books

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, "Structural Health Monitoring", Wiley - ISTE; 1st Edition, 2006

Reference Books

1. Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes, "Structural Health Monitoring", John Wiley and Sons, 2006
2. Ou, J. P., Li, H., Duan, Z. D. and Taylor and Francis Group, "Structural Health Monitoring and Intelligent Infrastructure", Volume 1, London, UK, 2006
3. Victor Giurglutiu, "Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc., 2007

Web References

1. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-oe05/
2. https://www.youtube.com/watch?v=IHKoohRHRII
3. https://www.iitk.ac.in/ce/test/MoHUPA%20Presentation_Dr.K%20Roy%20_%20Dr.S.Mukhopadhya.pdf

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HO 20CEH04Structural failure Protection Using AI 4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH02.1	Diagnose the distress in the structure understanding the causes and factors
20CEH02.2	Assess the health of structure using static field methods
20CEH02.3	Assess the health of structure using dynamic field tests
20CEH02.4	Explore the Neural Networks and its functioning
20CEH02.5	Develop the algorithm and the applications of neural networks to structural behaviour.

Unit I: Structural Health **9 Hours**

Factors affecting Health of Structures, Causes of Distress, Regular Maintenance

Unit II: Structural Health Monitoring and Structural Audit **9 Hours**

Concepts, Various Measures, Structural Safety in Alteration. Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Unit III: Static Field Testing& Dynamic Field Testing **9 Hours**

Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement. Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

Unit IV: Artificial Neural Networks **9 Hours**

Introduction to ANN- Inspiration and representation for Neural Network -feed forward and feedback networks-Introduction to the Activation Function- activation networks.

Unit V: Counter propagation and Back Propagation Neural Networks **9 Hours**

Introduction- Algorithm writing-Kohonen layers- Outstar& Instar- hidden layer – Applications of Neural Networks to Structural Behavior.

Text Books

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, "Structural Health Monitoring", Wiley-ISTE; 1st Edition, 2006

Reference Books

1. Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes,"Structural Health Monitoring", John Wiley and Sons,2006
2. Ou, J. P., Li, H., Duan, Z. D. and Taylor and Francis Group, "Structural Health Monitoring and Intelligent Infrastructure", Volume 1, London, UK,2006
3. Victor Giurglutiu,"Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc.,2007

Web References

1. https://www.javatpoint.com/artificial-neural-network
2. https://towardsdatascience.com/simply-deep-learning-an-effortless-introduction-45591a1c4abb
3. https://www.slideshare.net/mentelibre/counterpropagation-network

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

HO 20CEH05 Architecture and Town Planning

4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH05.1	Gain knowledgeofdesignelementsofarchitecture
20CEH05.2	Reviewtheindustrial revolution
20CEH05.3	Understandtheconceptsof townplanning
20CEH05.4	Applythegeneral principlesandtechniquesoftownplanning
20CEH05.5	Understand the town planning standards and technique

UnitI:Elements and Principles — 12 Hours

ElementsofDesign: Linedirection.Shape,size,texture,valueandcolour,balance,scaleandproportion.
Principles of Design: Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 Dcompositions.

Unit II: The Industrial Revolution — 12 Hours

The Industrial Revolution: The age of revivals, the emergence of engineer, new materials andtechniquesand theevolution of balloonframe and steel frame.
Origin of Modern Architecture: definition and concept of modern architecture, various pioneers ofmodernarchitecture.

Unit III: TownPlanning — 12 Hours

Definitionandmeaning,ageof planning,scopeandmotivesofplanning,briefhistoryof town planning, its origin and growth, historically development of town planning in ancient valleycivilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planningNew Concepts: Garden city movement, Linear city and concentric city concepts, Neighbourhood andRadburm,La-cite industrille, Radiantcityto presentdayplanning.

Unit IV: Planning Principles — 12 Hours

Types of town and their functions, types of town planning – Grid Iron, Radial,Spiderwebs, Irregular andMixed, theiradvantages and disadvantages.

Unit V: Planning Practice and Techniques — 12 Hours

Zoning – its definition, procedure and districts, height and bulkzoning, F. A. R., Master Plan – Meaning, preparation and realization, the scope of city planning – cityrehabilitationand slumclearance.

Text Books

1. Hiraskar, G. K., "The great ages of World Architecture", Dhanpat Rai Publishing Co. Pvt. Ltd., 2018
2. Sane, Y. S.,"Planning and Design of Buildings by Section of Architecture"
3. Krishnamurthy, G. K. and Ravindra,S. V., "Professional Practice", PHI Learning, New Delhi, 2020

Reference Books

1. Cherry and Gordon,"UrbanPlanningProblems"BoardHill,London,1974
2. Sundaram,K. V.,"Urban and Regional Planning in India", Vikas Publishing HousePvt. Ltd.,NewDelhi,2000
3. Gallion,A.B. and Eisner, S.,"TheUrbanPattern"VanNostrandreinhold,NewYork,1993

Web References

1. NPTEL :: Architecture - NOC:Introduction to Urban Planning
2. NPTEL :: Architecture - NOC:Housing Policy & Planning
3. Architecture and Town Planning lectures - Bing

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)

HO 20CEH06 Safety Analysis and Risk Management 4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH02.1	Gain knowledge in devising safety policy and procedures to be adopted to implement total safety in a plant
20CEH02.2	Become a skilled person in hazard hazarel analysis and able to find out the root cause of an accident
20CEH02.3	Illustrate how to handle the risk and analyzing the consequences.
20CEH02.4	Analyze the consequence of risk.
20CEH02.5	Manage the safety activities in the construction Industry with various case studies.

Unit I: Concepts of safety **12 Hours**

Hazard classification chemical, physical, mechanical, ergonomics, biological and noise hazards – Hazards from utilities like air, water, steam.

Unit II: Hazard identification **12 Hours**

Safety Audits – Checklists – What if Analysis – HAZAN – HAZOP – Vulnerability models – Event tree and Fault tree Analysis – Past accident analysis – Flix borough – Mexico – Bhopal – Madras – Vizag accident analysis.

Unit III: Hazard and operability Analysis **12 Hours**

Principles – Risk ranking – Guide word – Parameter – Deviation – Causes – Consequences – Recommendation – Coarse HAZOP study – Case studies – Pumping system – Reactor System – Mass transfer system.

Unit IV: Introduction to Consequence Analysis **12 Hours**

Fire and Explosion models: Radiation – Tank on fire – Flame length –Risk analysis- Radiation intensity calculation and its effect to plant, people & property, UCVCE -Explosion due to – Deflatration – Detonation – TNT, TNO & DSM model – Over pressure. Methods for determining consequences effects: Effect of fire- Effects of explosion – Risk contour – Flash fire – Jet fire – Pool fire – BLEVE – Fire ball

Unit V : Safety Management **12 Hours**

Safety management function, line versus staff authority, safety responsibility and accountability in construction industry. Case based reasoning, case indexing, retrieval, accident prevention and forecasting.

Text Books

1. Blake, R.P., "Industrial Safety", Prentice Hall, 1953.
2. Lees, F.P., "Loss Prevention in Process Industries", 2nd Edition, Butterworth Heinemann, 1996.
3. K. V. Raghavan and A A. Khan, "Methodologies in Hazard Identification and Risk Assessment", Manual by CLRI, 1990.
4. V. C. Marshal, "Major Chemical Hazards", Ellis Horwood Ltd., Chichester, United Kingdom. 1987.

Reference Books

1. Geoff Wells, "Hazard Identification and Risk Assessment", I.ChE.,John Ridley and John Channing, "Safety at Work", 6th Edition. Butterworth-Heinemann, 2003.
2. "A Guide to Hazard Operability Studies", Chemical Industry Safety and Health Council, 1977.
3. Safety Management by John V. Grimaldi, (1996). AITBS Publishers & Distributors, New Delhi, India.
4. Construction Project Administration by A.A.Kwakye, (1997), Adisson Wesley Longman, London.

Web References

1. https://www.britsafe.org/training-and-learning/find-the-right-course-for-you/informational-resources/risk-assessment/
2. https://www.ready.gov/risk-assessment
3. https://www.youtube.com/results?search_query=safety+management+and+risk+analysis

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Visakhapatnam-531173.

HO 20CEH07 Intelligent Transportation Networks

4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH07.1	Understand ITS, AVL& GIS
20CEH07.2	Understand ITS Systems and TMC
20CEH07.3	UnderstandATMS,ATIS and CVO New technologies AVCS,APTS and ARTS
20CEH07.4	Explain the Advanced Transportation Management System
20CEH07.5	Summarize ITS issues in terms of various factors and emerging issues

UnitI:Introduction to Intelligent Transportation Systems (ITS) **12 Hours**

Definition of ITS and Identificationof ITS Objectives, Historical Background, Benefits of ITS -ITS Data collection techniques – Detectors,AutomaticVehicleLocation(AVL),AutomaticVehicleIdentification(AVI),GeographicInformationSystems(GIS), video data collection.

Unit II:Telecommunications in ITS **12 Hours**

ImportanceoftelecommunicationsintheITSsystem,InformationManagement,TrafficManagementCentres(TMC).Vehicle–Roadsidecommunication– Vehicle Positioning System.

Unit III: ITS functional areas **12 Hours**

Advanced Traffic Management Systems (ATMS), Advanced TravelerInformation Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced VehicleControl Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced RuralTransportationSystems (ARTS).

Unit IV: ITS User Needs and Services **12 Hours**

ITSUserNeedsandServices–TravelandTrafficmanagement,PublicTransportationManagement,ElectronicPayment,CommercialVehicleOperations,EmergencyManagement,AdvancedVehiclesafetysystems,InformationManagement.

Unit V: ITS Applications **12 Hours**

Automated Highway Systems - Vehicles in Platoons – Integration of Automated HighwaySystems.ITSProgramsintheWorld–OverviewofITSimplementationsindevelopedcountries,ITSin developing countries

Text Books

1. KanPaulChen,JohnMiles, "ITSHandBook2000:RecommendationsforWorldRoadAssociation(PIARC)"
2. Sussman,J.M.,"PerspectiveonITS,ArtechHousePublishers",2005
3. USDepartmentofTransportation,"NationalITSArchitectureDocumentation",(CD-ROM),2007

Reference Books

1. Sussman, J.M.,"Perspectives on Intelligent Transportation Systems", Springer, Berlin, 2010

Web References

1. NPTEL :: Civil Engineering - Traffic Engineering & Management
2. Intelligent Transportation System - II (iitb.ac.in)
3. Intelligent Transportation System - I (iitb.ac.in)

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
M.S. Ram Institute of Technology(A)

HO 20CEH08 Building Information Modeling 4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH03.1	Specify the components and systems, by design process to the engineers and contractors
20CEH03.2	Make use of BIM tools for analyzing
20CEH03.3	Be able to plan the use of BIM in building projects and provide the right level of detail.
20CEH03.4	Be able to comply legal and project collaboration requirements
20CEH03.5	Provide the total analysis in a report manner

Unit I: Introduction **12 Hours**

Review of Buildings & Systems Building components and systems (architectural, MEP, structural) - Building Vocabulary-Building drawings, specifications-Building design process and roles of owners, managers, designers, engineers and contractors/subcontractors.

Unit II: BIM in Design Coordination **12 Hours**

Develop an advanced understanding of BIM approaches for retrieving, analysing and integrating information to aid decision-making, and using appropriate BIM tools.

Unit III: BIM in Construction Operations **12 Hours**

Looks at a range of BIM approaches and applications for construction planning and operations, including simulating construction schedules and logistics, buildability forecasting and clash detection.

Unit IV: Miscellaneous **12 Hours**

Miscellaneous Applications of BIM Cost Estimating- Energy Modelling- Conflicts/Interference checking- Future of BIM

Unit V : Report Writing **12 Hours**

Submission of the output compiled by the Software

Text Books

1. Dr. DV Harshul Savla, Dr. Chandrahauns ChavanBuilding Information Modeling: Global & Indian Perspective, Notin Press; 2021

Reference Books

1. A Guide To Building Information Modeling For Owners, Managers, Designers, Engineers And Contractors by Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston; Wiley publications, March 2011, ISBN 9781118021699, 111802169X
2. Building Information Modeling by Karen Kensek.Published by Routledge, April 10, 2014, ISBN 9780415717748

Web References

1. https://skill-lync.com/civil-engineering-courses/drafting-design-revit/about
2. https://www.udemy.com/topic/bim/#:~:text=Common%20BIM%20software%20includes%20Autodesk,help%20you%20learn%20about%20it.

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering

HO 20CEH09 Traffic Engineering and Management 4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH09.1	Carry out trafficsurveys
20CEH09.2	Implement traffic systemmanagement
20CEH09.3	Carry out intersection design forsafety
20CEH09.4	Record and analyse accident data and suggestcountermeasures
20CEH09.5	Carry out road safetyaudit

Unitl: Traffic Stream Characteristics 12 Hours

Road user, vehicle and highway characteristics, Fundamental parameters and relations of traffic flow, Traffic stream models. Speed data collection and analysis, Density and travel time measurement and analysis, Moving Observer Method, Automated Traffic Measurements - Traffic forecasting and growth studies. Capacity and level of services of roads. Pedestrian studies – flow characteristics - Design principles of pedestrian facilities.

Unit II: Traffic Management 12 Hours

Parking studies – parking statistics, parking surveys, parking requirements - on street and off street parking. Lay-byes and bus stops. Principles of Traffic Control: Basics of traffic management. Traffic Signs, Road Markings. Traffic System Management – speed, vehicle, parking, enforcement regulations. Mixed traffic regulations – one way, tidal flow, turning restrictions etc.

Unit III: Design of Intersections for Safety 12 Hours

Uncontrolled intersection, Conflicts at intersection, Channelization, Traffic islands, Design of median islands, turning vehicle templates. Traffic intersection control: Traffic Rotaries – design of traffic rotaries. Traffic signal design - Design Principles of Traffic Signal, Coordinated Traffic Signal, Vehicle Actuated Signals and Area Traffic Control. Design of Grade Separated Intersection - trumpet, diamond, cloverleaf and flyovers.

Unit IV: Accident Investigation and Prevention 12 Hours

Characteristics of road accidents, causes of accidents: road – driver – vehicle - environment, Significance of accident data, Accident recording and analysis - Crash reporting and collision diagrams - Statistical Interpretation and Analysis of Crash Data. Identification of potential sites for treatment - Safety countermeasures. Monitoring and evaluation. Roadwaylighting.

Unit V: Road Safety Audit 12 Hours

Overview, stages of road safety audit, audit process, checklists, and elements of good road safety audit. Highway safety improvement program - Safety Education, Traffic Law Enforcement. Road Safety Management System. Case studies.

Text Books

1. Kadiyali L. K., "Traffic Engineering and TransportationPlanning", 3rd Edition, Khanna Publishers, 2004
2. Mannering and Kilareski, "Highway Engineering and TrafficAnalysis", 3rd Edition, John Wiley Publications, 2007
3. Roger P. Roess, Elena S.Prassas, William R.McShane, "TrafficEngineering", 3rd Edition, Prentice Hall, 2004

Reference Books

1. Khanna, S. K., Justo, C. E. G. and Veeraragavan A., Highway Engineering, Nem Chand and Bros, Roorkee,2014
2. Kadiyali, L. R., and Lal, N. B., Principles and Practices of Highway Engineering, Khanna Publishers,2008
3. IRC SP: 88 – 2010
4. Rune Elvik, Alena hoye, TrulsVaa and Michael Sorensen, "The Handbook of Road Safety Measures", Emerald Group Publishing Limited,2009
5. ITE, Highway Safety Manual, ITE,2010

Web References

1. https://nptel.ac.in/courses/105/101/105101008/
2. https://www.youtube.com/watch?v=5zKC_aq4ypM&list=PLI_6Sjd3m1Meef4k2EpO7q2K-bsTWGa1M

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HO 20CEH10 Structural Health Monitoring Using IoT

4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes
20CEH04.1	Diagnose the distress in the structure understanding the causes and factors
20CEH04.2	Assess the health of structure using static field methods
20CEH04.3	Assess the health of structure using dynamic field tests
20CEH04.4	Suggest repairs and rehabilitation measures of the structure
20CEH04.5	Understand the concepts of Internet of Things and to Know basic communication protocols in IoT

Unit I: Structural Health **12 Hours**

Factors affecting Health of Structures, Causes of Distress, Regular Maintenance

Unit II: Structural Health Monitoring and Structural Audit **12 Hours**

Concepts, Various Measures, Structural Safety in Alteration. Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Unit III: Static Field Testing **12 Hours**

Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

Unit IV: Dynamic Field Testing **12 Hours**

Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

Unit V : Internet of Things **12 Hours**

Introduction: Internet of Things Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT, IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges, Applications.

Text Books

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, "Structural Health Monitoring", Wiley-ISTE; 1st Edition, 2006

Reference Books

1. Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes,"Structural Health Monitoring", John Wiley and Sons,2006
2. Ou, J. P., Li, H., Duan, Z. D. and Taylor and Francis Group, "Structural Health Monitoring and Intelligent Infrastructure", Volume 1, London, UK,2006
3. Victor Giurglutiu,"Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc.,2007

Web References

1. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-oe05/
2. https://www.youtube.com/watch?v=IHKoohRHRII
3. https://www.iitk.ac.in/ce/test/MoHUPA%20Presentation_Dr.K%20Roy%20_%20Dr.S.Mukhopadhya.pdf

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HO 20CEH11GIS and Remote Sensing 4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO4	
20CEH11.1	Understand the basic principles of Remote Sensing and GIS techniques	3	2	3	L1, L2
20CEH11.2	Understand the types of sensors and platforms	3	2	2	L1, L2
20CEH11.3	Understand the concepts of visual and digital image analyses	3	2	3	L1, L2
20CEH11.4	Understand the principles of spatial analysis	3	2	2	L1, L2
20CEH11.5	Understandtheapplication of RS and GIS to Civil Engineering	3	2	3	L1, L2

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective Pos
L1: Remember | L2. Understand | L3: Apply | L4 Analyze | L5 Evaluate | L6: Create. DoK: Depth of Knowledge

UnitI: Fundamental Of Remote Sensing 12 Hours

Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces,Active and Passive Remote Sensing, types of resolutions - advantages & limitations, Types of sensors, image data characteristics, digital image data formats

Advantages and disadvantages of Remotes sensing system

Unit II: Image Analysis 12 Hours

Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification. : Overlay function-vector overlay operations; raster overlay operations, network analysis.

Display of digital image, Keys

Unit III: GIS and Data entry Process 12 Hours

Basic Principles, components, application areas of GIS, map projections, spatial data structures, raster and vector data formats, data inputs, data manipulation, data retrieval, data analysis and data display.

Geo referenced Data, Fundamentals of data quality management

Unit IV: Gis Software 12 Hours

GIS and Image interpretation Software – Salient features – Capabilitiesand Limitations. Data management in public domain GIS software- Attribute DataManagement.

GIS applications, advantages

Unit V: Applications of RS and GIS 12Hours

Land cover and land use, agriculture, forestry, geology, geomorphology, urban & transportation applications,Flood zoning and mapping, groundwater prospects, groundwater quality monitoring and potential recharge zones, watershed management.

GIS case studies, Usefulness in Civil engineering

Text Books

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press.
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi.
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006.

Web References

1. CCRS Canada Centre for Remote Sensing -http://landmap.mimas.ac.uk/ipc/ccrs/fundam_e.html
2. NASA Remote Sensing Tutorial - http://rst.gsfc.nasa.gov/
3. TELSAT, Belgium - http://eoedu.belspo.be/en/guide/index.htm
4. http://www.landsat.org/ (Free)
5. Commercial ERDAS Imagine http://gi.leica-geosystems.com/LGISub1x33x0.aspx

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

HO 20CEH12 Disaster Risk Mitigation

4 0 0 4

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs				DoK
		PO3	PO6	PO7	PO12	
20CEH12.1	Identify various types of natural disasters, their causes, effects & mitigation measures	2	3	3	1	L1, L2
20CEH12.2	Identify various types of manmade disasters, their causes and effects	3	3	3	1	L1, L2
20CEH12.3	Demonstrate the understanding of various phases of disaster management cycle and create vulnerability and risk maps.	2	3	3	1	L2, L3
20CEH12.4	Understand the use of emergency management system to tackle the problems	3	3	3	1	L2, L3
20CEH12.5	To be in a position to provide the first line response in time of disaster.	2	3	3	1	L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1. Remember | L2. Understand | L3. Apply | L4. Analyze | L5. Evaluate | L6. Create. DoK. Depth of Knowledge

UNIT I: Natural Disasters — 12 Hours

Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, Volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion

UNIT II: — 12 Hours

Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

UNIT III: — 12 Hours

Disaster Management - Preparedness through (IEC) Information, education & Communication Pre-disaster stage(mitigation), Effect to mitigate natural disaster at national and global levels. International strategy for disaster reduction.

UNIT IV: — 12 Hours

Emerging approaches in Disaster Management-Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media.
Technology, Definition, Brief History, Technological Society, Technology and the Environment, Emerging Technologies in Disaster Mitigation, Remote Sensing, GIS, Disaster Mapping, Aerial Photography, Land Use Zoning, Emergency Communication, Wireless and Radio, HAM Radio, Worst Scenario Analysis, Emergency Operations Centre, Cost Benefit Analysis, Environment Impact Assessment

UNIT V: — 12 Hours

Central, state, district and local administration, Armed forces in disaster response; Disaster response; Police and other organizations

Text Books

1. Khanna,B.K.,2005.Disasters: All you wanted to know about, New India Publishing Agency ,New Delhi.
2. Edwards, B.,2005. Natural Hazards, Cambridge University Press, U.K.
3. Chakraborty, S.C.,2007. Natural Hazards and Disaster Management, Pargatishil Prokashak, Kolkata.

Reference books

1. Sahni, P.,2002.DisasterMitigationExperiencesandReflections,PrenticeHallofIndia,NewDelhi.
2. Prashant K. Srivastava, Sudhir Kumar Singh, U. C. Mohanty, Tad Murty,2020. Techniques for Disaster Risk Management and Mitigation

Web references

https://books.google.com
http://cbseacademic.nic.in

CONTROL COPY ATTESTED
Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam

OE 20CEM01 Air Pollution

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20CEM01.1	Identify different types of pollution and their sources
20CEM01.2	Identify the meteorological components
20CEM01.3	Outline the impact on local and global effects of air pollution on human, materials, properties and vegetation
20CEM01.4	Explain various types of air pollution control equipment and their working principles
20CEM01.5	Understand sampling methods and monitoring of air pollution

Unit I: Introduction — 9 Hours

Definition of air pollution, Sources and causes of air pollution, Types and classification of air pollution - Natural contaminants, Particulate, Gases and Vapors, Primary and secondary air pollutants

Unit II: Meteorology — 9 Hours

General atmospheric circulation, Atmospheric stability, Effect of meteorology on Plume dispersion, Inversion, Wind profiles and stack plume patterns

Unit III: Effects of Air Pollution — 9 Hours

Effects of air pollution on human beings, plants and animals and properties. Global effects-Green house effect, Ozone depletion, heat island, dust storms, Automobile pollution sources and control, Photochemical smog

Unit IV: Air Pollution Control — 9 Hours

Particulate matter and gaseous pollutants - Settling chambers, Cyclone separators, Scrubbers, Filters & Electrostatic precipitator

Unit V: Air Quality Sampling and Monitoring — 9 Hours

Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants

Text Books

1. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, "Environmental Engineering", Mc Graw Hill, International Edition, 2017
2. Rao M. N., Rao H. V. N., "Air Pollution", 1st Edition, Mc Graw Hill, 2004

Reference Books

1. Martin, Crawford, "Air Pollution Control Theory", Tata McGraw Hill, New Delhi, 1986
2. Bulkeley, H., "Cities and Climate Change", Routledge, London, 2013
3. Rao C. S., "Environmental Pollution Control Engineering," Wiley Eastern Limited, New Delhi, 1992
4. Gurjar, B. R., Molina, L., Ojha, C. S. P., "Air Pollution: Health and Environmental Impacts", CRC Press, 2010

Web References

1. http://www.epa.gov
2. http://www.indiaenvironmentportal.org.in
3. http://nptel.iitm.ac.in
4. http://www.filtersource.com
5. https://dgserver.dgsnd.gov

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20CSM01 E-Commerce

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20CSM01.1	Explain the role of new internet economy in E-Commerce
20CSM01.2	Explain the architecture of World Wide Web
20CSM01.3	Describe the E-Commerce process models and E-Payment System
20CSM01.4	Illustrate the network models in customization and internal commerce
20CSM01.5	Explain the E-commerce models in advertising and marketing of business

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Introduction **9 Hours**

Electronic Commerce- Architectural Frame work, anatomy of E-commerce applications, E-Commerce consumer applications, E-commerce organization applications

E-Commerce and media convergence

Unit II: World Wide Web & Network security **9 Hours**

Client-Server Network security, World Wide Web (WWW) as the architecture, Web background: Hypertext Publishing, Technology behind the web, Security and the web,

Emerging Client-Server Security Threats

Unit III: E-Payment Systems **9 Hours**

Consumer Oriented Electronic Commerce- Mercantile Process models, E-Payment systems- Digital Token-Based, smart cards, credit cards, risk and E- Payment systems

Designing E-Payment Systems

Unit IV: EDI Implementation and Intra organizational E-Commerce **9 Hours**

Standardization and EDI, EDI Software implementation, Value added networks, Intra organizational E-Commerce- Workflow Automation and Coordination, Customization and Internal Commerce, Supply chain management (SCM).

EDI Envelope for Message Transport

Unit V: Advertising and Marketing on the Internet **9 Hours**

Corporate Digital Library- Document Library, digital document types, corporate data warehouses, Advertising and marketing- Information based marketing, Advertising on Internet, online marketing process, market research.

Charting the Online Marketing Process

Text Books

1. Ravi Kalakota and Andrew B. Whinston., "Frontiers of electronic commerce", First Edition, Pearson Education , 2011
2. Jaiswal S., " E-Commerce", Second Edition,Galgotia,2010

Reference Books

1. Dave Chaffey., "E-business & E- commerece management- strategy, implementation and Practice", Fifth edition, Pearson Education, 2015.
2. Kenneth C, "E-Commerce: Business.Technology.Society", First Edition, Pearson Education, 2008

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology

Web References

1. https://www.techopedia.com/definition/18226/corporate -data-warehouse-cdw
2. http://ecmrce.blogspot.com
3. http://data.conferenceworld.in

Internal Assessment Pattern

CognitiveLevel	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	50	50
L2	50	50
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write any four important E-Commerce organization Applications
2. Write about any four requirements of EDI
3. Write short notes on Risks in E-Payment systems
4. Write short notes on Market research
5. What are the factors for design of electronic payment system?

L2: Understand

1. How enterprise resource planning and supply chain management software differs in their goals and implementations
2. How product or service customization is adopted in intraorganizational commerce?
3. Explain Merchantile's model from the Merchant's perceptive
4. Explain in detail about E-Payment systems
5. Discuss about mercantile transaction using credit cards

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531 173

Chairman
Board of Studies (CSE)

20MEM01 Biomaterials

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MEM01.1	Classify various biomaterials
20MEM01.2	Identify the Metallic implant materials
20MEM01.3	Describe the failure modes of implant materials
20MEM01.4	Apply Ceramic implant materials
20MEM01.5	Develop the Biocompatibility & Toxicological properties in of biomaterials

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create,DoK: Depth of Knowledge

Unit I: Introduction **09 Hours**

Definition of biomaterials, requirements & classification of biomaterials, Comparison of properties of some common biomaterials. Effects of physiological fluid on the properties of biomaterials. Biological responses (extra and intra- vascular system). Surface properties of materials.

physical properties of materials, mechanical properties.

Unit II: Metallic implant materials **09 Hours**

Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking. Host tissue reaction with bio metal, corrosion behavior and the importance of passive films for tissue adhesion. Hard tissue replacement implant: Orthopedic implants, Dental implants. Soft tissue replacement implants: Percutaneous and skin implants.

Vascular implants, Heart valve implants-Tailor made composite in medium.

Unit III: Polymeric implant materials **09 Hours**

Polyolefin's, polyamides, acrylic polymers, fluorocarbon polymers, silicon rubbers, acetyls. (Classification according to thermo sets, thermoplastics and elastomers).Viscoelastic behavior: creep-recovery, stress-relaxation, strain rate sensitivity. Importance of molecular structure, hydrophilic and hydrophobic surface properties, migration of additives (processing aids), aging and environmental stress cracking. Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes, Biopolymers in controlled release systems.

Synthetic polymeric membranes and their biological applications.

Unit IV: Ceramic implant materials **09 Hours**

Definition of bio ceramics. Common types of bio-ceramics: Aluminum oxides, Glass ceramics, Carbons. Bio resorbable and bioactive ceramics. Importance of wear resistance and low fracture toughness. Host tissue reactions: importance of interfacial tissue reaction (e.g. ceramic/bone tissue reaction). Composite implant materials: Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement
(short and long fibers, fibers pull out).

Polymers filled with osteogenic fillers (e.g. hydroxyapatite). Host tissue reactions.

Unit V: Biocompatibility & Toxicological screening of biomaterials **09 Hours**

Definition of biocompatibility, blood compatibility and tissue compatibility. Toxicity tests: acute and chronic toxicity studies (in situimplantation, tissue culture, haemolysis, thrombogenic potential test, systemic toxicity, intracutaneous irritation test), sensitization.

carcinogenicity, mutagenicity and special tests.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books

1. Biomaterials Science: An Introduction to Materials in Medicine, By Buddy D. Ratner, et. al. AcademicPress, San Diego, 1996.
2. Sujata V. Bhat, Biomaterials, Narosa Publishing House, 2002.
3. J B Park, Biomaterials – Science and Engineering, Plenum Press, 1984.
4. Comprehensive structural interity, Vol.9: Bioengineering Editors: Mithe, Ritchie and Karihalo, ElsevierAcademic Press, 2003.

Reference books

1. Biomaterials Science: An introduction to Materials in Medicine, Edited by Ratner, Hoffman, Schoet and Lemons, Second Edition: Elsevier Academic Press, 2004.

Web References

1. https://nptel.ac.in/content/syllabus_pdf/113104009.pdf
2. RBM603 BIOMATERIALS Syllabus free download
3. UP Technical University BE BM Syllabus
4. RBM603 Syllabus, BM Unit-wise Syllabus – BE 6th Semester

Internal Assessment Pattern

CognitiveLevel	InternalAssessment#1(%)	InternalAssessment#2(%)
L1	10	10
L2	30	30
L3	60	60
Total(%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write about classification of biomaterials?
2. State the applications of biomaterials?
3. List the advantages and disadvantages biomaterials?
4. Write about Effects of physiological fluid on the properties of biomaterials?
5. Define Importance of stress-corrosion cracking?

L2: Understand

1. Surface properties of materials
2. Comparison of properties of some common biomaterials
3. Corrosion behavior and the importance of passive films for tissue adhesion
4. Visco elastic behavior: creep-recovery, stress-relaxation, strain rate sensitivity

L3: Apply

1.Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement (short and long fibers, fibers pull out). Polymers filled with osteogenic fillers (e.g. hydroxyapatite). Host tissue reactions

CONTROLCOPYATTESTED

Chairman
Board of Studies (ME)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20EEM01 Basic Control Systems

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20EEM01.1	Determine time response specifications of second order systems
20EEM01.2	Determine error Constants for different types of input signals
20EEM01.3	Understand various levels of illuminosity produced by different illuminating sources.
20EEM01.4	Design different lighting systems by taking inputs and constraints in view for different layouts.
20EEM01.5	Understand the speed/time characteristics of different types of traction motors.

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Unit I: Introduction to Control Systems — 09 Hours

Classification of control systems, open loop and closed loop control systems and their differences, Feedback characteristics, transfer function of linear system, differential equations of electrical networks, translational and rotational mechanical systems

Differences between Closed loop and Open Loop Control Systems

Unit II: Time Response Analysis — 09 Hours

Standard test signals time response of first and second order systems time domain specifications, steady state errors and error constants

Definitions of Time domain Specifications

Unit III: Stability — 09 Hours

The concept of stability, Routh's stability criteria – Limitations of Routh's stability, effect of addition of poles and zeros, introduction to root locus.

Basics of Routh's Criteria

Unit IV: Frequency response — 09 Hours

Introduction to frequency domain specifications, basics of bode plot, Phase margin, Gain Margin. Introduction to Polar plots, its phase margin and gain margin. Introduction to Nyquist stability criteria

Definitions of Frequency domain Specifications

Unit V: State Space Analysis — 09 Hours

Concepts of state, state variables and state model, state space representation of transfer function, diagonalization, solving the time invariant state equations, State Transition Matrix and its Properties, concepts of controllability and observability.

Basics of Matrix operations

Text Books

1. I.J.Nagarath and M.Gopal, "Control Systems Engineering", Newage International Publications, 5th Edition, 2014.
2. Kotsuhiko Ogata, Modern Control Engineering, Prentice Hall of India, 5th edition, 2014

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. S.Palani, "Control Systems Engineering", Tata Mc Graw Hill Publications, 3rd Edition, 2012.

Web References

1. https://nptel.ac.in/courses/107/106/107106081/
2. https://www.tutorialspoint.com/control_systems/control_systems_introduction.htm

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1(%)	Internal Assessment #2(%)
L1	30	30
L2	40	30
L3	30	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels
L1: Remember

1. What are the various standard test signals?
2. Define concept of observability.
3. What is state transition matrix? Write its properties.

L2: Understand

1. Explain how Routh Hurwitz criterion can be used to determine the absolute stability of a system
2. Explain about feedback characteristics.
3. Describe the effect of addition of poles and zeros.

L3: Apply

1. The characteristic polynomial of a system is.s5+2s6+3s5+s4+5s3+2s2+s+7=0. Determine the the stability of the system using Routh's stability criteria.
2. Determine range of K for stability of unit feedback system whose open loop transfer function is G(s) = K/s(s+1)(s+2).
3. For a system having G(s) = 25/s(s+10) and units negative feedback, find its time response specifications.

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20ECM01 Semiconductor Devices & Circuits

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20ECM01.1	Classify different types of semiconductors with energy band diagrams
20ECM01.2	Explain the operation and characteristics of PN junction diode and special diodes
20ECM01.3	Classify and Analyze different types of rectifiers
20ECM01.4	Demonstrate the flow of current in different configurations of the transistor & the concept of DC biasing and transistor stabilization
20ECM01.5	Analyze and Design the small signal low frequency amplifiers

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Semiconductor Physics **09 Hours**

Atomic structure, Neil Bohr's atomic theory, definition of conductors, insulators and semiconductors, energy level diagrams. Semiconductors: Classification and types, intrinsic and extrinsic, P-type and N-type semiconductors, majority and minority carriers, recombination, effect of temperature.

Fermi Level, Charge Densities in Semiconductors

Unit II: Semiconductor Diodes and Special Diodes **09 Hours**

Formation of depletion region, barrier potential, reverse breakdowns, PN junction as diode, symbol, biasing modes, V-I characteristics, diode current equation, effect of temperature on diode current, ideal diode. Special Diodes: Zener diode, Photo Diode, LED - Working, characteristics and applications.

Diode Switching times, Varactor diode, Tunnel Diode

Unit III: Rectifiers and Filters **09 Hours**

Half wave Rectifier, Full wave rectifier, Bridge Rectifier - Operation, Input and output wave forms. Filters: Inductor filter, Capacitor filter, π filter, Comparison of various filter circuits in terms of ripple factors.

LC filter, Multi section π filter

Unit IV: Transistors and Biasing Techniques **09 Hours**

Junction transistor, Transistor current components, Transistor configurations, Transistor as an amplifier, characteristics of transistor in CB and CE configurations. Need for biasing, operating point, Load line analysis, fixed bias and self bias, Stabilization against variations in VBE, Ic, and β, Stability factor, Thermistor and Sensistor bias compensation techniques, Thermal runaway.

Ebers-Moll model of a transistor, Punch through/reach through, Thermal stability

Unit V: Small Signal Low Frequency Transistor Amplifier Models **09 Hours**

BJT: Two port network, Transistor hybrid model, Determination of h-parameters, Generalized analysis of transistor amplifier model using h-parameters, Exact and approximate analysis of CB and CE amplifiers, Comparison of transistor amplifiers.

Effects of emitter bypass capacitor (Ce) on low frequency response

Textbooks

1. Lal Kishore K., "Electronic Devices and Circuits", 4th Edition, Bright Sky Publications, 2016
2. Millman J. and Christos C. Halkias, "Electronic Devices and Circuits", 4th Edition, Tata Mc-Graw Hill, 2010
3. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2009
4. Boylestad R. L. and Louis Nashelsky, "Electronic Devices and Circuits", 10th Edition, Pearson Publications,2009

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Reference Books

1. Salivahanan S., Suresh Kumar and Vallavaraj N. A., "Electronic Devices and Circuits", 2nd Edition, Tata Mc-Graw Hill, 2012
2. Donald A. Neamen, "Electronic Circuit Analysis and Design", 3rd Edition, Tata McGraw Hill, 2010
3. Millman J. and Halkias C., "Integrated Electronics", 2nd Edition, Tata Mc-Graw Hill, 2009
4. Singh B. P. and Rekha, "Electronic Devices and Integrated Circuits", 3rd Edition, Pearson publications, 2009
5. Mittal G. K., "Electronic Devices and Circuits", 3rd Edition, Khannan Publishers, 2008

Web Resources

1. www.elprocus.com/p-n-junction-diode-theory-and-working/
2. http://fourier.eng.hmc.edu/e84/lectures/ch4/node3.html
3. http://nptel.ac.in/courses/117103063/11

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	35
L2	40	35
L3	20	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Semiconductor
2. What is ideal diode?
3. List any three applications of Zener diode
4. What is rectifier?
5. Define ripple factor
6. What is BJT?
7. What is thermal runaway?
8. Define stability

L2: Understand

1. Describe the formation of P type semiconductor
2. Draw and explain V-I characteristics of PN junction diode
3. Describe the construction and operation of Photo diode
4. With neat circuit diagram describe the operation of bridge rectifier
5. Explain, why Zener diode is used in reverse bias with the help of characteristics
6. Draw and explain the input and output Characteristics of Common base configuration
7. With neat sketches explain the V-I characteristics of NPN transistor in common emitter configuration
8. Write a short note on Thermal Runaway
9. Explain thermister compensation technique

L3: Apply

1. Show that the efficiency of half wave rectifier is 40.6%
2. Show that the efficiency of full wave rectifier is 81.2%
3. Obtain an expression of stability factor for fixed bias
4. With suitable expressions explain self bias of BJT
5. Obtain the expressions for voltage gain and current gain of small signal low frequency common emitter amplifier

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (ECE)

20AIM01 Fundamentals of Neural Networks

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20AIM01.1	Describe the concepts of artificial neural networks
20AIM01.2	Compare functions of biological and artificial neural networks
20AIM01.3	Explain the architecture and functioning of Single Layer feed forward networks
20AIM01.4	Describe architecture and functioning of Multi-layer networks
20AIM01.5	Explain associative memory networks

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit 1: Introduction to Neural Networks **9 hours**

Introduction - Humans and Computers - Organization of the Brain – Biological Neuron - Biological and Artificial Neuron Models - Characteristics of ANN - McCulloch-Pitts Model - Historical Developments - Potential Applications of ANN

Unit 2: Essentials of ANN **9 hours**

Artificial Neuron Model - Operations of Artificial Neuron - Types of Neuron Activation Function - ANN Architectures - Classification Taxonomy of ANN – Connectivity - Learning Strategy (Supervised, Unsupervised, Reinforcement) - Learning Rules

Unit 3: Single Layer Feedforward Networks **9 hours**

Introduction - Perceptron Models: Discrete - Continuous and Multi-Category - Training Algorithms: Discrete and ContinuousPerceptron Networks – Limitations of the Perceptron Model

Unit 4: Multi - Layer Feedforward Networks **9 hours**

Generalized Delta Rule - Derivation of Backpropagation (BP) Training - Summary of Backpropagation Algorithm - Kolmogorov Theorem, Learning Difficulties and Improvements

Unit 5: Associative Memory Networks **9 hours**

Paradigms of Associative Memory - Pattern Mathematics - Hebbian Learning - General Concepts of Associative Memory - Bidirectional Associative Memory (BAM) Architecture - BAM Training Algorithms: Storage and Recall Algorithm - BAM Energy Function

Text Books

1. S. N. Sivanandam, S. Sumathi, S. N. Deepa, "Introduction to Neural Networks Using MATLAB 6.0", Tata McGraw-HillCompanies, 2006
2. Simon Haykin, "Neural Networks: A Comprehensive Foundation", Second Edition, Pearson Education, Asia
3. James A. Freeman, David M. Skapura, "Neural Networks: Algorithms, Applications, and Programming Techniques", Addison-Wesley Publishing Company

Reference Books

1. B. YagnaNarayana, "Artificial Neural Networks", Prentice Hall India, 2013
2. Satish Kumar, "Neural Networks: A classroom approach", Tata McGraw Hill, 2004.
3. Laurene Fausett, "Fundamentals of Neural Networks", Pearson Education

Web Resources

1. https://www.tutorialspoint.com/artificial_neural_network/index.html

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1	Internal Assessment #2
L1	50	50
L2	50	50
Total (%)	100	100

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

5. Define Neural Computing
6. Define ANN and Neural Computing
7. List any 4 design parameters in the design of Artificial Neural Network
8. What kinds of transfer functions can be used in each layer?
9. Define Pattern Association
10. What is Adaline Model?
11. What are the types of Learning?
12. What is simple artificial neuron?
13. List any 4 applications of Artificial Neural Network
14. Define Delta Learning rule

L2: Understand

4. Describe on the process of assigning and updating weights in a artificial neural network
5. What are the design steps to be followed for using ANN for your problem?
6. Describe least square algorithm with example
7. Why XOR Problem cannot be solved by a single layer perceptron? Write an alternative solution for it
8. Explain Back Propagation Network with necessary diagrams and equations
9. Write the differences between Hetero Associative Memories and Interpolative Associative Memories

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE-AIML)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20DSO03 Introduction to R Programming

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20DSO03.1	Understand the basic concepts of R programming
20DSO03.2	Understand about Scalars and Vectors
20DSO03.3	Implement Lists and data Frames
20DSO03.4	Implement Tables and Statistical Distributions
20DSO03.5	Implement Functions in R programming

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create DoK: Depth of Knowledge

Unit I: Introduction **9 Hours**

Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

Variable Scope & Default Arguments

Unit II: Control Structures And Vectors **9 Hours**

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes

Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

Higher-Dimensional Arrays

Unit III: Lists **9 Hours**

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations

Merging Data Frames

Unit IV: Factors and Tables **9 Hours**

Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Lik Operations on Tables, Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

aggregate () Function, Set Operations

Unit V: Functions **9 Hours**

Scripts to Functions, Making the Script, Transforming the Script, Using the Function, Reduce the number of Lines, Adding more Arguments, Dots, Using Functions as Arguments, Crossing the Boarders, Choices with If-Else Statements, vectorizing Choices, Looping Through Values

Coping and Scoping of Functions

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Text Books

1. Norman Matloff, " The Art of R Programming- A Tour of Statistical Software Design ", 2011
2. Roger D. Peng, " R Programming for Data Science " , 2012

Reference Books

1. Garrett Grolemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions andSimulations", 1st Edition, 2014
2. Andrie de Vries, Joris Meys, "R For Dummies", 2nd Edition, 2015

Web References

1. https://swayam.gov.in/nd1_noc19_ma33/preview
2. https://data-flair.training/blogs/object-oriented-programming-in-r/
3. http://www.r-tutor.com/elementary-statistics
4. https://www.tutorialspoint.com/r/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	30	40
L3	40	40
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write about vectors in R
2. Write any three type conversions in R
3. What is a data structure in R?
4. Write any two Boolean operators in R
5. Write any two linear vector algebra operations

L2: Understand

1. Explain the importance of data frame
2. How to apply same functions to all rows and columns of a matrix? Explain with example
3. Explain about Finding Stationary Distributions of Markov Chains
4. Describe R functions for Reading a Matrix or Data Frame from a File
5. Explain different matrix operation function in R

L3: Apply

1. Implement binary search tree with R
2. Write R script to create a line graph
3. Create a R language code to generate first n terms of a Fibonacci series
4. Apply R program to implement quicksort
5. Apply R code to the function by using if else
   commandf(x) = x if x<1/2
   = (1-x) if 1/2<x<1
   = 0 otherwise

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE- DS)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20SHM01 Psychology

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20SHM01.1	Focuses on classical/operant conditioning, reinforcement schedules, and observational learning to help students obtain an understanding of learning and conditioning
20SHM01.2	Understand the properties of Senses
20SHM01.3	Understand the state of Consciouness, Sleep & Dreams
20SHM01.4	Understand the importance of learning
20SHM01.5	Understanding the components of memory, language, cognition, problem solving, and the many forms of memory will be the focus of this course

Unit I: Introduction

9 Hours

Definition of Psychology, Psychology as a Science: Methods of psychology, Different schools of Psychology and modern perspectives of psychology - Scope and branches of psychology

Unit II: Sensation and Perception

9 Hours

General Properties of Senses, subliminal stimuli, Selective Attention, Physiological correlates of Attention, Internal influences on Perception - Learning, Set, Motivation and Emotion, External influences on perception - Figure Ground separation, Movement, organization, illusions, Perceptual constancies, Depth perception, Binocular and Monocular Depth, Perception; Perceptual defense and perceptual vigilance, sensory deprivation, sensory bombardment

Unit III: Consciousness

9 Hours

Fundamental Process, Active and passive roles of consciousness, Sleep and Dreams, Meditation, Hypnosis, Psi Phenomena, Alternate states of consciousness, Natural and Drug induced

Unit IV: Learning

9 Hours

Definition of learning, Theories of learning, Classical conditioning, Operant conditioning, Cognitive Learning, Social Learning

Unit V: Memory

9 Hours

Meaning and nature of memory, Theories of memory: Information processing theories - sensory register, short term memory, rehearsal; Levels of processing theories, Long term memory - organizations, TOT, semantic and episodic memory, encoding and storing long term memories, role of organization, role of imagery, role of constructive processes; Retrieval from long term memory, Forgetting- Motivated forgetting, Interference, Decay through disuse, Techniques of improving memory

Text Books

1. Morgan C. T., King, R. A., Weisz, J. R. and Schopler J., Introduction to Psychology, 7th Edition, Singapore: Mcgraw - Hill, 2007
2. Myers D. G., Psychology, 5th Edition, Worth Publishers: New York, 2004
3. Kalat J., Introduction to Psychology, 8th Edition, Wordsworth Pub. Co., 2007

Reference Books

1. Feldman R. S., Understanding Psychology, 6th Edition, Tata McGraw - Hill, New Delhi, 2006
2. Kosslyn S. M. and Rosenberg R. S., Psychology in Context, 3rd Edition, Pearson Education Ltd., 2006

Web References

1. https://www.all-about-psychology.com/learn-psychology.html
2. https://study-uk.britishcouncil.org/plan-studies/choosing-course/subjects/psychology
3. https://www.youtube.com/watch?v=k-P1BEk6hhE

CONTROL COPY ATTESTED

Chairman
Board of Studies (BS&H)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20SHM02 Statistical Methods

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20SHM02.1	Demonstrate statistical techniques in real life problems
20SHM02.2	Gain statistical knowledge on measures of central tendency and variation
20SHM02.3	compute sample space, event, relative frequency, probability, conditional probability, independence
20SHM02.4	familiar with some standard discrete and continuous probability distributions
20SHM02.5	Understand the theory of sampling techniques and their practical applications

Unit I: Introduction — 9 Hours

Definition and classification of statistics, Stages in statistical investigation, Definition of some basic terms, Applications, uses and limitations of statistics, Scales of measurement, methods of data collection and presentation, Diagrammatic and graphical presentation of data

Unit II: Treatment of Data — 9 Hours

Frequency distributions, stem-leaf displays, measures of central tendency (mean,median,mode,quantiles), measures of variation (range, quartile deviation, mean deviation, standard deviation), standard scores, moments (about origin and mean) skewness and kurtosis

Unit III: Elementary Probability — 9 Hours

Introduction, definitions of random experiment, samplespace, events, types of events, countingrules, permutation and combinations rule, definition of probability in several approaches, some probability rules, conditional probability and independence, bayes theorem

Unit IV: Probability Distributions — 9 Hours

Definition of random variables and probability distributions, Introduction to expectation: mean and variance of a random variable, Common discrete probability distributions: Binomial and Poisson, Common continuous probability distributions: normal, t and chi-square distributions

Unit V: Sampling Techniques — 9 Hours

Basic concepts: population, sample, parameter, statistic, sampling frame, sampling units , Reasons for sampling, Sampling and non sampling errors, probability sampling techniques (simple, stratified, systematic), Non probability sampling methods

Text Books

1. Bluman A. G., Elementary Statistics: A Step by Step Approach, 2nd Edition, Wm. C. Brown Communications, Inc., 1995
2. Spiegel M. R. and Stephens L. J., Schaum's Outline of Statistics, Schaum's Outline Series , 4th Edition, 2007
3. Gupta C.B. and Gupta, V., An Introduction to Statistical Methods, Vikas Publishing House, Pvt. Ltd., India, 2004

Reference Books

1. Richard A., Gupta C. B.", Probability and Statistics for Engineers", Miller & Fruend ,Pearson's Edition, 2010
2. Freund, J. E. and Simon G. A., Modern Elementary Statistics, 9th Edition, 1998
3. Snedecor G.W. and Cochran W. G.,Statistical Methods, 7th Edition, 1980
4. David S. M., McCabe P. and Craig B., Introduction to the Practice of Statistics, 6th Edition, W. H. Freeman, 2008

Web References

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://archive.nptel.ac.in/courses/111/105/111105077/
3. http://www.nitttrc.edu.in/nptel/courses/video/111105077/L10.html

CONTROL COPY ATTESTED

Chairman
Board of Studies (BS&H)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20MBM01 General Management

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MBM01.1	Understand basic functions of management
20MBM01.2	Understand the planning process and strategic formulation
20MBM01.3	Know the nature of the organization process
20MBM01.4	Understand the staffing objectives and functions
20MBM01.5	Understand the directing process and controlling methods

Unit I: Management Introduction

09 Hours

Concept, Nature, Process and Significance of Management, Managerial Roles (Mintzberg), An Overview of Functional areas of Management - Marketing, Finance, Production, HRM, IT,R & D, Development of Management Thought - Classical, Neo – classical

Unit II: Planning

09 Hours

Process and Types, Decision - making concept and process, Bounded rationality, Management by objectives, Corporate Planning - Environment analysis and Diagnosis, Strategy Formulations

Unit III: Organizing

09 Hours

Concept, Nature, Process and Significance, Authority and Responsibility relationships - Delegation, Decentralisation, Departmentation basis and formats (Project and Matrix), Formal and Informal Organisation, Changing patterns in organisation structures in the knowledge economy

Unit IV: Staffing

09 Hours

Human Resource Planning, Objectives, Factors influencing Human Resource Planning, HR Planning Process, Job Analysis, Recruitment, Process and Sources of Recruitment, Selection, Process of selection and Techniques, Errors in selection Retention of employees

Unit V: Directing and Control

09 Hours

Motivating and Leading People at work - basic concepts, Communication - nature, process, networks and barriers, Effective Communication Managerial Control - Concept and process, Designing an Effective Control System, Techniques –Traditional and Modern (PERT and CPM)

Note: Discuss case studies from every unit

Text Books

1. Singh B. P. and Chhabra T. N., Management Concepts and Practices, Dhanpat Rai, New Delhi
2. Singh B. P. and Singh A. K., Essentials of Management, Excel Books, New Delhi
3. Dwivedi R. S. Management – An Integrated Approach, National Publishing House

Reference Books

1. Weihrich, Heing and Harold Koontz, Management a Global Perspective, Mc - Graw Hill, New Delhi
2. Stoner, James A. F., Freeman A. E. and Gilbert D. A., (Jr.), Management, Prentice Hall of India Pvt. Ltd.
3. Ivancevich, John M., Donnelly J. H. and Gibson J. L., Management: Principles and Functions, AITBS, New Delhi
4. Luthans, Fred, Introduction to Management, Mc - Graw Hill
5. Jones, Gareth R and Jennifer M., George, Contemporary Management, Tata Mc-Graw Hill

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://onlinecourses.swayam2.ac.in/nou20_cs14/

CONTROL COPY ATTESTED

Chairman

Board of Studies (MBA)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

MI 20MBM02 Human Resource Planning 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MBM02.1	Understand staffing concept Write sound job descriptions, job specifications
20MBM02.2	Develop a structured, job - related interview for talent acquisition across all the verticals
20MBM02.3	Know the training and development strategies of a firm
20MBM02.4	Understand compensation management and performance management process
20MBM02.5	Understand the role of trade unions in a firm

Unit I: Introduction 09 Hours

Human resource planning concepts, Concept of Staffing, Factors affecting Staffing, Staffing Process. Job Analysis -- Concept, Job - Specifications, Job - Description, Process and Methods, Advantages of Job Analysis. Job Designing: Introduction, Definition, Modern Techniques, Factors affecting Job Design

Unit II: Talent Acquisition 09 Hours

Recruitment and Selection: Needs-recruitment process - alternative to recruitment, Concept of Selection, Criteria for Selection, Process. Screening – Pre and Post Criteria for Selection, Interviewing – Types and Guidelines for Interviewer & Interviewee, Types of Selection Tests, Selection Hurdles and Ways to Overcome Them, Current trends in Recruitment and Selection

Unit III: Training & Development 09 Hours

Induction – Concept, Types - Formal/Informal Induction, Advantages of Induction, Training Vs Development, Need, Process of Training, Methods of Training, Development techniques, need for development, Career Planning, training and development policies, linking training and development to company's strategy

Unit IV: Compensation and Performance Management 09 Hours

Compensation management process, Forms of pay, Financial and non – financial compensation - Factors influencing Wage fixation, Performance Appraisal System, Methods of Performance Appraisal, Performance management process

Unit V: Managing Industrial relations 09 Hours

Managing Industrial Relations – Components of IR - Trade Unions, Functions of Trade Union – Employee Participation – Importance and Schemes, Collective Bargaining – Grievance Redressal, Industrial Dispute – Settlement mechanism

Note: Discuss case studies from every unit

Text Books

1. Subba Rao P., Human Resource Management, Himalaya, Mumbai
2. Aswathappa K., Human Resources and Personnel Management, Tata McGraw-Hill
3. Armstrong M., Performance Management: Key Strategies and practical Guidelines, Kogan Page, London

Reference Books

1. Gary Dessler, Human Resources Management. Pearson Publication
2. Mammoria C. B., Personnel Management
3. Recruitment and Selection: Theories and Practices, Dipak Kumar Bhattacharyya, Cengage, India

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://onlinecourses.swayam2.ac.in/nou20_cs14/

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (MBA)

ME 20CEM02 Climate Change Mitigation and Adaptation

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20CEM02.1	Understand the concept of climate change scenarios
20CEM02.2	Outline the causes for the changes in the climate
20CEM02.3	Identify the impacts of climate change on various sectors
20CEM02.4	Adopt the methodologies in finding the changes in climate
20CEM02.5	Demonstrate the climate change adaptation and mitigation options forsecuring sustainable development

Unit I: Fundamentals of Climate Change — 9 Hours

Greenhouse gases, radiative forcing potential, carbon dioxide equivalency, natural climate forcing factors, emissions sources and sinks

Unit II: Observed Changes and its Causes — 9 Hours

Observation of Climate Change – Changes in patterns of temperature, precipitation and sea level rise – Observed effects of Climate Changes – Patterns of Large Scale Variability – Drivers of Climate Change –Evidences of Changes in Climate and Environment – on a Global Scale and in India.

Unit III: Impacts of Climate Change — 9 Hours

Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios -Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

Unit IV: Clean Technology and Energy — 9 Hours

Clean Development Mechanism -Carbon Trading- examples of future Clean Technology -Biodiesel – Natural Compost – Eco-Friendly Plastic – Alternate Energy – Hydrogen – Biofuels -Solar Energy – Wind – Hydroelectric Power.

Unit V: Adaptation and Mitigation Responses — 9 Hours

Policy, Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC, Concept framework of urban adaptation to climate change, Mitigation Efforts in India and Adaptation funding.

Text Books

1. Jan C. Van Dam, "Impacts of Climate Change and Climate Variability on Hydrological Regimes", Cambridge University Press, 2003
2. Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007

Reference Books

1. Pielke, R., "Lifting the taboo on adaptation", Nature 445 (7128), 597-598, 2007
2. Bulkeley, H., "Cities and Climate Change", Routledge, London, 2013

Web References

1. IPCC Fourth Assessment Report – The AR4 Synthesis Report
2. https://www.coursera.org/learn/climate-change-mitigation
3. https://www.usc.edu.au/study/courses-and-programs/courses/course-library/ens/ens204-climate-change-mitigation-and-adaptation

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (CE)

MI 20CSM02 Knowledge Discovery and Databases 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20CSM02.1	Illustrates the basic concepts of database management system
20CSM02.2	Able to summarize mining and preprocessing of data
20CSM02.3	Outline the functionalities of data mining(characterization)
20CSM02.4	Able to explain the processes of association analysis
20CSM02.5	Illustrate the features of various clustering techniques

Unit I: Introduction to Database and Data Warehouse 9 Hours

Overview of Data, What is Database and What is Database Management Base System, Meaning of Entity, Relation, Database Design and ER diagrams, Attributes, DMBS Software's available in Market, Structured Query Language (SQL)
What is Data Warehouse, Types of Data Warehouse, On-Line Analytical Processing (OLAP)

Unit II: Data Mining Introduction 9 Hours

Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, Data Objects and Attribute Types, Statistical Description of Data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and Discretization, Data Visualization

Unit III: Classification 9 Hours

Introduction and Basic Concepts of Classification, What is Training Data, Supervisory Learning and Unsupervisory Learning. Decision Tree Induction, Working of Decision Tree and Building a Decision Tree, Bayes' Theorem, Classification by Back Propagation

Unit IV: Association 9 Hours

What is Association Analysis, Frequent Item Set Generation, Association Rule Generation using Apriori Algorithm.

Unit V: Clustering and Outlier Analysis 9 Hours

What is Cluster Analysis, Different Types of Clusters, Partition Method – K-Means Algorithm, Hierarchical Methods – Hierarchical Cluster Algorithm, Density Based Method- DBSCAN and Outlier Analysis, What is Outlier Analysis?

Practicing Tool: SQL, Weka, Python and R

Text Books

1. Raghurama Krishnan, Johannes Gehrke, "Data base Management Systems", Third Edition, TATA McGraw Hill, 2008.
2. Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson, 2016

Reference Books

1. Alex Berson, Stephen J.Smith, –"Data Warehousing, Data Mining & OLAPll", Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, ShyamDiwakar and V. Ajay, – "Insight into Data Mining Theory and Practicell", Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten, Eibe Frank, – "Data Mining: Practical Machine Learning Tools and Techniques", Second Edition, Elsevier.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web Resources

1. https://www.tutorialspoint.com/
2. https://www.coursera.org/learn/

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20MEM02 Micro Electromechanical Systems

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MEM02.1	Acquire the operation of micro devices, micro systems and their applications
20MEM02.2	Ability to design the micro devices, micro systems using the MEMS fabrication process.
20MEM02.3	Acquire basic approaches for various sensor design
20MEM02.4	Acquire basic approaches for various actuator design
20MEM02.5	Gain the technical knowledge required for computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale devices.

Unit I: Basic Concepts

9 Hours

Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA. MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology

Unit II: Thermal Sensors and Actuators

9 Hours

Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

Unit III: Micro-Opto-Electro Mechanical Systems

9 Hours

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement, MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe-based storage device

Unit IV: Micro Fluidic Systems

9 Hours

Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemo resistors, chemo capacitors chemotransistors, electronic nose (E-nose), mass sensitive chemosensors, fluorescence detection, calorimetric spectroscopy

Text Books

1. Nitaigour Premchand Mahalik, "MEMS" TMH Publishing co.

Reference Books

1. Chang Liu," Foundation of MEMS", Prentice Hall Ltd.
2. Sergey EdwrdLyshevski, "MEMS and NEMS", CRC Press, Indian Edition.
3. Tai-Ran Hsu, "MEMS and Micro Systems: Design and Manufacture", TMH Publishers.
4. Thomas M Adams, "Richard A Layton Introductory MEMS", Springer International Publishers.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://nptel.ac.in/courses/117/105/117105082/

CONTROL COPY ATTESTED

Chairman
Board of Studies (ME)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

VI **20EEM02 Basics of Electrical Machines and Drives** 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20EEM02.1	Understand the basic concepts of different types of electrical drives
20EEM02.2	Able to explain the performance characteristics of electrical drives
20EEM02.3	Study the different methods of starting D.C motors and induction motors
20EEM02.4	Study the conventional and solid-state D.C. drives
20EEM02.5	Study the conventional and solid-state A.C. drives

Unit I: Introduction **9 Hours**

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

Unit II: Drive Motor Characteristics **9 Hours**

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound – single phase and three phase induction motors

Unit III: Starting Methods **9 Hours**

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors

Unit IV: Conventional and Solid-State Speed Control of D.C. Drives **9 Hours**

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system – Using controlled rectifiers and DC choppers –applications.

Unit V: Conventional and Solid-State Speed Control of A.C. Drives **9 Hours**

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme Using inverters and AC voltage regulators – applications

Textbooks

1. Nagrath I.J. & Kothari D.P, "Electrical Machines", Tata McGraw-Hill, 2006
2. Vedam Subrahmaniam, "Electric Drives (Concepts and Applications)", Tata McGraw-Hill, 2010

Reference Books

1. Partab. H., "Art and Science and Utilisation of Electrical Energy", Dhanpat Rai and Sons, 2017
2. Pillai.S.K "A First Course on Electric Drives", Wiley Eastern Limited, 209
3. Singh. M.D., K.B.Khanchandani, "Power Electronics", Tata McGraw-Hill, 2006.

Web References

1. https://link.springer.com/book/10.1007/978-3-319-72730-1
2. https://www.routledge.com/Electrical-Machine-Drives-Fundamental-Basics-and Practice/Franchi/p/book/9781138099395

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

M 20ECM02 Digital Electronics 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20ECM02.1	Utilize theory of Boolean algebra & the underlying features of various number systems
20ECM02.2	Choose the concepts of Boolean algebra for the minimization of switching functions
20ECM02.3	Design of various combinational logic circuits using basic gates
20ECM02.4	Design various simple programmable logic devices to complex programmable logic devices & arrays
20ECM02.5	Develop of various sequential logic circuits

Unit I: Introduction to Boolean Algebra and Switching Functions — 9 Hours

Conversion from One Radix to Another Radix, r - 1 and r's complement, 4 Bit Codes: BCD, Excess - 3, 2421, 84 – 2 – 1, 9's Compliment Code, Gary Code etc. Realization of logic operations for Basic and Universal gates

Unit II: Boolean Minimization — 9 Hours

Minimization of Logic Functions using Boolean Theorems, Minimization of Switching Functions using K-Map Up to 6 Variables, Quine - McCluskey Method, Standard SOP And POS forms

Unit III: Finite State Machines and Bipolar Logic Families — 9 Hours

Design of synchronous FSMs, Asynchronous FSMs. Bipolar Logic Families (ECL), MOS logic families (NMOS and CMOS) and their electrical behaviour

Unit IV: Memory Elements — 9 Hours

Basic structures and realization of Boolean functions using PROM, PAL, PLA, PLD, CPLD, FPGA, Buffers. Logic Implementation using Programmable Devices (ROM, PLA, FPGA)

Unit V: Elementary Combinational and Sequential Digital Circuits — 9 Hours

Adders, Subtractors, Multiplexer, Demultiplexer, Encoder, Decoder, Comparators, Latches, Flip-flops, Shift registers, Counters

Text Books

1. Taub, H. and Schilling, D., "Digital Integrated Electronics", McGraw Hill, 1977
2. Hodges, D.A. and Jackson, H.G., "Analysis and Design of Digital Integrated Circuits", International Student Edition, McGraw Hill, 1983
3. Hill, F.J. and Peterson, G.L., "Switching Theory and Logic Design", John Wiley, 1981
4. Anand Kumar, A., "Switching Theory and Logic Design", 3rd Edition, Prentice Hall International Learning, 2016

Reference Books

1. Kohavi, Z., "Switching and Finite Automata Theory", McGraw Hill,1970
2. Jain, R.P., "Modern Digital Electronics", 3rdEdition, Tata McGraw Hill, 2003
3. Charles Roth, H. and Larry Kinney, L.Jr., "Fundamentals of Logic Design", 7thEdition, Cengage Learning, 2014

Web Resources

1. https://onlinecourses.nptel.ac.in/noc19_ee51/preview
2. https://nptel.ac.in/courses/117/105/117105080/
3. https://gate.iitkgp.ac.in/gate_syllabus.html
4. https://www.ee.iitb.ac.in/web/academics/courses/EE221

CONTROL COPY ATTESTED

Chairman
Board of Studies (ECE)

20AIM02 Machine Learning with Python **3 0 0 3**

At the end of the course, students will be able to

Code	Course Outcomes
20AIM02.1	Solve simple computational problems with python
20AIM02.2	Identify and use appropriate functions to handle data in python code
20AIM02.3	Describe the foundational concepts and terminologies of machine learning
20AIM02.4	Explain various unsupervised learning algorithms
20AIM02.5	Evaluate the performance of the machine learning algorithm

Unit 1: Basics of Python Programming **9 Hours**

Introduction to Python: evolution, features – Python IDE installation – Syntax –Comments – Variables – Data types – Numbers – Strings – Booleans – Operators – Control statements – Data structures: lists, dictionary, tuples, sets, arrays – Functions

Unit 2: Python modules for ML **9 Hours**

NumPy – Pandas – SciPy – Matplotlib

Unit 3: Introduction to Machine Learning **9 Hours**

Machine Learning essentials: data set, mean, median, mode, standard deviation, percentile, data distribution, normal distribution – Types of learning: supervised, unsupervised – Supervised learning: classification and regression – Classification algorithms: KNN, Naïve Bayes classifier, Decision trees, Linear models, SVM

Unit 4: Unsupervised Learning and Pre-processing **9 Hours**

Types of unsupervised learning – Challenges in unsupervised learning – Pre-processing and Scaling – Dimensionality reduction: Principal Component Analysis – Clustering: k-means, agglomerative, DBSCAN

Unit 5: Data Representation and Model Evaluation **9 Hours**

Categorical variables: one-hot encoding – Binning – Discretization – Automatic feature selection – Model evaluation: cross-validation –Grid search – Evaluation metrics and scoring

Text Books

1. Andreas C. Miller and Sarah Guido, "Introduction to Machine Learning with Python – A guide for Data Scientist", O.Reilly Publisher, 1st edition, 2016
2. Peter Flach, "Machine Learning – The art and science of algorithms that make sense of data", Cambridge Press, 2012
3. Tom Michell, "Machine Learning", McGraw Hill, 2014

Reference Books

1. Peter Harington, "Machine Learning in Action", Cengage Publications, 2012
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012

Web Resources

1. https://www.tutorialspoint.com/python
2. https://www.w3schools/python

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies CSE (AI/ML)

MI **20DSM02 Data Management and Analysis** **3 0 0 3**

At the end of the course, students will be able to

Code	Course Outcomes
20DSM02.1	Understand database and be familiar with relational database concepts
20DSM02.2	Demonstrate knowledge of terms, methods of ER Modelling
20DSM02.3	Demonstrate knowledge of trends in data management in Entity Clustering
20DSM02.4	Demonstrate how to acquire, transform, analyse in SQL
20DSM02.5	Demonstrate how to solve problems in accounting using Transactions

Unit I: Database Concepts and Design Concepts **9 Hours**

Why Databases? Data Versus Information, Why Database Design is Important? Evolution of File System Data Processing, Problems with File System Data Processing, Database Systems, Relational Database Model- A Logical View of Data, Keys, Integrity Rules, Relational Algebra, Relationships within the Relational Database, Data Redundancy

Unit II: Entity Relationship (ER) Modeling **9 Hours**

Entities, Attributes, Relationships, Connectivity and Cardinality, Existence Dependence, Relationship Strength, Weak Entities, Relationship Participation, Relationship Degree, Recursive Relationships, Associative Entities, Developing an ER diagram

Unit III: Entity Clustering **9 Hours**

Entity Integrity: Selecting Primary Keys, Natural Keys and Primary Keys, Primary Key guidelines, when to use Composite Primary Keys, when to use Surrogate Primary Keys, Design Cases: Learning Flexible Database Design

Unit IV: Introduction to SQL **9 Hours**

Data Definition Commands, Data Manipulation Commands, SELECT Queries, Additional Data Definition Commands, Additional SELECT Query Keywords, Creating VIEW, Joining Database Tables

Unit V: Transaction Management and Concurrency Control **9 Hours**

What is Transaction? Concurrency Control, Concurrency Control with Locking Methods, Concurrency Control with Time Stamping Methods, Concurrency Control with Optimistic Methods

Text Books

1. Carlos Coronel and Steven Morris," Database systems: Design, Implementation, & Management", 13th Edition. Cengage Learning. ISBN-13: 978-1337627900, 2019
2. Sholom M. Weiss, Nitin Indurkhya, Tong Zhang, and Fred Damerau, "Text Mining: Predictive Methods for Analyzing Unstructured Information", First Edition. Springer, 2020

Reference Books

1. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom, "Database Systems: The Complete Book". 2nd Edition. Pearson, 2001
2. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques". 3rd Edition. Elsevier. 2006

Web Resources

1. https://www.niti.gov.in/verticals/data-management-and-analysis
2. https://searchdatamanagement.techtarget.com/definition/data-management
3. https://nptel.ac.in/courses/110/104/110104094/

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE (DS)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

MI 20SHM03 English for the Media

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20SHM03.1	Understand what media literacy is and its importance
20SHM03.2	Introduce the essential requirements of writing for the media
20SHM03.3	Familiarise the learners with the process of writing for the media
20SHM03.4	Make them familiar with the specific use of english in the field of media
20SHM03.5	Generate interest in various aspects of media and thereby equip them with the basic writing skills required for the same

Unit I: Introduction to Media Literacy — 9 Hours

Understand what media literacy is and its importance, analyze and interpret media messages through guided questions, Practice reading strategies to preview a text & skimming and scanning when you read
Practice reading for the main idea, Define and accurately use content - related vocabulary in course activities and games, Apply comprehension strategies as you read, watch, and listen to a variety of texts and multimedia sources Demonstrate your understanding of these texts and key course ideas through comprehension check quizzes and a discussion board response

Unit II: Writing for the Print Media — 9 Hours

Newspaper: Writing headlines – Analysing newspaper articles- Practising interview skills – Planning and writing a newspaper article
Magazine: Composing magazine covers – Planning the contents of a magazine – Giving instructions for a photo shoot – Planning and writing a true life story

Unit III: Writing for Radio, Television and Film — 9 Hours

Radio: Understanding the language of radio presenters – Understanding the production process – Planning a newslist – Giving post production feedback.
Television: Understanding the pre-production process – Organising a filming schedule – Filming on location – Editing a TV documentary
Film: Writing a screenplay – Pitching successfully – Organizing a shoot – Writing a film review

Unit IV: Writing for Advertisements — 9 Hours

Advertisement : Creating a print advert –Creating a screen advert –Presenting a finished advert- Analysing market trends – Setting up a marketing communication strategy – Organising the relaunch of a product – Evaluating the success of a Relaunch

Unit V: Writing for the New Media — 9 Hours

New Media: Briefing a website designer – Analysing problems and providing solutions – Planning and writing a blog – Creating a podcast- Vlogs – Graphic novel [It is suggested for students to follow the different styles of reporting in various media and to familiarize themselves with the emerging trends in the new media]
Core Reading: Ceramella, Nick and Elizabeth Lee. Cambridge English for the Media. CUP, 2008

Text Books

1. Ryan, Michael and James W Tankard, Writing for Print and Digital Media, McGraw-Hill, 2005
2. Allen, Victoria, Karl Davis et. al., Cambridge Technicals Level 3 Digital Media, Hodder, 2016
3. Hayward, Susan. Cinema studies: The Key Concepts, Routledge, 1996

Reference Books

4. Parthasarathy, Rangaswami, Here is the News! Reporting for the Media.Sterling Publications, 1998
5. Axford, Barrie and Richard Huggins. New Media and Politics, Sage, 2001

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531173

Web References

1. https://www.google.co.in/books/edition/Designing_New_Media/
2. https://www.google.co.in/books/edition/AS_Media_Studies
3. https://www.google.co.in/books/edition/Social_Media_and_Democracy

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology

Chairman
Board of Studies

MI 20SHM04 Statistical Inference

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20SHM04.1	Understand the concept of sampling distribution for large and small samples
20SHM04.2	Calculate the estimator of a parameter using point estimation and bias
20SHM04.3	Compare means and variances of two independent or paired samples using interval estimation
20SHM04.4	Understand the framework of hypothesis testing for carrying out statistical inference
20SHM04.5	Carry out the NP tests with due regard to the assumptions underlying these procedures

Unit I: Sampling Distribution — 9 Hours

Population, Samples, Parameter and statistics, Standard error, Sampling distribution of a statistic, Sampling distribution of mean (known and unknown variance) for large and small samples, Sampling distribution of difference of means, Central limit theorem

Unit II: Point Estimation — 9 Hours

Definition of point estimator, General properties of estimators, Uniformly minimum variance unbiased estimators, Sufficient statistics, Factorization theorem, CR Rao inequality, Cramer - Rao lower bound and UMVUE, Methods of finding point estimators by MLestimation, Method of moments

Unit III: Interval Estimation — 9 Hours

Notion of interval estimation, Review of sampling distributions, Confidence Intervals, Confidence interval for the mean (population variance is known and unknown), Confidence interval for the variance (population mean is known and unknown), Confidence interval for the difference between two means

Unit IV: Testing of Hypothesis — 9 Hours

Statistical hypothesis, null and alternative hypothesis, Simple and composite hypotheses,Test of hypothesis, critical region, type I and type II errors and their probabilities, Simple null hypothesis versus simple alternative, Neyman - Pearson lemma, Examples from the normal population, Tests on the mean, Tests on the variance

Unit V: Non-Parametric Methods — 9 Hours

Introduction, assumptions of Npmethods, Advantages and disadvantages,Testing a hypothesis about median, Test for randomness, sign test, Wilcoxon signed rank test

Text Books

1. Gupta Kapoor V. K., " Fundamentals of Mathematical Statististics", Sultan Chand Publications, New Delhi
2. Rao C. R., Linear Statistical Inference and its Applications, Wiley Eastren Publications

Reference Books

6. Richard A.,Gupta C. B. ", Probability and Statistics for Engineers", Miller & Fruend, Pearson's Edition, 2010
7. Rohatgi V. ,K. Statistical Inference, Dover Publications, 2003
8. Iyengar T. K. V., Krishna Gandhi B., Prasad M. V. S. S. N., "Probability and Statistics", Revised Edition, 2012
9. Wasserman L., "A Concise Course in Statistical Inference", Springer Publications, 2004

Web References

5. https://archive.nptel.ac.in/courses/111/105/111105043/
6. https://onlinecourses.nptel.ac.in/noc20_ma19/preview
7. https://onlinecourses.swayam2.ac.in/cec20_ma01/preview

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531 173.

Chairman
Board of Studies

M 20MBM03 Organizational Behaviour 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MBM03.1	Understand basic concepts of organizational behavior and its nature
20MBM03.2	Understand the basic concepts personality, values and motivation
20MBM03.3	Understand inter personal behavior and its significance
20MBM03.4	Know the group behavior and its dynamics
20MBM03.5	Know about organizational climate, culture and organizational change

Unit I: Introduction 9 Hours

Organisational Behaviour - Concept and Emergence of OB Concept, Nature and Theoretical frameworks, Disciplines contributing to the field of OB, Historical Background - Hawthorne Studies, Psychological foundations

Unit II: Individual Behaviour 9 Hours

Personality, Learning, Values and Attitudes, Perception, Learning-Behaviourist, cognitive and social learning; Stress at work. Motivation -Maslow's Need Hierarchy, Herzberg's Two Factors Theory

Unit III: Inter - Personal Behaviour 9 Hours

Interpersonal communication and Feedback, Transactional Analysis (TA), Johari Window. Managingmis() behaviour at work, Substance abuse, cyber slacking, Aggression, and Violence

Unit IV: Group Behaviour 9 Hours

Group Dynamics, Cohesiveness and Productivity, Management of Dysfunctional groups, Group Decision Making, Organisational Politics.

Leadership- Concept and Styles, Fielder's Contingency Model, House's Path - Goal Theory, Leadership Effectiveness

Unit V: Organizational Process 9 Hours

Organizational Climate: Concept, Determinants, Organization Culture - Concept, Forming, Sustaining, and Changing a Culture, Organizational effectiveness - concept and measurement, Organizational change - resistance and management.

Note: Discuss case studies from every unit

Text Books

1. Singh B. P. and Chhabra T. N., Management Concepts and Practices, Dhanpat Rai, New Delhi
2. Singh B. P. and Singh A. K., Essentials of Management, Excel Books, New Delhi
3. Dwivedi R. S. Management – An Integrated Approach, National Publishing House

Reference Books

1. Udai Pareek, Organizational Behavior, 3rd Edition, Oxford University Press, 2011
2. Subba Rao P., "Management and Organizational Behavior", 3rd Edition, Himalaya Publishing House, 2017
3. Ghuman, K. and Aswathappa K., Management: Concepts, Practice and Cases, Tata Mc - Graw Hill

Web References

8. https://nptel.ac.in/courses/105/102/105102012/
9. https://onlinecourses.swayam2.ac.in/nou20_cs14/

Head of the Department
Dept. of CIVIL Engineering
N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531 173

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20MBM04 Compensation Management & Employee Welfare Laws 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MBM04.1	Understand different pay structures and pay levels
20MBM04.2	Know about wage act 1936 and its implications
20MBM04.3	Understand the factors influence the wage fixation
20MBM04.4	Understand the components of bonus act 1965
20MBM04.5	Understand various incentive plans and international compensation concept

Unit I: Compensation Management **9 Hours**

Compensation management process, forms of pay, financial and non - financial compensation. Compensation Strategies, Assessing job values, pay structures, designing pay levels, construction of optimal pay structure. Paying for performance, skills and competence. International pay systems: comparing costs and systems

Unit II: The Payment of Wages Act, 1936 **9 Hours**

Objects, Application, Responsibility for payment of wages, Fixation of wage periods, time - limits, Deduction from wages, Remedies available to worker, Powers of authorities, Penalty for offences

Unit III: The Minimum Wages Act, 1948 **9 Hours**

Objects, application, minimum fair and living wages, determination of minimum wage, taxation of minimum wage, advisory board, remedy to worker for non - payment of minimum wages

Unit IV: The Payment of Bonus Act, 1965 **9 Hours**

Objects, Scope and Application, Definitions, Calculation ofamount payable as Bonus, Eligibility and Disqualifications for Bonus, Minimum & maximum Bonus, Application of Act in Establishment in Public Sector, Bonus linked with Production or Productivity

Unit V: Incentives Incentive Plan **9 Hours**

Individual incentives, pay for performance, compensation of special group Benefits, legally required benefits: Retirement, medical and other benefits, Employee profit sharing, employee stock option, gain sharing International Compensation: Recognizing variation, the social contract, Culture and pay, Preliminary considerations of international compensation

Text Books

1. Belchor, David W., "Compensation Administration", Prentice Hall, Englewood Cliffs. NT.
2. Henderson R. I., Compensation Management in a Knowledge Based World, New Delhi: Pearson Education
3. Milkovich G., Newman J. and Ratnam C. S. V., Compensation, Tata Mc – Graw Hill, Special Indian Edition

Reference Books

1. Armstrong M.& Murlis H., Reward Management: A Hand book of Salary administration, London: Kegan Paul
2. Sharma J. P., An Easy approach to Company and Compensation Laws, New Delhi: Ane Books Pvt. Ltd.
3. Malik P. L., Hand book of Labourer and Industrial Law, Eastern Book Company
4. Government of India Report of the National Commission on Labour Ministry of Labour and Employment, New Delhi. (latest)

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://onlinecourses.swayam2.ac.in/nou20_cs14/

CONTROL COPY ATTESTED

N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531173

Chairman
Board of Studies

MI 20CEM03 Sustainability and Pollution Prevention Practices 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20CEM03.1	Concept of sustainability and its goals
20CEM03.2	Sources and effects of environmental pollution
20CEM03.3	Identify the prevention measures for environmental protection
20CEM03.4	Approach for analysis and assessment of developmental activities and their impacts on environment
20CEM03.5	Objectives and components of environmental management

Unit I: Concept of Sustainability and Development — 9 Hours

Sustainability and its goals, Growth and development, Development and environment, Causes for industrialization, Changing life styles, Regulatory aspects of industrialization, Overall impact of industrialization and Urbanization on quality of human life, Global environmental issues

Unit II: Pollution, Monitoring and Control — 9 Hours

Definition, types and sources of pollution, Quality standards for air, water, soil; types of pollutants; Methods of monitoring and control of air, water, soil Pollution (Physicochemical and bacteriological sampling and analysis); effects of pollution on plants, animals and Human beings.

Unit III: Measures for Environmental Protection — 9 Hours

Formal and informal environmental education, awareness for nature conservation and protection, environmental ethics and morality, conservation of natural habitats, National parks and wild life sanctuaries, role of youth and women, role of NGO's, urban planning and land-use pattern

Unit IV: Environmental Impact Assessment — 9 Hours

Definition, significance and scope of impact assessment, Need & objective, types of environmental impacts, methods of environmental impacts, major steps in impact assessment procedure, generalised approach to impact analysis

Unit V : Environmental Management — 9 Hours

Objectives and components of environmental management need for training, Environmental Impact Statement and Environment Managemental Plan, Role of remote sensing in environmental management, Sustainable use of natural resources, management of soil, wildlife and its methods, agriculture management, Public participation in resource management

Text Books

1. Lars F. Niklasson, "Improving the Sustainable Development Goals: Strategies and the Governance Challenge", 2009
2. Herman Koren, "Best Practices for Environmental Health: Environmental Pollution, Protection, Quality and Sustainability", 21 April, 2017
3. McCully, P, "Rivers no more: the environmental effects of dams (pp. 29-64)", Zed Books, 1996
4. McNeill, John R, "Something New Under the Sun: An Environmental History of the Twentieth Century", 2000

Reference Books

1. Environmental Chemistry - A.K. De, New Age Int. Pub. Co., New Delhi, 1990
2. Lave, L.B and Upton, "Toxic Chemicals, Health and the Environment", The Hopkins Press Ltd., London, 1987
3. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. "Environmental and Pollution Science. Academic Press", 2011

Web References

1. http://mcic.ca
2. https://www.drishtiias.com
3. https://www.jica.go.jp

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

MI 20CSM03 Database Security

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20CSM03.1	Explain the Cossets DBMS
20CSM03.2	Explain the Constrains in Database
20CSM03.3	Describe different Database Schemas
20CSM03.4	Illustrate Desecrate Data Models and Water Marking Processes
20CSM03.5	Explains Geospatial Data Models and Access Methods

Unit I: Database Introduction — 9 Hours

Introduction to Database – Relational Database & Management System, Data Abstraction (Physical Level, Logical Level & View Level) - Multi-level Database, Distributed Database, Database Architecture.

Unit II: Database Securities — 9 Hours

Security issues in Database – Integrity constraints, Access Control (Grant & Revoke Privileges) - Statistical Database, Differential Privacy. Distributed Database Security.

Unit III: Schema Models — 9 Hours

Security in Data Warehouse & OLAP – Introduction, Fact table, Dimensions, Star Schema, Snowflake Schema, Multi-Dimension Range Query, Data Cubes.

Unit IV: Data Mining Introduction — 9 Hours

Data Mining – Introduction - Randomization methods, Data Swapping, Database Watermarking – Basic Watermarking Process - Discrete Data, Multimedia, and Relational Data, Different Data Migration Techniques.

Unit V: Geospatial Database — 9 Hours

Geospatial Database Security – Geospatial data models – Geospatial Authorization, Access Control Models: Geo-RBAC, Geo- LBAC

Text Books

1. Michael Gertz., Sushil Jajodia., "Handbook of Database Security: Applications and Trends", ISBN-10: 0387485325, Springer, 2007
2. Osama S. Faragallah., El-Sayed M. El-Rabaie., Fathi E. Abd El-Samie., Ahmed I. Sallam., Hala S. El-Sayed., "Multilevel Security for Relational Databases", ISBN 978-1-4822- 0539-8, CRC Press, 2014.

Reference Books

1. Bhavani Thuraisingham., "Database and Applications Security: Integrating Information Security and Data Management", CRC Press, Taylor & Francis Group, 2005.
2. Elmasri Navrate., "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016.
3. Peter Rob., Carlos Coronel., "Database Systems Design, Implementation and Management," Tenth Edition, Pearson Education, 2013

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web Resources

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html
2. https://www.ibm.com/in-en/cloud/learn/database-security
3. http://data.conferenceworld.in

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Engineering & Technology
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (CSE)

ME 20MEM03 Surface Engineering

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MEM03.1	Decide the surface preparation methods suitable for different substrate materials.
20MEM03.2	Apply knowledge on properties offered by different Coatings based on the application requirement.
20MEM03.3	Interpret the testing &evaluation of metallic coatings.
20MEM03.4	Explain the effect of process parameters on the properties & microstructure of the surface coating processes.
20MEM03.5	Explain the importance & role of surface modifications to achieve several technological properties.

Unit I: Fundamentals of Surface Engineering — 9 Hours

Introduction to surface engineering, Scope of surface engineering for different engineering materials, Surface Preparation methods such as Chemical, Electrochemical, Mechanical: Sand Blasting, Shot peening, Shot blasting, Hydro-blasting, Vapor Phase Degreasing etc., Coatings: Classification, Properties and applications of Various Coatings

Unit II: Chemical Conversion Coating — 9 Hours

Chromating, Phosphating, and Anodizing, Thermochemical processes: Methodology used, mechanisms, important reactions involved, Process parameters and applications.

Unit III: Coating from Vapor Phase — 9 Hours

PVD, and CVD: Various Methods used, mechanisms, important reactions involved, Process parameters and applications.

Unit IV: Metallic coating — 9 Hours

Hot Dipping, Galvanizing, Electrolytic and Electro less plating: Methodology used, mechanisms, important reactions involved, Process parameters and applications. Testing/ evaluation of metallic coatings.

Unit V: Thermal spray coatings — 9 Hours

Processes, Types of spray guns, Comparison of typical thermal spray processes, Surface Preparation, Finishing Treatment, Coating Structures and Properties, Applications.

Text Books

1. J. R. Davis, "Surface Engineering for Corrosion and Wear Resistance", 1st Edtion, 1997.
2. George J, "Rudzki -Surface Finishing Systems metal and non-metal finishing handbook-guide", 1st Edition, Metals Park: ASM, 1983.
3. James A. Murphy, "Surface Preparation and Finishes for Metal, McGraw-Hill", New York 1971.
4. P. G. Sheasby and R. Pinner, "Surface treatment and finishing of Aluminium and its alloy", 1st Edition, ASM, Metals Park, 1987.

Reference Books

1. Friction Stir Welding and Processing, Rajiv Sharan Mishra, Partha Sarathi De, Nilesh Kumar, International 2006.
2. Friction Stir Welding and Processing, R.S. Mishra and M.W. Mahoney, ASM International, 2007.
3. Advances in Friction-Stir Welding and Processing, M-K Besharati-Givi and P. Asadi, ASM International 2008.

Web References

1. www.nptel.iitm.ac.in
2. www.btechguru.com
3. www.ocw.mit.edu
4. www.corrosion-doctors.org

CONTROL COPY ATTESTED

Chairman
Board of Studies (ME)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

MI 20EEM03 Electrical Engineering Material Science 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20EEM03.1	Understand the phenomena of metal conductivity
20EEM03.2	Explain the properties of di-electric properties
20EEM03.3	Understand the magnetic properties of materials
20EEM03.4	Explain the types of semi-conductors
20EEM03.5	Understand the modern techniques used for studying the material science

Unit I: Conductivity of Metal 9 Hours

Introduction, factors affecting the resistivity of electrical materials, motion of an electron in an electric field, Equation of motion of an electron, current carried by electrons, mobility, energy levels of a molecule, emission of electrons from metals, thermionic emission, photo electric emission, field emission, effect of temperature on electrical conductivity of metals, electrical conducting materials

Unit II: Dielectric Properties 9 Hours

Introduction, effect of a dielectric on the behavior of a capacitor, polarization, the dielectric constant of monatomic gases, frequency dependence of permittivity, dielectric losses, significance of the loss tangent, dipolar relaxation, frequency and temperature dependence of the dielectric constant, dielectric properties of polymeric system,

Unit III: Magnetic Properties of Materials 9 Hours

Introduction, Classification of magnetic materials, diamagnetism, paramagnetism, ferromagnetism, the hysteresis loop, factors affecting permeability and hysteresis loss, common magnetic materials

Unit IV: Semiconductors 9 Hours

Energy band in solids, conductors, semiconductors and insulators, types of semiconductors, Intrinsic semiconductors, impurity type semiconductor, diffusion, thermal conductivity of semiconductors, electrical conductivity of doped materials

Unit V: Modern Techniques for Materials Studies 9 Hours

Optical microscopy – Electron microscopy – Photo electron spectroscopy – Atomic absorption spectroscopy – Introduction to Biomaterials and Nanomaterials

Text Books

1. Joseph Le Roy Hayde Proteus Steinmetz, "Radiation, Light and Illumination: A Series of Engineering Lectures Delivered at Union College", BiblioLife, 2019
2. Jack L. Lindsey, "Applied Illumination Engineering", 4th Edition, PHI, 2011
3. John Matthews, "Introduction to the Design and Analysis of Building Electrical Systems", 2nd Edition, Springer, 2013.

Reference Books

1. M.A. Cayless, "Lamps and Lighting", 5th Edition, Routledge, 2016.
2. Leopold Bloch, "Science of Illumination: An Outline Of The Principles Of Artificial Lighting", Kessinger Pub, 2018.

Web References

1. https://nptel.ac.in/courses/108/105/108105060/

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

MI 20ECM03 Analog Electronic Circuits 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20ECM03.1	Demonstrate the concept of DC biasing and transistor stabilization leading to the design of amplifiers
20ECM03.2	Classify, analyze types of multistage amplifiers
20ECM03.3	Classify, analyze and design different types of feedback amplifiers and Oscillators
20ECM03.4	Analyze the response of different signals for linear and Nonlinear wave shaping circuits
20ECM03.5	Understand the internal operation of Op-Amp and its Applications

Unit I: Transistor Biasing — 9 Hours

Need for biasing, operating point, BJT biasing methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S, S', S").

Unit II: BJT and Multistage Amplifiers — 9 Hours

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier.

Unit III: Feedback Amplifiers and Oscillators — 9 Hours

Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of feedback amplifiers. Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT, generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT.

Unit IV: Linear Wave Shaping — 9 Hours

Linear wave shaping: High pass, low pass RC circuits, response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator, Attenuators, Diode clippers.

Unit V: Linear Applications of Op-Amp — 9 Hours

Internal Block Diagram of various stages of Op-Amp and Roll of each Stage, Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier.

Text Books

1. Robert, L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 10th Edition, Prentice Hall of India, 2009.
2. Millman, J, TaubH, Mothiki Surya Prakash Rao and Millman's, "Pulse Digital and Switching Waveforms", 2nd Edition, Tata McGraw-Hill, 2008.
3. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", Prentices Hall of India, 1987.

Reference Books

1. Donald A. Neaman, "Electronic Circuit Analysis and Design", 3rd Edition, Tata Mc Graw-Hill, 2010
2. Paul Gray, Hurst, Lewis and Meyer, "Analysis and Design of Analog Integrated Circuits", 4th Edition, John Willey &Sons, 2005
3. Anand Kumar, A., "Pulse and Digital Circuits", 2nd Edition, Prentice Hall of India, 2005
4. Sanjay Sharma, "Operational Amplifiers & Linear Integrated Circuits", 2nd Edition, S. K. Kataria & Sons, 2010.

Web Resource

1. https://nptel.ac.in/courses/108102112
2. https://www.udemy.com/course/analog-electronics-basic-concepts/

CONTROL COPY ATTESTED

Chairman
Board of Studies (ECE)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

AI&ML 20AIM03 Interpretable Machine Learning 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20AIM03.1	Introduction to interpretability
20AIM03.2	Different interpretable models
20AIM03.3	Explain the software's for interpretable models.
20AIM03.4	Illustrate plotting of prediction changes.
20AIM03.5	Explains individual predictions of any black box classification model.

Unit I: Introduction **9 Hours**

Importance of Interpretability, Taxonomy of Interpretability Methods, Scope and evaluation of Interpretability, Properties of Explanations, Human-friendly Explanations

Unit II: Interpretable Models-I **9 Hours**

Data Sets-Regression, Text Classification. Interpretable Models -Linear Regression, Logistic Regression, Decision Tree, Decision Rules, Decision Rule Fit

Unit III: Interpretable Models-II **9 Hours**

Generalized Linear Models (GLM) - Non-Gaussian Outcomes, Advantages; Generalized Additive Models (GAM) - Nonlinear Effects, Advantages and software; Other interpretable Models: Naive Bayes Classifier, K-Nearest Neighbors

Unit IV: Model Agnostic Methods **9 Hours**

Partial Dependence Plot (PDP), Accumulated Local Effects (ALE) Plot, Feature Interaction, Functional Decomposition, Permutation Feature Importance, Global Surrogate.

Unit V: Local Model Agnostic Methods **9 Hours**

Individual Conditional Expectation (ICE), Local Surrogate (LIME), Counterfactual Explanations, Scoped Rules (Anchors), Shapley Values.

Text Books

1. "Interpretable Machine Learning, A Guide for Making Black Box Models Explainable", By Christoph Molnar · 2020
2. "Interpretable Machine Learning with Python, Learn to Build Interpretable High-performance Models with Hands-on Real-world", By Serg Masis · 2021

Reference Books

1. "Explainable AI: Interpreting, Explaining and Visualizing Deep Learning", By Andrea Vedaldi, Grégoire Montavon, Klaus-Robert Müller, Lars Kai Hansen, Wojciech Samek,2019.
2. "Interpreting Machine Learning Models, Learn Model Interpretability and Explainability Methods", By Anirban Nandi, Aditya Kumar Pal · 2021

Web References

1. https://christophm.github.io/interpretable-ml-book/index.html
2. https://ai.googleblog.com/2021/12/interpretable-deep-learning-for-time.html
3. https://arxiv.org/abs/2103.10689

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE(AI/ML)

Dept. of CSE
N.S. Raju Institute of Technology
Sontyam, Visakhapatnam-531173.

MI 20DSM03 Data Governance

3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20DSM03.1	Understanding of the role computation can play in solving problems and optimization techniques
20DSM03.2	Understanding the usage of computational techniques.
20DSM03.3	Understanding Stochastic programming and statistical thinking
20DSM03.4	Identify the problem using Monte Carlo simulations
20DSM03.5	Plotting with the pylab package

Unit I: Introduction, Data Literacy and Concepts — 9 Hours

Data is an asset, Data governance and governance, Data management, The governance "V", Solutions Other terms, Some final core concepts

Unit II: Overview: A Day in the life of a Data Governance Program and its Capabilities — 9 Hours

What does it look like? - The scope of data governance and data management, Business model, Content, Development methods -Federation, Elements of data governance programs, Principles, Policies, Metrics, The critical success factors for data governance

Unit III: The Data Governance Business Case — 9 Hours

The business case, Objectives of the business case for data governance, Components of the business case - The big picture (vision), Program risks, Business alignment, Costs of data quality issues, Costs of missed opportunities, Data debt, Obstacles, impacts, and changes, Presentation of the case. The process to build the business case - Fully understand business direction, identify possible opportunities, identify usage opportunities, define business benefits, confirm business benefits, quantify costs, Prepare the business case documentation, Approach considerations

Unit IV: Overview of Data Governance Development and Deployment — 9 Hours

Types of approaches, The data governance delivery framework, Process overview, Engagement, Strategy, Architecture and design, Implementation, Operation, and changes

Unit V: Engagement — 9 Hours

Initiation- Obtain program approval, Develop DG rollout team structure. Definition- Define DG for your organization, identify business units (subject to DG), Identify business capabilities that need data governance (and don't have it). Scope- Define scope and constraints with the initial plan for DG, Approve scope and constraints. Assessment- Information maturity, Change capacity, Data environment

Text Books

1. John Ladley, "Data Governance", Academic Press, Second Edition, 2012.

Reference Books

1. Evren Eryuek, Uri Gilad, "Data Governance: The Definitive Guide", O'Reilly Media, Inc., 2021.

Web Resources

1. https://nptel.ac.in/courses/110/106/110106072/
2. https://nptel.ac.in/courses/110/104/110104094/

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE(DS)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

20SHM05 Journalism 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20SHM05.1	Understand the concepts of mass communication in general and journalism in particular
20SHM05.2	Impact fundamentals of journalism, evolutionary process, basics concepts, practices and recent trends
20SHM05.3	Get exposed to different faces of journalism
20SHM05.4	Get trained to develop inquisitive and analytical skills to be successful in media
20SHM05.5	Prepare the report for the representation

Unit I: Introduction 9 Hours

Journalism: Meaning, Definition Nature, Scope, Functions; Truth, Objectivity, verification, independent monitor, forum for criticism and comment, watch dog role of press and democracy principles of journalism will stop types of journalism: print, broadcast and online

Unit II: Process Control and Capability Analysis 9 Hours

Mass Media And Development - Early Journalism in the world, India and Karnataka global context Colin rise of advocacy journalism, professionalism, modern journalism and mobile journal journalism. Community journalism, rural journalism, yellow journalism, penny press, tabloid press, and citizen journalism

Unit III: Process-monitoring and Control Techniques 9 Hours

Journalism as a profession, responsibilities and criticism, do you know any his interest understanding the public taste, press as a tool in social service relationship between press and other mass media

Unit IV: Acceptance Sampling 9 Hours

Normative theories of press enter relevance to the present day; wire services- Indian and international news agencies

Unit V: Reliability and Life Testing 9 Hours

Photojournalism- caption writing, photo feature, visual composition- case studies Danish Siddiq, Jimmy Nelson, Margaret Brooke-white, Philip JonesGriffits, Rathika Ramaswami Raghu Rai exercise assignments analysis of daily newspaper in the classroom practice of writing new stories on various topics writing reports on civic problems incorporating information from civil organization based on interviews prepare questions for a specific interview rewriting news stories from newspapers for magazine filing report of more press conferences filing report for an actual press conference practice of writing to wall journal twice a week

Text Books

1. Keval J. Kumar (2001), Mass Communication in India, Jaico Publication, New Delhi
2. Seema Hasan (2010), Mass Communication – Principles and Concepts, CBS Publishers and distributors, New Delhi
3. V S Gupta & Vir Bala Aggarwal (2001), Handbook of Journalism and Mass Communication, Concept Publishing Company, New Delhi

Web References

3. http://wikipedia.org//wiki//media_of_india#cite
4. http://wikipedia.org//wiki//mass%2520_media__of_india#cite
5. http://wikipedia.org//wiki//mass_media_of_india#cite-buzzle

CONTROL COPY ATTESTED

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

MI 20SHM06 Statistical Quality Control 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20SHM06.1	Identify application of various Statistical quality tools
20SHM06.2	Use control chart techniques for quality improvement
20SHM06.3	planning, establishing, and operating SQC procedures
20SHM06.4	Design a procedure testing incoming batches
20SHM06.5	Carry out reliability testsand perform statistical analysis

Unit I: Introduction 9 Hours

Quality Improvement in the Modern Business Environment, Modeling Process Quality, Methods and Philosophy of Statistical Process Control

Unit II: Process Control and Capability Analysis 9 Hours

Control Charts for Variables, Control Charts for Attributes, Process and Measurement System Capability Analysis

Unit III: Process-monitoring and Control Techniques 9 Hours

Cumulative Sum and Exponentially Weighted Moving Average Control Charts, Univariate Statistical Process Monitoring and Control Techniques

Unit IV: Acceptance Sampling 9 Hours

Concepts of acceptance sampling, Lot-by-lot acceptance sampling for attributes, Other acceptance sampling techniques

Unit V: Reliability and Life Testing 9 Hours

Common models and distributions, Estimation of mean life with complete samples, Reliability Estimation, Types of reliability tests

Text Books

1. Montogomery D. C, Introduction to Statistical Quality Control (5th Edition) Wiley eastrenLtd, 2005
2. Gupta,V,Kapoor,V.K Fundamentals of Applied Statistics Sultan Chand Publications, New Delhi

Reference Books

1. Chang D. and Macmillan S. (1992). Statistical Quality Design and Control. Contemporary Concepts and Methods
2. Mahajan M. Statistical Quality Control, Danpatrai & Co Delhi
3. Gupta R.C Statistical quality Control and Quality management,10th Edition, Kanna Publishers, New Delhi

Web References

6. https://www.digimat.in/nptel/courses/video/112107259/L01.html
7. https://freevideolectures.com/course/4539/nptel-operations-management/49
8. https://freevideolectures.com/course/4384/nptel-engineering-metrology/48

CONTROL COPY ATTESTED

Chairman
Board of Studies (BS&H)

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

M 20MBM05 Entrepreneurship and Business Venture Planning 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MBM05.1	Know the role of entrepreneurship development in economy
20MBM05.2	Understand the entrepreneurship and creativity
20MBM05.3	Understand the concept of project planning
20MBM05.4	Understand the sources of financing to ventures
20MBM05.5	Know the methods of entrepreneurship training

Unit I: Introduction 9 Hours

Concept of Entrepreneurship, Role of entrepreneurship in economic Development; factors impacting emergence of entrepreneurship, types of entrepreneurs. Characteristic of successful entrepreneurs; Women Entrepreneurs, Social entrepreneurship, Entrepreneurial challenges

Unit II: Entrepreneurship Development 9 Hours

Types of start-ups, Entrepreneurial class Theories, Entrepreneurial training; EDP Programme, Characteristics of entrepreneurial leadership, Components of Entrepreneurial Leadership, Source of innovative ideas, Entrepreneurship and creativity.

Unit III: Project Planning 9 Hours

Concept of Project and classification of Project, Identification, Project Formulation, Project Report, Project Design, Project Appraisal, Profitability Appraisal, Social cost benefit analysis, financial analysis, Developing a Marketing plan-customer analysis, sales analysis, steps in marketing research, Marketing Mix; business plan preparation, elements of a business plan; Business plan failures

Unit IV: Project Financing & Venture Capital 9 Hours

Financing Stages; Sources of Finance; Venture Capital; Criteria for evaluating new-venture proposals; Evaluating the Venture Capital-process; Sources of financing for Indian entrepreneurs.

Unit V: Entrepreneurship Training 9 Hours

Designing appropriate training programmers to inculcate entrepreneurial spirit, significance of entrepreneurial training, training for new and existing entrepreneurs, role of entrepreneurship development institutes, MSMES in providing entrepreneurial training.

Note: Discuss case studies from every unit

Text Books

1. Kumar, Arya and Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Pearson, India.
2. Hishrich, Peters, Entrepreneurship: Starting, Developing and Managing New Enterprise, Irwin.

Reference Books

1. Allen K. R., Launching New Ventures: An Entrepreneurial Approach, Cengage Learning.
2. Rama Chandran K., Entrepreneurship Development, Tata McGraw-Hill, India.
3. Roy, Rajeev, Entrepreneurship, Oxford University Press
4. Vasant, Desai, Small – Scale Industries and Entrepreneurship, Himalya Publication, India

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://onlinecourses.swayam2.ac.in/nou20_cs14/

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies (MBA)

20MBM06 Performance Management and Talent Management 3 0 0 3

At the end of the course, students will be able to

Code	Course Outcomes
20MBM06.1	Know about performance management process
20MBM06.2	Understand the performance management system
20MBM06.3	Understand the issues and challenges in implementation of performance management system
20MBM06.4	Understand the talent management approaches
20MBM06.5	Understand the talent management practices and process of companies

Unit I: Introduction 9 Hours

Performance management process, Objectives of performance management system; Historical development in India, Performance management and performance appraisal, Linkage of performance management system with other HR practices

Unit II: Performance Management System 9 Hours

Performance planning, Ongoing support and coaching, Performance measurement and evaluation, Performance management and appraisal; Methods of performance appraisal, Appraisal Communication; Counselling, Identifying potential for development, Linking pay with performance

Unit III: Issues in Performance Management 9 Hours

Implementing performance management system - Strategies and challenges, Role of HR professionals in performance management, Performance management as an aid to learning and employee empowerment, Performance management documentation, Performance management audit, Ethical and legal issues in performance management

Unit IV: Talent Management 9 Hours

Concept and approaches, Frame work of talent management, Talent identification, integration and retention

Unit V: Talent Management Practices and Process 9 Hours

Building the talent pipeline, Managing employee engagement, Key factors and different aspects of talent management, using talent management processes to drive culture of excellence

Note: Discuss case studies from every unit

Text Books

1. Bhattacharyya, D. K., "Performance Management Systems and Strategies", Pearson Education
2. Robert B, "Performance Management", McGraw-Hill Education, India
3. ASTD, "Talent Management: Strategies for success from six leading companies", Cengage Learning

Reference Books

1. Armstrong M, & Baron A, "Performance Management and Development", Jaico Publishing House, Mumbai
2. Rao T. V, "Hurconomics for Talent Management: Making the HRD missionary business – driven", Pearson Education

Web References

1. https://nptel.ac.in/courses/105/102/105102012/
2. https://onlinecourses.swayam2.ac.in/nou20_cs14/

CONTROL COPY ATTESTED

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology

Chairman
Board of Studies (MBA)

ICC 20ICC01 Competitive Programming

2 0 8 6

Version: 01.00

Duration	240 hours (2 hours theory and 14 hours practical per week) as specified above
Industry Collaborator	M/s. Demy Software Solutions, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC01.1	Understand the basics of Programming	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC01.2	Explain various types of Operators, operations, relations, and techniques in programming	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC01.3	Demonstrate gaming basics	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC01.4	Execute various Operations on Linked lists	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC01.5	Explore various applications of the techniques.	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC01.6	Solving various problems of Binary Trees, insertion, deletion and updation.	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective POs

L1: Remember | L2. Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge

Deliverables

WEEK 1 - Introduction- Execution of a program, Decimal - Binary conversion, Ranges of Data Types and constraints, Complexity Analysis of Algorithms, Big-O Notation, Time & Space Analysis and Constraints, Importance of constraints

WEEK 2 - Bit-Manipulation, Bitwise operators, Bit-masking, Modular Arithmetic, Recursion, Thinking Recursively, Recurrence Relations, Sorting Techniques, Two Pointer Technique

WEEK 3 - Binary Search, Applications of Binary Search, Lower Bound & Upper Bound, Finding Frequency, Optimization problems, Hashing, Hashing Techniques, Collision Resolutions, Inbuilt Libraries

WEEK 4 - Maps and Sets, Subarrays and Sub sequences, String matching, Sieve of Eratosthenes, Segmented Sieve, Game Theory, Nims Game, Counting Game

WEEK 5 - Prefix and Suffix concepts, Collecting water, Stacks, Balanced Parentheses, Largest Histogram Area, Queues, Sliding Window Maximum

WEEK 6 - Linked Lists, Various Operations on linked lists, LRU Cache, Cloning Linked list with random pointer, Doubly-linked list

WEEK 7 - Binary Trees, BT and FBT, Traversals, Various operations on Binary Trees, Binary Search Trees, Insertion, Updating and Deletion

WEEK 8 - More Problems on Binary Trees, Iterative Traversals, Least Common Ancestor, Heaps, Quick Select, Running Median, Trie, Introduction and Implementation

WEEK 9 - Problems on Tries, Maximum XOR pair, Partitioning of string, 1D Dynamic Programming, Approaching DP problem, Problems on Overlapping subproblems, Problems on Optimal Substructure, Longest Increasing Subsequence

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

WEEK 10 - 2D Dynamic Programming, Compute NCR, Knapsack, Matrix chain multiplication, Graphs, Introduction and Implementation, Dijkstra, Topological sort.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	9 (Nine)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)

ICC 20ICC02 Web Technologies – Transferring to Practice **2 0 8 6**

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. Demy Software Solutions, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC02. 1	Learn the basics and application of HTML	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC02. 2	Understand the CSS3 module operation	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC02. 3	Explain JAVA script and its application	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC02. 4	Demonstrate the basics of jQuery	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC02. 5	Study the basics of Bootstrap and its application	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC02. 6	Understand the basics of Angular JS	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4. Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Module 1

Introduction HTML, HTML Basics, HTML Elements, HTML5 Semantic, HTML Attributes, HTML Headings, HTML Paragraph, HTML Styles, HTML Formatting, HTML Quotations, HTML Computer Code, HTML Comments & Colours, HTML CSS, Links and Images, HTML Lists, HTML Blocks, HTML Classes, HTML Layout, HTML Responsive, HTML I frames, HTML JavaScript, HTML Head, HTML Entities and URI Code, HTML Symbols and XHTML, HTML Charset and Forms

Module 2

Introduction CSS3, CSS3 Syntax, CSS3 How To, CSS3 Colours, CSS3 Backgrounds, CSS3 Boarders, CSS Padding, CSS Height/Width, CSS3 Gradients, CSS3 Shadows, CSS3 Text, CSS3 Fonts, CSS3 2D Transforms, CSS3 3D Transforms, CSS Links, CSS Lists, CSS Tables, CSS Box Model, CSS Outline, CSS Display, CSS Max-width, CSS Position, CSS Float, CSS Inline-block, CSS Align, CSS Combinators, CSS Pseudo-class, CSS Pseudo-element, CSS Navigation Bar, CSS Dropdowns, CSS Tooltips, CSS3 Images, CSS Attr Selectors, CSS Forms, CSS Counters, CSS3 Animations, CSS3 Buttons, CSS3 Pagination, CSS3 Multiple Columns, CSS3 User Interface, CSS3 Box Sizing, CSS3 Filters, CSS3 Media Queries, CSS3 Responsive

Module 3:

Introduction to JavaScript, Java Script Language Basics, JavaScript Objects, JavaScript Scope, JavaScript Events, JavaScript Strings, JavaScript Numbers, JavaScript Math, JavaScript Arrays, JavaScript Boolean, JavaScript Comparisons, JavaScript Conditions, JavaScript Switch, JavaScript Loops, JavaScript Type Conversion, JavaScript RegExp, JavaScript Errors, JavaScript Debugging, JavaScript Hoisting, JavaScript Strict Mode, JavaScript Functions, JavaScript Objects, JavaScript Forms, JavaScript HTML DOM, JavaScript BOM

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Module 4:

Introduction to jQuery, jQuery Syntax, jQuery Selectors, jQuery Events, jQuery Effects, jQuery HTML, jQuery Traversing, jQuery AJAX, jQuery Misc.

Module 5:

Introduction to Bootstrap, Bootstrap Basics, Bootstrap Grids, Bootstrap Themes, Bootstrap CSS, Bootstrap JS

Module 6:

Introduction to AngularJS, AngularJS Expressions, AngularJS Modules, AngularJS Data Binding, AngularJS Scopes, AngularJS Directives & Events, AngularJS Controllers, AngularJS Filters, AngularJS Services, AngularJS HTTP, AngularJS Tables, AngularJS Select, Fetching Data from MySQL, AngularJS Validation, AngularJS API, AngularJS Animations, AngularJS i18n and i10n

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)

ICC 20ICC03 Java Spring boot **2 0 8 6**

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. Demy Software Solutions, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC03.1	Understand the JAVA programming.	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC03.2	Execute various methods in JAVA programming	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC03.3	Study and execute the OOPS concept	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC03.4	Demonstrate the debugging and testing of units	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC03.5	Learn the basics of Spring Boot	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC03.6	Explore the applications of Spring Boot and JAVA	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective POs

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Java

Introduction to the course, software tools set up, Introduction about programming, Hello World Project and defining the main method. Variables, Starting with out expressions, Primitive data types, byte short, float, char, Boolean, double, casting.

Operators, operands, expressions. If else statement, Bit wise Operator, Ternary operator, Operator precedence and operator challenge. Keywords and expressions, statements white space and Indentation, code blocks, if then else statement.

Methods in Java, final Method. Code problems on JAVA – HACKERRANK. Method Overloading and Over riding, Control flow statements – if else, while do while, Problems on coding – Prime Number, Even Number, Fibonacci series

OOPS concept – classes, constructors and inheritance, composition, encapsulation, polymorphism, Arrays, Java list, Auto boxing and unboxing. Inner and Abstract classes and interfaces, Java Generics, Naming conventions and package, static and final keywords.

Java Collections, Debugging and unit testing, Data Bases. Basic input and output including Java.util, Concurrency in Java, Lambda expression, regular expressions

Spring Boot:

Introduction to Spring Boot – Build a hello world API, Understanding Spring boot project, Auto configuration. Create a Spring boot web application development, overview of spring boot project. Annotations, step by step code and debugging

Introduction to Junits, Mockito. Spring boot deep dive with rest API

Assessment

Head of the Department
Dept. of CSE
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

ICC 20ICC04 Robotic Process Automation

2 0 8 6

Version: 01.00

Duration	240 hours (2 hours theory and 14 hours practical per week) as specified above
Industry Collaborator	M/s. HMI Engineering Services, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC04.1	Explore the Robotic Automation Process	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC04. 2	Understand the Process Flow and basic inputs and outputs	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC04. 3	Demonstrate the functioning of Business Objects	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC04. 4	Demonstrate the application of Object Studio attributes	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC04. 5	Explain the Case management and additional features	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC04. 6	Understand the functioning of Error management	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Module: 1 – Robotic Automation Process Studio

Running a Process, Basic Skills, Process Validation, Decision Stage, Calculation Stage, Data Items

Module: 2 – Process Flow

Decisions, Circular Paths, Controlling Play, Set Next Stage, Breakpoints, Collections and Loops, Layers of Logic, Pages for Organization

Module: 3 – Inputs and outputs

Input Parameters, Stepping and Pages, Data Item Visibility, Data Types, Output Parameters, Start-up Parameters, Control Room, Process Outputs

Module: 4 – Business Objects

Object Studio, Business Objects, BLUE PRISM CONTENT, Action Stage, Inputs and Outputs, The Process Layer

Module: 5 – Object Studio

Creating a Business Object, Application Modeler, Spying Elements, Attributes, Attribute Selection, Launch, Wait, , Timeouts, Terminate, Write, Press, Attach and Detach, Read, Actions, Action Inputs and Outputs, Data Items as Inputs

Module: 6 – Error Management

Exception Handling, Recover and Resume, Throwing Exceptions, Preserving the Current Exception, Exception Bubbling, Exception Blocks, Exception Handling in Practice.

Module: 7 – Case Management

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Queue Items Commercial in Confidence, BLUE PRISM CONTENT, Work Queue Configuration, Defer, Attempts, Pause and Resume, Filters Reports

Module: 8 – Additional Features

Safe Stop, Collection Actions, Choice Stage, Logging, Log Viewer, System Manager, Process/Business Object, Grouping, Process and Object References, Export and Import

Module: 9 – Consolidation Exercise

Order System Process

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)

ICC 20ICC05 Information Security and Forensics **2 0 8 6**

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. HMI Engineering Services, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC05. 1	Understand the basic terminology of various servers, networking, security and hacking.	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC05. 2	Explore the web applications, testing, debugging, hacking, etc.	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC05. 3	Understand the coding techniques	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC05. 4	Demonstrating the usage of tools for testing, hacking, etc.	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC05. 5	Execute the code using various algorithms	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC05. 6	Perform various case studies to dive deep.	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Domain 1 – Introduction & Terminology

Global Anonymous: Proxy Server, TOR Browser, VPN, SOCKS, RDP, Psiphon, Surface Web, Deep Web, Dark Web, etc., Terminology about Web, Servers, Systems, Network Programming Languages, Hacking, IT Security, Intro to OWASP Top 10 Vulnerability. Intro to Bug Bounty & Enterprise Security and Risk Management with IT Security Life Cycle, Case Studies of Hacking, IT Security & C Forensics. Phishing + Live Hacking Impact Demonstration

Domain 2 – Hacking to Explore

Web Application Penetration Testing based in OWASP TOP 10 Vulnerabilities with Live Ex. Live Demonstration of SQLi, XSS, CSRF, and other bugs with tools and with Manual Testing. Bug Bounty, Latest CMS Exploitation, Cryptography & Practical Implementation, SSL Vulnerabilities & Live Testing, Mobile Hacking, Sniffing, Virus, Ransomware, Intro to Carding & Luhn algorithm

Domain 3 – Defence in Depth

Secure Code Review & Code Brabbing Techniques, Enterprise Security, Risk Management & Report, Tools & Web Apps Penetration Testing, Hacking Attacks & Case Studies, WAF, Firewall, Honeypots, UTM, Introduction to Security Compliance, Introduction to Mobile Apps Pen testing, Defence for Vulnerabilities

Domain 4 – Hacking Automation

Virtualization, Tools for Penetration Testing & Hacking, Kali Linux & It's Applications with Uses, Cloud Security & It's Fundamentals, SQLMAP, Metasploit, nmap etc, Exploits & Incident Response Analysis, Intro to Exploit Development & Research.

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

ICC 20ICC06 Battery System – Design Engineering **2 0 8 6**

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. Vihaan Electrix, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC06. 1	Determine specifications of the Battery system	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC06.2	Design the Battery system	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC06.3	evaluate each design option based on parameters such as safety, performance and cost	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC06.4	Testing and validation of the design	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC06.5	perform safety test to minimize overcharging and overheating	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC06.6	perform failure mode and effect analysis of the Battery System	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective POs

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Determining specifications of the Battery system

Electric Vehicle level specifications, EV specifications into Battery System level specifications, Battery potential and load requirement based on Electric Vehicle specification, list various design options / specifications available at each component level of the Battery system, selection of battery system specifications to suit specifications of cells and modules, Battery system circuit based on Battery application, electrical, mechanical or thermal interface requirements, statistical modelling and state diagrams for the battery operations.

Designing the Battery system:

Cross-functional partners to integrate the battery into the final system, designing, building, and testing code to satisfy design requirements, hardware, and software systems for battery protection, charging and gauging, design connections between anode / cathode terminals through use of suitable busbars, simulations of the designed circuit, charging and discharging of the battery in a controlled manner.

Testing and validation of the design:

design areas where checking and testing is essential, requirements for continuous automation test case, correct application for activation, using technologies of traction battery and battery charger.

Performing safety test:

test plans for batteries at the component and system level, safety test to minimize overcharging and overheating.

Performing cycle test:

failure mode and effect analysis (FMEA) of the battery system, SoC for determining electrolyte's specific gravity in each cell

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173

by using hydrometer.

Performing load test:

load testing to remove AMPS from a battery, electrical worst-case (circuit performance), rigorous failure /root cause on battery related problems.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

ICC 20ICC07 Block Chain Technology

2 0 8 6

Version: 01.00

Duration	150 hours (2 hours theory and 14 hours practical per week) as specified above
Industry Collaborator	M/s. HMI Engineering Services, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC07.1	Learn basics of Blockchain	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC07.2	Understand various Types of Blockchain	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC07.3	Demonstrate the concepts of Blockchain	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC07.4	Study the basics of Ethereum	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC07.5	Learn Solidity	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC07.6	Implement the Dapp	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective POs

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Introduction to Blockchain

Definition of Blockchain, History of Blockchain, Explaining Distributed Ledger, Blockchain ecosystem, Explaining Distributed Ledger

Types of Blockchain

Private/Consortium/Permission-less, Public/Permissioned implementation difference, What Blockchain has to offer across Industry? Companies currently using Blockchain, Overview of what we are going to study in this course,

Key Concepts of the Blockchain

Mining -Mining algorithm, Node, peer, and block explanation, Merkle tree and Blockchain, Consensus Mechanisms- proof of work, proof of stake, How Bitcoin Blockchain works? What is Transaction?

Introduction to Ethereum

Ethereum: Blockchain with smart contract, What is Ether? Bitcoin vs Ethereum Blockchain, What is Ethereum wallet? What is Smart Contract? Ethereum clients, Geth Introduction, Setting up Private Blockchain using Geth.

Learn Solidity

Introduction to solidity, Hands on solidity, Understand and implement different use cases, Implement and deploy smart contract on Blockchain.

Implement Dapp

Setting up the environment, Tools to install – Truffle, MetaMask ,Testrpc, Implement and deploy your first Dapp, Different use cases for implementation of Dapp.

Future Scope

Talk about the future of the Blockchain, What is Hyperledger? What is Hash graph? Discussion on current

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

research on Blockchain, Understand current industry challenges and needs.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

ICC 20ICC08 Network Administration

2 0 8 6

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. HMI Engineering Services, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC08.1	Understand the processes of updation, Installation of Operating System.	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC08.2	Understand the mapping of Hardware devices	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC08.3	Demonstrate the management of group and Computer accounts	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC08.4	Explain the File System Management	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC08.5	Study the server administration	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC08.6	Explore the disaster recovery	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Overview of Networking.

Installing or Upgrading a Network Operating System, Preparing for installation, Installing from different installation mediums, Upgrade process, Identifying setup errors

Managing Hardware Devices

Understanding device drivers and PnP. Adding new devices. Hardware resource settings and driver signing, Hardware profiles

Creating and Managing Accounts

User authentication. User profiles. Creating, managing and troubleshooting user accounts.

Implementing Group and Computer Accounts

Creating group objects. Group types and scopes. Build-in groups. Creating and managing computer accounts.

Managing File Access

Introduction to file systems. Creating and managing shared folders. Managing shared folder permissions. NTFS permissions

Managing Disks and Data Storage

Disk management concepts. Managing partitions and volumes. Fault tolerant disk strategies. Monitoring disk health. Disk utilities.

Advanced File System Management

File and folder attributes. Advanced attributes. Disk quotas The distributed file system.

Implementing and Managing Printers

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Installing and sharing printers, Configuring and managing printer resources.

Using Group Policy

Creating and editing group policy objects. Group policy inheritance.

Server Administration

Procedures and standards. Terminal services and remote administration. Delegating administrative authority. Software update services.

Monitoring Server Performance and Disaster Recovery

Task manager, event viewer and performance console. Planning disaster recovery. Backing up data. Automated system recovery.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Chairman
Board of Studies

ICC 20ICC09 Product Engineering **2 0 14 9**

Version: 01.00

Duration 240 hours (2 hours theory and 14 hours practical per week) as specified above

Industry Collaborator M/s. HMI Engineering Services, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC09.1	Understand the basics of Manufacturing Process	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC09.2	Explain the Manufacturing Design	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC09.3	Explore various Production Processes	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC09.4	Demonstrate various Production Machine Operations	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC09.5	Study the Product monitoring	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC09.6	Execute the Product Logistics	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective POs

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge

Deliverables

Manufacturing Process Overview

Product concepts, Market feasibility, Engineering design, Prototyping, Production, Marketing/sales

Manufacturing Design

Product analysis: Materials, Cost

Production methods: Assembly lines, Work cells, Inventory, Work flow

Quality control: Production monitoring, Product testing

Production Processes

Machine and process overviews: Boring and machining, Presses, Molding/Casting, Welding, Finishing, Assembly

Materials: Applicable types, Cost, Availability

Production Machine Operations

Presses, Molding/Casting, Drilling/Boring, Machining, Welding, Finishing, Advanced Intelligence, Automation, Programmable Logic Controllers

Production Monitoring

Monitoring production processes: Baselines, Environmental control

Quality improvement: Production improvement

Finished Product Logistics

Delivery methods, Delivery options, Customer interaction

Assessment

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

ICC 20ICC10 Machine Learning Engineer

2 0 8 6

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. Vihaan Electrix, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC10.1	Evaluate the existing Machine Learning (ML) processes	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC10.2	Analyse large and complex datasets to extract insights and select the appropriate technique to be used	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC10.3	Develop models to achieve the business objectives	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC10.4	Analyses the machine learning algorithms that could be used to solve a given problem	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC10.5	Perform statistical analysis to resolve data set problems	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC10.6	Train models and optimize their hyper-parameters	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing. for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge

Deliverables

Prepare to Develop Machine Learning (ML) Systems:

Machine Learning (ML) processes, appropriate datasets and data representation methods, large and complex datasets to extract insights, need of retraining the existing machine programs based on objectives, data validation strategies, pre-processing or feature engineering for a given dataset, data augmentation pipelines, models to achieve the business objectives, along with the relevant metrics to track.

Develop and Assist in the Implementation of Machine Learning (ML) Systems:

Machine learning algorithms, Logistic Regression, and Naive Bayes, based on statistical modelling procedures, data cleaning to remove the irrelevant data and ensure its quality and accuracy, data acquisition process, prepare the data by transforming textual and graphical data into numbers for use in the machine learning system, create data pipeline depending on the machine learning application needs Linear Regression, , differences in data distribution, statistical analysis to resolve data set problems, solve complex problems with multi-layered data sets, use data modelling and evaluation strategy to find patterns and predict unseen instances, evaluate and transform data science prototypes.

Perform machine learning tests:

Design machine learning systems/applications and self-running Artificial Intelligence (AI) software to automate predictive models, carry out machine learning tests, interpret the test results and make appropriate adjustments based on test results, carry out research and implement best practices to improve the existing machine learning infrastructure, optimize existing machine learning libraries and frameworks based on testing, create useful information from unstructured data by auto-tagging images and text-to-speech conversions.

Train and retrain models:

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

Train models and optimize their hyper-parameters, analyses the errors of the model and develop appropriate strategies to rectify them, retrain the existing systems based on new machine learning model, document the machine learning processes as per the organizational policy, follow the latest machine learning developments and technologies.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.

ICC 20ICC11 Data Scientist

2 0 8 6

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. Vihaan Electrix, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC11. 1	Determine specifications of the Battery system	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC11. 2	Design the Battery system	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC11. 3	evaluate each design option based on parameters such as safety, performance and cost	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC11. 4	Testing and validation of the design	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC11. 5	perform safety test to minimize overcharging and overheating	1, 2, 3, PSO #1	3	L1, L2, L3
20ICC11. 6	perform failure mode and effect analysis of the Battery System	1, 2, 3, PSO #1	3	L1, L2, L3

1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective POs
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge

Deliverables

Determining specifications of the Battery system

Electric Vehicle level specifications, EV specifications into Battery System level specifications, Battery potential and load requirement based on Electric Vehicle specification, list various design options / specifications available at each component level of the Battery system, selection of battery system specifications to suit specifications of cells and modules, Battery system circuit based on Battery application, electrical, mechanical or thermal interface requirements, statistical modelling and state diagrams for the battery operations.

Designing the Battery system:

Cross-functional partners to integrate the battery into the final system, designing, building, and testing code to satisfy design requirements, hardware, and software systems for battery protection, charging and gauging, design connections between anode / cathode terminals through use of suitable busbars, simulations of the designed circuit, charging and discharging of the battery in a controlled manner.

Testing and validation of the design:

design areas where checking and testing is essential, requirements for continuous automation test case, correct application for activation, using technologies of traction battery and battery charger.

Performing safety test:

test plans for batteries at the component and system level, safety test to minimize overcharging and overheating.

Performing cycle test:

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology (A)
Sontyam, Visakhapatnam-531173.

failure mode and effect analysis (FMEA) of the battery system, SoC for determining electrolyte's specific gravity in each cell by using hydrometer.

Performing load test:

load testing to remove AMPS from a battery, electrical worst-case (circuit performance), rigorous failure /root cause on battery related problems.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

Chairman
Board of Studies

ICC **20ICC12 Industrial IOT** **2 0 8 6**

Version: 01.00

Duration	150 hours (2 hours theory and 8 hours practical per week) as specified above
Industry Collaborator	M/s. HMI Engineering Services, Visakhapatnam

At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs		DoK
		POs / PSOs	Weight	
20ICC12.1	Understand the basics of IIOT & IOT	1, 2, 3 & PSO1	3	L1-L3
20ICC12.2	Demonstrate the components of IIOT & IOT	1, 2, 3 & PSO1	3	L1-L3
20ICC12.3	Describe the Communication Technologies of IIoT	1, 2, 3 & PSO1	3	L1-L3
20ICC12.4	Analyze the Visualization and Data Types of IIoT	1, 2, 3 & PSO1	3	L1-L3
20ICC12.5	Describe the methods of Retrieving the data	1, 2, 3 & PSO1	3	L1-L3
20ICC12.6	Explain the Control & Supervisory Level of Automation	1, 2, 3 & PSO1	3	L1-L3

Deliverables

MODULE 1: Introduction & Architecture

Theory

IIoT and connected world, the difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT.

Practice

Introduction to Arduino, ESp8266, Introduction to raspberry Pi.

MODULE 2: IIOT Components

Theory

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): Sensor, Types of sensors, working principle of basic Sensors - Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11). Digital switch, Electro Mechanical switches.

Practice

Measurement of temperature & pressure values of the process using raspberry pi/node mcu.

Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.

Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node mcu.

MODULE 3: Communication Technologies of IIoT

Theory

Communication Protocols: IEEE 802.15.4, ZigBee, Z Wave, Bluetooth, BLE, NFC, RFID

Industry standards communication technology (LoRAWAN, OPC UA, MQTT), connecting into existing Modbus and Profibus technology, wireless network communication.

Practice

Demonstration of MQTT communication.

Demonstration of LoRa communication.

MODULE 4: Visualization and Data Types of IIoT

Theory

Front-end EDGE devices, Enterprise data for IIoT, Emerging descriptive data standards for IIoT, Cloud data base, Cloud computing, Fog or Edge computing. Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')

Sending alert message to the user. ways to control and interact with your environment)

MODULE 5: Retrieving Data

Theory

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

Device control using mobile Apps or through Web pages.

Machine to Machine communication.

MODULE 6: Control & Supervisory Level of Automation

Theory

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA). HMI in an automation process, ERP & MES.

Practice

Digital logic gates programming using ladder diagram.

Implementation of Boolean expression using ladder diagram.

Simulation of PLC to understand the process control concept.

MODULE 7: Application of IIOT

Case study: Health monitoring, Iot smart city, Smart irrigation, Robot surveillance.

Assessment

Mode of Delivery	Offline / Online
No. of transferable credits for redemption	6 (Six)
Credits validity	7 years from the date of registration of the program and remains NIL after redemption for the award of the degree.
Dedicated certificate by the collaborating industries	Yes

CONTROLLED COPY

Chairman
Board of Studies

Head of the Department
Dept. of Civil Engineering
N.S. Raju Institute of Technology(A)
Sontyam, Visakhapatnam-531173.