NSRIT

ACADEMIC RULES & REGULATIONS

2023

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Academic Rules and Regulations

2023

(Applicable for the students admitted during 2023 – 2024)

Undergraduate Programs

Rigid free curriculum design in accordance with NEP 2020

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

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Year of Introduction	2023
Approved	VIII Meeting of Academic Council
Date of Approval	October 21, 2023

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 Undergraduate Certificate, Diploma, Advanced Diploma and B.Sc. in Engineering, B. Tech. (Regular), B. Tech. (Minor) & B. Tech. (Honors)

(For all the candidates admitted from the Academic Year 2023 – 2024 onwards)

B. Tech. (Regular: 160 Credits | Lateral Entrants at the end of the second year after 10 + 3 Years (Diploma): 120) | B. Tech. (Honors: 175 Credits | Lateral Entrants: 135) | B. Tech. (Minor: 180 Credits | Lateral Entrants: 120) | B. Tech. Undergraduate Certificate: 50 | Diploma: 90 | Advanced diploma: 50 (lateral entrants) | B. Sc. in Engineering: 120

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 Jawaharlal Nehru Technological University – Gurajada, Vizianagaram (JNTU – GV)

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

f. **"NEP 2020"** means National Education Policy 2020

2. Eligibility for Admission

2.1. Admission to the B. Tech. (Regular, Honors, Minor, Undergraduate Certificate, Diploma and B. Sc. In Engineering) 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 common 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. For B. Tech. 8 consecutive academic years from the date of joining

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 2 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

Program of Study	Duration	Total Credits at Exit
Undergraduate Certificate	One year	50
Diploma	Two years	90
Advanced Diploma	Two years	50 (Lateral Entrants)
B.Sc. in Engineering	Three years	120
B. Tech. (Regular)	Four years	160
B. Tech. (Minor)	Four years	160 (Inclusive of 12 Credits)
B. Tech. (Honors)	Four years	175

The program duration for the award of degree in B. Tech. (Regular, Honors and Minor) 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 stipulated 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 indicating the duration of Instruction Period, Mid-Term Tests, Semester End Examinations, Practical Examinations and eventually evaluation. Normally each semester will have sixteen weeks of instruction exclusive of mid-term tests, practical examinations and two weeks for semester end examinations. In total, each semester will span for a maximum duration of 16 – 20 weeks.

4. Multiple Entry & Multiple Exit Requirement (ME - ME)

The academic regulation provides complete flexibility to leverage the option of ME – ME. The student can have the exit after the completion of first two-, four- consecutive semesters or at both levels. If a student wants to take exit at any level as mentioned above or he/she intend to earn the degree viz., Undergraduate Certificate, Diploma, Advanced Diploma and B. Sc. in Engineering. He/She need to pursue two certification courses each of two credits from the courses available in the curriculum along with one Job Specific Internship / OJT / Apprenticeship with 6 credits, in case if he/she prefers to exit at the end of the first year and second year of study.

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, Page No. 14, Clause 11, the time duration for the entry and exit is as per norms, provided the duration of the course or programme is of two-years or more (Four semesters or more). In case if he/she earns additional credits through National service schemes/ (or) from higher learning institutes (or) higher educational Institutes of repute taking necessary approval during the exit period. He/she should accumulate the credits in ABC if he/she wants to consider for the approval of the degree. A student will be allowed to enter/re-enter only at the odd semester and exit only in even semester. Re-entry at

various levels as lateral entrants in academic programmes will be purely based on the earned credits and proficiency tests conducted at the institute level.

5. Programs of Study

NSRIT offers eight programs of three- and four-year engineering programs duration leading to B. Sc. (Engineering) and Bachelor of Technology (B. Tech.) respectively as follows

i. Civil Engineering (CE)
ii. Computer Science and Engineering (CSE)
iii. Computer Science and Engineering - Artificial Intelligence and Machine Learning – CSE (AI&ML)
iv. Computer Science and Engineering – Data Science - CSE (DS)
v. Electronics and Communication Engineering (ECE)
vi. Electronics Engineering - VLSI Design and Technology[1] (EVT)
vii. Electrical and Electronics Engineering (EEE)
viii. Mechanical Engineering (ME)

6. Structure of Programs

6.1. Categorization of Courses

Each program shall have a common curriculum framework with well defined educational objectives, program outcomes, Program Specific Outcomes, 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. Also, the curriculum is framed with Choice Based Credit System (CBCS). The courses of a particular program are categorized as follows:

a. Foundation courses
b. Professional core courses relevant to the chosen program of study
c. Professional electives
d. Open electives
    i. Inter-Disciplinary Electives
    ii. Trans-Disciplinary Electives
e. On Job Training
f. Skill Oriented Courses (SOC)and Industry Connect Courses (ICC)
g. Mandatory Courses (MC) as prescribed by AICTE / UGC
h. Project, Seminar and Internship
i. Vocational Courses

The outcome based competitive curriculum is prepared in line with the core values of NEP 2020, streaming out single phased education and enabling the learners to tailor their curriculum as per his/her choice of interest. The academic regulation provides flexibility to deliver the courses of national interest like Constitution of India in native languages of the state of Andhra Pradesh. Further the examination can also be facilitated to drop the responses in the same way as mentioned above. In this connection the learners may be given with the choice of selecting the

[1]One time admission during the academic year 2023 - 2024 only as per EoA (AICTE) 2023-2024

language of medium either in English or native language of Andhra Pradesh of the above said courses.

6.2. Nomenclature of Credit Distribution

No.	Nature of Course	Credit	Nomenclature
1	Theory Course / Elective Course (Physical Lecture Hour)	1.0	1 Hour / Credit
2	Theory Course / Elective Course (Digital Lecture Hour)	0.5	0.5 Hour / Credit
3	Practical / Drawing Course	0.5	0.5 Hour / Credit
4	Internship / Idea Incubation / CSP	2.0	-
5	Full Semester Internship	6.0	-
6	Capstone Project	6.0	-
7	MOOCs / Digital learning	1.5	0.5 Hour / Credit
8	Skill Oriented Course / On Job Training	2.0 | 6.0	-
9	Health, Wellness, Yoga, Sports, NSS/NCC /Scouts & Guides/Community Service	0.5	-
10	Vocational Courses	2.0	-
11	Mandatory Course/Technical Paper Writing	0.0 | 2.0 | 3.0	-
12	Counseling/Mentoring	-	-
13	Sports/Hobby Clubs/Activities	-	-

6.3. Structure of Curriculum

Sem.	No. of Theory Courses	No. of Lab Courses, Internship, OJT / OC, Project / CE / CSP	Total Credits
I	6 (5 Theory + 1 SOC)	3/4 + 1 Health, Wellness, Yoga/NSS & NCC + Sports/Hobby Clubs/Activities	19.5/20.5
II	5 Theory	4/3 + 1 Health, Wellness, Yoga, Sports, NSS/NCC /Scouts & Guides/Community Service/Hobby Clubs/Activities	20.5/19.5
III	7 (5 Theory + 1 SOC + 1 MC)	3 + Sports/Hobby Clubs/Activities	20.0
IV	7 (5 Theory + 1 SOC + 1 MC)	3 + Sports/Hobby Clubs/Activities	22.0
V	7 (2 PC + 1 PE + 2 IE/TE + 2 SOC)	2 + 1 Internship # Onsite/Virtual / CSP + Sports/Hobby Clubs/Activities	22.0
VI	7 (3 PC + 2 PE + 1 IE/TE + 1 SOC)	1 + 1 Technical Paper Writing + Sports/Hobby Clubs/Activities	21.0
VII	8 (3 PC + 2 PE + 1 IE/TE + 1 SOC + 1 MC)	2 + 1 Internship # Onsite/Virtual	23.0
VIII	-	Full Semester Internship & Capstone Project	12.0
		Total Credits	**160**

6.4. Credit Distribution for each Category

No.	Category	Credits	
		Regular	Lateral
1	**Foundation Courses**	**41.5**	**08**
	Humanities and Social Science including Management (HS)	08	05
	Engineering Science (ES)	16.5	-
	Basic Sciences (BS)	17	03
2	**Professional Core Courses (PC)**	**62.5**	**58**
3	**Electives**	**39**	**38**
	Program / Professional Electives (PE)	13	13
	Open Electives (Inter-Disciplinary Electives/Trans-Disciplinary Electives)	12	12
	Skill Oriented Courses	14	13
4	**Project, Seminar, CSP and Internship**	**16**	**16**
5	**Health, Wellness, Yoga, Sports, NCC/NSS/Scouts & Guides/Community Service**	**01**	-
6	**Mandatory Courses**	**Non Credit**	**Non Credit**
Minimum credits to be earned for the award of the B. Tech. (Regular) degree		**160**	**120**

6.5. Course Classification

All the courses offered for the undergraduate program in Engineering & Technology (B.Tech. degree programs) are broadly classified as follows:

S. No.	Broad Course Classification	Course Category	Description
1.	Foundation Courses	Foundation Courses	Includes Mathematics, Physics and Chemistry; fundamental engineering courses; humanities, social sciences and management courses
2.	Core Courses	Professional Core Courses (PC)	Includes courses related to the discipline/department/branch of engineering parent
3.	Elective Courses	Professional Elective Courses (PE)	Includes elective courses related to the parent discipline/department/ branch of Engineering
		Open ElectiveCourses (OE)	Elective courses which include interdisciplinary and transdisciplinary courses or courses in an area outside the parentdiscipline/ department/ branch of Engineering
		Domain specific skill enhancement courses (SEC)	Interdisciplinary / Job - Oriented / Domain Courses which are relevant to the industry
4.	Project, Internships & Community Service Project	Project	Capstone Project
		Internships	Summer Internships – Community based and Industry Internships; Industry Oriented Full Semester Internship
5.	Audit Courses	Mandatory non-credit courses	Covering courses of developing desired attitude among the learners

6.6. 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 question papers shall be designed with a combination of question responses with short answer, long answer and higher order thinking skills through critical thinking and creativity and Multiple Choice Questions that fits best to the assessment of the intended learning outcomes during the process of continuous internal evaluation which includes assignments, mid-term tests and semester end examination.

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 rubrics indicating the criteria and scale/metric 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.

In case of video based grading, suitable rubrics shall be developed and approved for meeting the course outcomes or intended learning outcomes.

In all the cases other than the assessment pattern being prescribed in the academic regulation 2023, the customized and approved assessment pattern shall be submitted to the office of the Controller of Examinations before the commencement of the course.

6.7 Project & Internships

6.7.1 Community Service Project (CSP)

Community Service Project is a type of a learning strategy that integrates meaningful community service with instruction, participation, learning and community development. CSP involves the students in community development and service activities and applies the experience to personal and academic development. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution. As per the guidelines specified in these regulations, each student is expected to undergo CSP for duration of 8 weeks. As per the standard operating procedure (http://nsrit.edu.in/admin/img/cms/Guidelines-for-the-OJT-Internship-Community-Service-Project.pdf) prescribed by the institution and the allotment of CSP is done by the Community Service Wing, and in coordination with the respective program of study for monitoring and assessment. The assessment is to be conducted for 100 marks. The number of credits assigned is 3. Later as per the present practice the marks are converted into grades and grade points to include finally in the SGPA and CGPA.

6.7.2 Summer Internship

As per the guidelines specified (http://www.nsrit.edu.in/admin/img/folder/SOP%20-%20SI.pdf), each student is expected to undergo summer Internship. The curriculum provides a span of four to eight weeks for completing the Internship as furnished in the curriculum. As per the standard operating procedure prescribed by the institution the allotment of Internship is done by the Industry – Institute Linkage cell, and in coordination with the respective program of study for monitoring and assessment.

6.7.3 Full Semester Internship (FSI)

With regard to the FSI (onsite/virtual), the curriculum provides flexibility at two different slots during VII and VIII semesters with a span of 12 to 16 weeks. The students who are opting FSI either during semester VII or VIII shall register for the course during the semester VI through the Head of the department and the same shall be forwarded to the Industry – Institute Linkage Cell through the Office of Controller of Examination (CoE) for allotment; subsequent monitoring and assessment shall be by the respective program of study. 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. Students will be evaluated by a panel of internal/external subject matter experts (SMEs)

nominated by Chairman / chairperson BoS/HoD of the respective board duly approved by the Head of the Institution. It is mandate for all the learners going either for internship to capture a video demonstrating the self-reflection on the learning outcomes for grading by the course supervisor/guide.

6.7.4 Capstone Project

Each student is expected to carry out 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 should submit a detailed project report along with the working models wherever applicable. Students will be evaluated by a panel of internal/external subject matter experts (SMEs) nominated by Chairman / Chairperson BoS/HoD of the respective board duly approved by the Head of the Institution. In case, if any student is interested in doing industry-oriented project (Individual) at the industries or research organization, he/she shall take up the project duly approved by the Head of the Department 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 VI. The students who opted FSI in the semester VII shall take up the courses as prescribed in the curriculum during semester VIII along with the capstone project.

6.8. Mandatory Courses

Mandatory courses are those courses which are designed in line 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 assessments in the form of multiple-choice questions during the continuous assessment. A minimum of 40% of marks 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 in the relevant area as specified in the curriculum. In addition to the above, the curriculum provides flexibility to nurture employability skills through mandatory courses and it is compulsory for all students to complete the mandatory 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.

6.9. Massive Open Online Courses (MOOCs) / Digital Learning

The curriculum provides adequate flexibility for the students to take up MOOCs spanning for duration of 8 to 12 weeks through self-study mode enabling them to learn the courses on independent/autonomous mode with a guidance of faculty mentor to earn necessary credits for the award of the degree and the attendance is not mandatory. However, it is recommended not to exceed 20 credits in case of MOOCs during the course of study. A student is not permitted to register and pursue core courses through MOOCs. The courses shall be opted from MOOCs platform viz. NPTEL, SWAYAM or any other platforms as approved by the respective Chairman/ Chairperson, Board of Studies (BoS). In case of MOOCs through NPTEL, SWAYAM, v-Lab, the credits shall be directly transferred without conducting any further examination from the institution.

In case, if the student fails to earn the certification, he/she has the flexibility to appear for supplementary examination for the same MOOCs for 100 marks without Continuous Internal Assessment as and when the notification is released by the institution incase if he/she is not interested to earn the certification from NPTEL subsequently. Necessary amendments in rules and regulations regarding adoption of MOOCs would be proposed from time to time. For all other MOOCs 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 descriptive examinations.

B. Tech. (Honors) shall also be in line with the agencies or the platforms offering these courses. Further, if the grade is not specified by the particular agency or platform, the award of the grade follow the institutional SOP and take necessary approval from the Academic Council. MOOCs shall be identified by the respective program taking necessary approval from the Chairman / Chairperson (BoS) and shall be intimated well in advance to the students.

6.10. **Industry Connect Courses**

a. Students can opt for one-credit courses, offered by *experts from industry/research* organizations which are approved by BoS and Academic Council. Students can register such courses from 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 and subject 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

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 students who are opting Industry Connect Courses (ICC), as per the list furnished in the respective curriculum, the credits earned through ICC can be trade off to only Professional Elective, Trans – Disciplinary/Inter – Disciplinary elective in the curriculum for the award of B. Tech. (Regular) Degree. Further, the credits earned through ICC cannot be compensated for the courses of B. Tech. (Honors) and B. Tech. (Minor)

6.11. **Semester Away Programme (SAP) to Promote Research**

The students interested in pursuing the B.Tech. (Regular)/B.Tech. (Honors) shall be permitted to go for the semester away program in higher learning institutions, after taking the necessary approval from both the institutions and the earned equivalent credits may be accumulated, transferred through ABC and redeemed for the award of the B.Tech.(Regular)/B.Tech.(Honors). In the above case, the application should be pre approved by the parent University.

6.12. **Technical Paper Writing**

The introduction of technical paper writing aims to foster a research culture aligned with academia. It entails a structured method for presenting scientific and engineering research articles, facilitating learners' comprehension of current trends in the engineering and technology domains.

6.13. **Skill Oriented Courses**

Skill Oriented courses are gaining momentum in higher education, transcending traditional academic approaches to prioritize practical skills and real-world applicability. They span a wide spectrum of fields, including business, technology, healthcare, and the arts. These U.G. programs are instrumental in nurturing hands-on expertise, bolstering students' employability, and preparing them for the ever-changing job landscape. By incorporating internships, industry partnerships, and innovative teaching methods, these courses effectively bridge the gap between theory and practice. In a swiftly evolving job market, U.G. programs centered on skill development empower students with a competitive advantage, enabling them to thrive in their careers and adapt to shifting industry needs.

6.14. **On Job Training (OJT) – Applicable for students who opt for Exit Policy**

On Job Training will be facilitated through Industry – Institute linkage cell of NSRIT as and when the situation demands. However, he/she need to appear for the tests and examinations to meet the academic compliance. The student shall be given an option to choose the industry for OJT which has to be approved by chairman / chairperson BoS of a particular department.

6.15. **Vocational Courses**

The vocational courses are basketed under the category of certification courses 1, 2, 3 & 4.

6.16. **Procedure for Evaluation** (Refer SOP: http://www.nsrit.edu.in/admin/img/folder/SOP-12-12-23.pdf)

Theory (Internal: 30 Marks | External 70 Marks)

Continuous Internal Assessment #1 with duration of 90 Minutes (I & II units)

Descriptive Examination	: 15 Marks
Objective Type Examination	: 10 Marks
Assignment	: 05 Marks

Continuous Internal Assessment #2 with duration of 90 Minutes (III, IV & V units)

Descriptive Examination	: 15 Marks
Objective Type Examination	: 10 Marks
Assignment	: 05 Marks

The final internal marks will be awarded by considering 80% of marks secured in the best of the two continuous internal evaluation and 20% marks secured in the other internal test.

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, Results (30 Marks) & Viva – Voce (20 Marks)	: 50 Marks
Video Assessment (Learning Outcomes)	: 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 Assessment	: 15 Marks
Mid - Term Examination	: 15 Marks
Total External Marks	**: 70 Marks**

The final internal marks will be awarded by considering 80% of marks secured in the best of the two continuous internal evaluation and 20% marks secured in the other internal test.

Mandatory Courses

Assessment	: As prescribed in the Academic Regulation
Online certification course	: 01 course (in the relevant area of the pursuing mandatory course and the students need to submit the certification of completion for the award of the degree)

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 suggests publishing 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 predominantly 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 initiatives by the interns.

Skill Oriented Courses (Internal: 30 Marks | External: 70 Marks)

Interim Assessment and Report Writing	: 30 Marks
Total External Marks	**: 70 Marks**
Outcomes	: 40 Marks
Final Presentation	: 20 Marks
Video Based Assessment	: 10 Marks

The outcomes shall be in the form of design, development of working model of a system component or a product and these 40 marks shall be awarded based on Rubrics that addresses Critical Thinking, Creativity, Collaboration and Communication.

Capstone Project (Internal: 60 Marks | External: 140 Marks)

Distribution of Marks (Continuous Internal Assessment)

Innovativeness of the Project	: 05 Marks
Literature Survey	: 05 Marks
Experimentation/ Simulation	: 05 Marks
Presentation, Interpretation, Product Development & Analysis of Results	: 10 Marks
Interim Review #1(Presentation)	: 05 Marks
Interim Review #2 (Presentation)	: 05 Marks
Terminal Presentation	: 05 Marks
Report	: 05 Marks
Publication in Conference / Journal (CARE)	: 05 Marks
Video Based Assessment	: 05 Marks (Mandatory)
Online Certification	: 05 Marks (Mandatory)
Total Internal Marks	**: 60 Marks**
Total External Marks	**: 140 Marks**

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.

Community Service Project (External: 100 Marks)

Distribution of Marks

Project Log	: 20 Marks
Project Implementation	: 30 Marks
Project Report	: 25 Marks
Final Presentation	: 25 Marks

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% 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

Massive Open Online Courses (MOOCs) / Digital Learning

In case of MOOCs through NPTEL, SWAYAM, v-Lab, the credits shall be directly transferred without conducting any further examination from the institution. In case, if the student fails to earn the certification, he/she has the flexibility to appear for supplementary examination for the same MOOCs for 100 marks without Continuous Internal Assessment as and when the notification is released by the institution incase if he/she is not interested to earn the certification from NPTEL subsequently.

Theory (External 100 Marks)

7. Attendance Finalization and Result Declaration

7.1. 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 having representation from parent University.

7.2. 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 semester end examinations
b. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester shall be permitted based on medical leave (hospitalization / accident / specific illness) and on-duty leave for participation in College / University / State / National / International Sports, NCC/NSS 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 semester end examination by paying the Condonation fee. However, the student who have represented the college in outside world activities shall be exempted in paying the Condonation fee
c. 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/readmit in that particular semester in the subsequent academic year
d. Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student
e. In case if there are any professional electives and/or open electives (Inter-Disciplinary/ Trans-Disciplinary) 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

f. If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for readmission into the same class

g. If the learning is carried out in blended mode (both offline & online), then the total attendance of the student shall be calculated considering the offline and online attendance of the student

8. Promotion Policies

The following academic requirements must be satisfied in addition to the attendance requirements mentioned in Clause (7.2).

i. A student shall be promoted from first year to second year if he/she fulfils the minimum attendance requirement as per university norms

ii. A student will be promoted from II to III year if he/she fulfils the academic requirement of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) up to in the courses that have been studied up to III semester

iii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the courses that have been studied up to V semester

And in case a student is detained for want of credits for a particular academic year by ii) & iii) above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V semester or VII semester respectively as the case may be

iv. When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted

9. Eligibility for the Award of the Degree

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

a. The student should earn the minimum requirement of credits (160 for B. Tech. regular admission and 120 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 entry) from date of admission

b. The student should earn the minimum requirement of credits (175 for B. Tech. Honors and 135 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 entry) from date of admission

c. The student shall not have any pending disciplinary issues

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

10. 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

Equivalent Percentage = (CGPA – 0.5) X 10

11. Classification of the Degree Awarded

a. **B. Tech. (Honors):** In addition to the requirement as cited in (11.c), if the student secures 15 additional credits in accordance with the clause (15), he/she shall be declared with B. Tech. (Honors)

b. **B. Tech. (Minor):** if the student secures 12 credits inclusive of 160 credits for the award of B. Tech. in accordance with the clause (16), he/she shall be declared with B. Tech. (Minor)

c. **B. Tech. (Regular) - First Class with Distinction:** The student who qualifies for the award of the B. Tech. degree in the chosen program of study with 160 credits (Regular) within 4 consecutive academic years without any supplementary appearance from the date of admission and 120 credits (Lateral Entry) within 3 consecutive academic years 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 distinction 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 120 credits (Lateral) within 3 consecutive academic years from the date of admission maintaining 6.5 CGPA and above and less than 7.5 CGPA 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 120 credits (Lateral) within 6

consecutive academic years from the date of admission maintaining 5.5 CGPA and above and less than 6.5 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 5.5 CGPA shall be declared to get Pass with minimum credit requirement for the award of the degree in B. Tech. program
g. **UG Certificate (in Field of study/discipline)** - Programme Duration: First year (first two semesters) of the undergraduate programme, 40 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce
h. **UG Diploma (in Field of study/discipline)** - Programme Duration: First two years (first four semesters) of the undergraduate programme, 80 credits followed by an additional exit 10-credit bridge course(s) lasting two months, including at least 6- credit job-specific internship/ apprenticeship that would help the candidates acquire job-ready competencies required to enter the workforce
i. **Bachelor of Science (in Field of study/discipline)** i.e., B.Sc. Engineering in (Field of study/discipline)- Programme duration: First three years (first six semesters) of the undergraduate programme, 120 credits

12. 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

13. Withdrawal from the Examination

a. A candidate may, for valid reasons, be granted permission by the Head of the Institution 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

14. 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 JNTU-GV /Academic regulation within the Institute, the following regulations shall be followed based on the nature of case as cited above.

- Transfer of candidate from Autonomous / Non-Autonomous Institution affiliated to JNTU-GV
- Within the Institution from one regulation to other academic regulation

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

Any candidate 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 2 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 semesters are 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 mentioned 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.

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh and the University from time to time.

15. B.Tech. (Honors)

The curriculum provides flexibility to enable the students to register for B.Tech. (Honors) program by earning additional 15 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 ≥7 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 20% of the total intake in a particular batch of students.

The additional 15 credits shall be earned by opting the 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. Above all, if any student fails to maintain the ≥7 SGPA without history of arrears 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 SGPA compliance will be considered from semester III onwards as already mentioned.

16. B.Tech. (Minor)

The curriculum provides flexibility to enable the students to register for B. Tech. (Minor) program by earning 12-credits which is inclusive of the 160 credits required for the award of the B. Tech. (Regular) degree. It is mandate for a student to complete two core courses each of 3-credits to be awarded with a minor degree but may be waived off for the students who have done similar or equivalent courses. If a core course is waived off for a student, the student must take an extra elective course in its place. It is recommended that a student should complete the core courses or equivalents before registering for the electives.

A student needs to complete minimum of two elective courses each of 3-credits to earn the total 12-credits for the award of minor degree. A student can opt the open electives listed in the curriculum offered through various programs of study.

17. 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.

In case 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 as specified by the degree awarding institute. As per the document cited above is in line with ABC. The students shall be required to earn at least 50% of credits required for the award of (Regular, Honors, Minor, Undergraduate Certificate, Diploma and B. Sc. in Engineering) from the institute in which the student is enrolled. (As per the clause # 8.3, PP. 13 of the ABC policy document of UGC)

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. Gap Year

The concept of Gap Year will be considered case to case based on the request from the candidate similar to the guidelines of the University keeping ME – ME into consideration.
Candidates who are permitted to avail Gap Year shall be eligible for re-joining into the succeeding year of their B. Tech from the date of commencement of class work, subject to Clause (14) and they will follow the academic regulations into which they are readmitted.

21. Guidelines for the courses related to Health, Wellness, Sports & Yoga/NSS, NCC, Scouts & Guides & CS

Courses related to Health, Wellness, Sports & Yoga/NSS, NCC, Scouts & Guides & CS are in line with the requirement of the parent University. These courses are awarded with 0.5-credit and are accounted in the calculation of CGPA. The course will be evaluated for a total of 100 marks. A student can select 6 activities of his/her choice with a minimum of 1 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totaling to 90 marks and 10 marks for Viva – Voce on the respective course. A minimum of 40% of marks is required to complete the course.

22. General Instructions

i. The academic regulations should be read as a whole for purpose of any interpretation
ii. Malpractices rules-nature and punishments are appended
iii. Where the words "he", "him", "his", occur in the regulations, they also include "she", "her", "hers", respectively
iv. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Head of the Institution is final.
v. The Institution may change or amend the academic regulations or syllabi at any time and the changes or amendments shall be made applicable to all the students on rolls with effect from the dates notified by the Head of the Institution
vi. In the case of any doubt or ambiguity in the interpretation of the guidelines given, the decision of the Head of the Institution is final

23. Guidelines for Lateral Entrants

(Effective for the students admitted into II year through Lateral Entry Scheme from the Academic Year 2024 - 2025 onwards)

1. **Award of the Degree**
   (a) Award of the B.Tech. Degree / B.Tech. Degree with a Minor if he/she fulfils thefollowing:
      (i) Pursues a course of study for not less than three academic years and notmore than six academic years. However, for the students availing Gap year facility this period shall be extended by two years at the most and these two years would in addition to the maximum period permitted for graduation (Six years)
      (ii) Registers for 120 credits and secures all 120 credits

   (b) **Award of B.Tech. degree with Honors** if he/she fulfils the following:
      (i) Student secures additional 15 credits fulfilling all the requisites of B.Tech. Program i.e., 120 credits
      (ii) Registering for Honors is optional
      (iii) Honor is to be completed simultaneously with B.Tech. Program

2. Students, who fail to fulfill the requirement for the award of the degree within six consecutive academic years from the year of admission, shall forfeit their seat.

3. **Minimum Academic Requirements**
   The following academic requirements have to be satisfied in addition to the requirements mentioned in item no.2
   i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the mid semester evaluation and endexamination taken together

   ii. A student shall be promoted from III year to IV year if he/she fulfils the academic requirements of securing 40% of the credits (any decimal fraction should be rounded off to lower digit) in the subjects that have been studied up to V semester

   And in case if student is already detained for want of credits for particular academic year, the student may make up the credits through supplementary exams of the above exams before the commencement of IV year I semester class work of next year.

4. **Course Pattern**
   i) The entire course of study is three academic years on semester pattern
   ii) A student eligible to appear for the end examination in a subject but absent at it or has failed in the end examination may appear for that subject at the next supplementary examination offered When a student is detained due to lack of credits/shortage of attendance the studentmay be re-admitted when the semester is offered after fulfillment of academic regulations, the student shall be in the academic regulations into which he/she is readmitted

5. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme).

24. 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 2023 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 (ECA) 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 organisations and Parents to capture their voice of the respective stakeholders.

The Curriculum design, delivery, and assessment, the major pillars of academic system is completely aligned in line with Outcome Based Education (OBE) to assess and evaluate the learning outcomes 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 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	JNTU - GV	NSRIT (A)
HS	Humanities and Social Sciences	8 -9%	8%	3.125%
BS	Basic Sciences	12 – 16%	13%	15.6%
ES	Engineering Sciences	10 - 18%	14%	10.3%
PC	Professional Core	30 - 36%	34%	38.4%
PE	Professional Elective	19 - 23%	21%	15.6%
MI	Inter- / trans - disciplinary Electives			
IN	Internship (s), Project & Seminars	8 - 11%	10%	10.3%
SC	Skill Oriented Courses	-	-	7.5%
MC	Mandatory Courses	-	-	-
AC	Audit Course	-	-	-

Curriculum with Multiple Entry & Multiple Exit (ME-ME) adhering to NEP 2020
(Academic Regulation 2023 – 2024)

	Credit requirement	Exit credit requirement	Total credit	Level as per NCRF
Undergraduate Certificate| (After the one year of study)	40	10	50	L5
Diploma| (After two year of study)	80	10	90	L6
Advanced Diploma | (After two year of study) - Lateral Entrants	40	10	50	
B.Sc. in Engineering (After three years of study)	120	10	130	L7
B. Tech. (Regular) | (Four years of study)	160	-	160	L8
B. Tech. (Minor)	12 (Inclusive of 160)	-	160	L8
B. Tech. (Honors)	175	15 (160+15)	175	L8

Semester I								Category
No.	Code	Course Title	POs / PSOs	L/D[1]	T[2]	P	Credit	
1	23HSX01	Communicative English	5, 8, 10	2	0	2	2.0	HS
2	23BSX21	Engineering Chemistry	1, 2, 7	3	1	0	3.0	BS
3	23BSX11	Linear Algebra & Calculus	1, 2	3	1	0	3.0	BS
4	23ESX01	Basic Electrical and Electronics Engineering	1, 2, 3	3	0	0	3.0	ES
5	23ME101	Engineering Mechanics	1, 2	3	0	0	3.0	PC
6	23HSX02	Communicative English Lab	9, 10	0	0	2	1.0	HS
7	23BSX22	Engineering Chemistry Lab	1, 4	0	0	2	1.0	BS
8	23ESX04	Electrical and Electronics Engg. Workshop	1, 2, 4	0	0	3	1.5	ES
9	23CE101	Engineering Mechanics & Building Practices lab	1, 4	0	0	3	1.5	PC
10	23ESS01	IT Workshop	1, 2, 3, 4, 5	0	0	2	1.0	SOC
11	23CSP01	NSS/ NCC/Scouts & Guides/Community Service	7, 8, 12	-	-	1	0.5	CSP
						Sub-total	20.5	
Semester II								Category
No.	Code	Course Title	POs / PSOs	L/D[1]	T[2]	P	Credit	
1	23BSX31	Engineering Physics	1, 2, 7	3	1	0	3.0	BS
2	23BSX12	Differential Equations and Vector Calculus	1, 2, 5	3	1	0	3.0	BS
3	23ESX02	Introduction to Programming	1, 2, 3	3	0	0	3.0	ES
4	23ESX03	Basic Civil & Mechanical Engineering	1, PSO #1	3	0	0	3.0	ES
5	23BSX32	Engineering Physics Lab	1, 4	0	0	2	1.0	BS
6	23ESX06	Engineering Workshop	1	0	0	3	1.5	ES
7	23ESX07	Engineering Graphics	1, 10	2	0	2	3.0	ES
8	23ESX05	Computer Programming Lab	1, 2, 3, 4, 5	0	0	3	1.5	ES
9	23WLP01	Health, Wellness, Yoga & Sports	2, 7, 12	-	-	1	0.5	Wellness
						Sub-total	19.5	
Exit mandate at the level of I year for the award of Undergraduate Certificate[3]								
1		Certification #1		Min. 60 hours			2.0	SOC
2		Certification #2		Min. 60 hours			2.0	SOC
3		Job Specific Internship / OJT / Apprenticeship		Min. 60 Days			6.0	OJT

[1] In case of digital learning other than face-to-face learning, double the number of learning hours is mandate for the equivalent credit as per NCRF

[2] Suggested tutorials do not carry credits

[3] Students exiting at the level of first year of study must complete two skill-oriented courses and Job specific Internship/ OJT/ Apprenticeship that tunes to a total of 10 credits

Semester III								Category
No.	Code	Course Title	POs / PSOs	L/D	T	P	Credits	
1	23BSX13	Numerical and Statistical Methods	3, 4, 7	3	0	0	3.0	BS
2	23HSX03	Universal Human Values–Understanding Harmony & Ethical Human Conduct	8, 9, 10	2	1	0	3.0	HS
3	23CE303	Surveying	1, 2, 12	3	0	0	3.0	ES
4	23CE304	Strength of Materials	1, PSO #1	3	0	0	3.0	PC
5	23CE305	Fluid Mechanics	1, 3, PSO #2	3	0	0	3.0	PC
6	23CE306	Surveying laboratory	1, 2, 10, 12	0	0	3	1.5	PC
7	23CE307	Strength of Materials laboratory	1, 4	0	0	3	1.5	PC
8	23DSS01	Python Programming	1, 2, 5, PSO #1	0	1	2	2.0	SOC
9	23ACX01	Environmental Science	7	2	0	0	-	MC
						Sub-total	**20.0**	
Semester IV								Category
No.	Code	Course Title	POs / PSOs	L/D	T	P	Credits	
1	23HSX04	Managerial Economics & Finance analysis; Business Environment Organizational Behavior	11	2	0	0	2.0	HS
2	23CE402	Engineering Geology		3	0	0	3.0	ES
3	23CE403	Building Materials & Concrete Technology	1, 2, 6, 8,12	3	0	0	3.0	PC
4	23CE404	Structural Analysis	1, 3, PSO #1	3	0	0	3.0	PC
5	23CE405	Hydraulics & Hydraulic Machinery	1, 4	3	0	0	3.0	PC
6	23CE406	Concrete Technology lab	1, 2, 4	0	0	3	1.5	PC
7	23CE407	Engineering Geology Lab	1, 4, 12	0	0	3	1.5	PC
8	23SCX01	Soft Skills	1, 10	0	1	2	2.0	SOC
9	23ESX08	Design Thinking and Innovations	1 – 3, 6,7, 9, 10	1	0	2	2.0	ES
10	Mandatory Community Service Centric Internship of 6-8 weeks duration during summer vacation							
						Sub-total	**21.0**	
Exit mandate at the level of I year for the award of Diploma[4]								
1		Certification #3		Min. 60 hours			2.0	SOC
2		Certification #4		Min. 60 hours			2.0	SOC
3	23SOC02	Job Specific Internship/OJT/Apprenticeship		Min. 60 Days			6.0	OJT

[4] Students exiting at the level of second year study must complete two skill-oriented courses and Job specific Internship/ OJT/ Apprenticeship that tunes to a total of 10 credits

Semester V								Category
No.	Code	Course Title	POs / PSOs	L/D	T	P	Credit	
1	23CE501	Water Resources Engineering	1, PSO #1	3	0	0	3.0	PC
2	23CE502	Design of Reinforced Concrete Structures	1, 2, 3, 8, PSO #1, 2	3	0	0	3.0	PC
3	23CE503	Geotechnical Engineering	1,2,3, 6, PSO #1	3	0	0	3.0	PC
4	-	Program elective #1		3	0	0	3.0	PE
5	-	Open Elective-I		3	0	0	3.0	OE
6	23CE504	Geotechnical Engineering Lab	1, 4, 12	0	0	3	1.5	PC
7	23CE505	Fluid Mechanics &Hydraulic Machines Lab	1, 4	0	0	3	1.5	PC
8	23CES03	Estimation, Specifications & Contracts	1, 11, 12	0	1	2	2.0	SOC
9		Tinkering lab	-	0	0	2	1.0	ES
10	Evaluation of the Community Service Centric Internship[5]		All PO's & PSO's	-	-	-	2.0	INTERN
						Sub-total	**23.0**	
Semester VI								Category
No.	Code	Course Title	POs / PSOs	L	T	P	Credit	
1	23CE601	Design of Steel Structures	1, 3, 12, PSO #1	3	0	0	3.0	PC
2	23CE602	Transportation engineering	1, 2, 3, PSO #1	3	0	0	3.0	PC
3	23CE603	Environmental Engineering	3, 6, 7, 12	3	0	0	3.0	PC
4	-	Program elective #2	-	3	0	0	3.0	PE
5	-	Program elective #3	-	3	0	0	3.0	PE
6	-	Open Elective-II	-	3	0	0	3.0	OE
7	23CE604	Environmental Engineering Lab	1, 6, 8, PSO #1	0	0	3	1.5	PC
8	23CE605	Transportation Engineering Lab	1,2,14, PSO #2	0	0	3	1.5	PC
9	23CES04	Building Information Modelling	1, 5, 10	0	1	2	2.0	SOC
10	-	Technical Paper Writing & IPR[6]		2	0	0	-	MC
11	Mandatory Industry Internship of 8 weeks duration during summer vacation							
						Sub-total	**23.0**	
Exit mandate at the level of third year for the award of Bachelor of Science in Engineering[7]								
1		Certification #3		Min. 60 hours			2.0	SOC
2		Certification #4		Min. 60 hours			2.0	SOC
3	23SOC02	Job Specific Internship / OJT / Apprenticeship		Min. 60 Days			6.0	OJT

[5] 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 summer internship #1 or 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 04 weeks

[6] 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

[7] Students exiting at the level of third year of study must complete two skill-oriented courses and Job specific Internship/ OJT/ Apprenticeship that tunes to a total of 10 credits

Semester VII								Category
No.	Code	Course Title	POs / PSOs	L	T	P	Credits	
1	23CE701	Finite Element Methods	1, 2	3	0	0	3.0	PC
2	23HSX06	Construction Economics and Finance	1, 5, 11	2	0	0	2.0	HS
3	-	Program elective #4		3	0	0	3.0	PE
4	-	Program elective #5		3	0	0	3.0	PE
5	-	Open Elective-III		3	0	0	3.0	OE
		Open Elective-IV		3	0	0	3.0	OE
8	23CES05	Skills in Civil Engineering software. (STAADPRO/ETABS/CAD/REVIT/SAP)	1, 5, 10	0	1	2	2.0	SOC
9	23MCX04	Gender Sensitization		2	0	0	-	MC
10	-	Evaluation of Industry Internship	5 – 10, PSO # 1, 2				2.0	INTERN
						Sub-total	**21.0**	
Semester VIII								Category
No.	Code	Course Title	POs / PSOs	L/D	T	P	Credits	
1	-	Full Semester Internship[8]	5 – 10, PSO # 1, 2	-	-	12	6.0	INTERN
2	-	Capstone Research Project	5 – 10, PSO # 1, 2	-	-	12	6.0	INTERN
						Sub-total	**12.0**	
						Total	**160.0**	

[8] 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

List of Electives

Program Elective #1									
No	Code	Title		PO	L/D	T	P	C	
1	23CE001	Advanced Structural Analysis		-	2	0	0	2.0	PE
2	23CE002	Ground Improvement Techniques		-	2	0	0	2.0	PE
3	23CE003	Repair and Rehabilitation of Highway structures		-	2	0	0	2.0	PE
4	23CE004	Watershed Development and Management		-	2	0	0	2.0	PE
5	23CE005	Building Services		-	2	0	0	2.0	PE
Program Elective #2									
7	23CE006	Earthquake Resistant Design of Structures		-	3	0	0	3.0	PE
8	23CE007	Subsurface investigation and instrumentation		-	3	0	0	3.0	PE
9	23CE008	Transportation Safety and Environment		-	3	0	0	3.0	PE
10	23CE009	Open channel flow		-	3	0	0	3.0	PE
11	23CE010	Cost Effective Housing Techniques		-	3	0	0	3.0	PE
Program Elective #3									
13	23CE011	Bridge Engineering		-	2	0	0	2.0	PE
14	23CE012	Geo synthetics And Reinforced Earth Structures		-	2	0	0	2.0	PE
15	23CE013	Pavement Analysis and Design		-	2	0	0	2.0	PE
16	23CE014	Hydraulic Structures and Hydropower Engineering		-	2	0	0	2.0	PE
17	23CE015	Optimization Techniques in Civil Engineering		-	2	0	0	2.0	PE
Program Elective #4									
19	23CE016	Prestressed Concrete		-	3	0	0	3.0	PE
20	23CE017	Foundation Engineering		-	3	0	0	3.0	PE
21	23CE018	Railways, Airports, Docks and Harbor Engineering		-	3	0	0	3.0	PE
22	23CE019	Air Pollution and Control		-	3	0	0	3.0	PE
23	23CE020	Experimental stress analysis		-	3	0	0	3.0	PE
Program 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 (3-credits) and the assessment shall be as per the academic regulation 2023.									PE
Inter – disciplinary Elective #1[9]			Pre-requisite[10]						
26	23CEO01	Environment Pollution and Control / Construction Technology and Management	23MCX04	23CE008	-	3	0	0	3.0	MI-ES
27	23CSO01	Operating Systems			-	3	0	0	3.0	MI-CS
28	23AIO01	Introduction to Python	23ESX02		-	3	0	0	3.0	MI-AI
29	23DSO01	Introduction to Database Management Systems	23BSX11		-	3	0	0	3.0	MI-DS
30	23ECO01	Semi-Conductor Devices & Circuits	23BSX31	23ESX01	-	3	0	0	3.0	MI-EC
31	23EEO01	Basics of DC Machines	23ESX01		-	3	0	0	3.0	MI-EE
32	23MEO01	Nano Technology	23BSX21		-	3	0	0	3.0	MI-ME
Inter – Disciplinary Elective #2			Pre-requisite						
33	23CEO02	Air Pollution / Sustainability in Engineering Practices	23MCX04	23CE008	-	3	0	0	3.0	MI-ES
34	23CSO02	Software Engineering			-	3	0	0	3.0	MI-CS
35	23AIO02	Fundamentals of Artificial Intelligence			-	3	0	0	3.0	MI-AI
36	23DSO02	Introduction to Data Science	23BSX15	-	-	3	0	0	3.0	MI-DS
37	23ECO02	Digital Electronics	23ESX01	-	-	3	0	0	3.0	MI-EC
38	23EEO02	Basics of AC Machines	23ESX01	-	-	3	0	0	3.0	MI-EE
39	23MEO02	Biomaterials	23BSX21	-	-	3	0	0	3.0	MI-ME
Inter – Disciplinary Elective #3			Pre-requisite						
40	23CEO03	Climate Change Mitigation & Adaption / Environmental Impact Assessment	23MCX04	23CE008	-	3	0	0	3.0	MI-ES

[9] Inter-disciplinary elective/trans-disciplinary electives shall be factored under B.Tech. minor. To travel in a particular minor track, two pre-requisite courses should be completed to a tune of six credit out of four or equivalent courses that suits the pre-requisite.

[10] Pre-requisite courses are those that are offered in core or in elective pertaining to minor offered by the respective program of study. It is not the program core of the parent department

41	23CSO03	Database Management Systems	23BSX11	-	-	3	0	0	3.0	MI-CS
42	23AIO03	Machine Learning for Engineers	23BSX15	-	-	3	0	0	3.0	MI-AI
43	23DSO03	Introduction to Big data	-	-	-	3	0	0	3.0	MI-DS
44	23ECO03	Analog Electronics Circuits	23BSX31	-	-	3	0	0	3.0	MI-EC
45	23EEO03	Basics of Power electronics	-	-	-	3	0	0	3.0	MI-EE
46	23MEO03	Micro Electro mechanical Systems	23ESX03	-	-	3	0	0	3.0	MI-ME
Inter – Disciplinary Elective #4			Pre-requisite							
47	23CEO04	Sustainability and Pollution Prevention Practices / Solid Waste Management	23MCX04	23CE008	-	3	0	0	3.0	MI-ES
48	23CSO04	Computer Networks	23SOC01	-	-	3	0	0	3.0	MI-CS
49	23AIO04	Fundamentals of Deep Learning	-	-	-	3	0	0	3.0	MI-AI
50	23DSO04	Introduction to Data Visualization	23SOC01	-	-	3	0	0	3.0	MI-DS
51	23ECO04	Communication Systems	-	-	-	3	0	0	3.0	MI-EC
52	23EEO04	Introduction to Electric Vehicles	-	-	-	3	0	0	3.0	MI-EE
53	23MEO04	Surface Engineering	-	-	-	3	0	0	3.0	MI-ME
Trans – Disciplinary Stream #1 (Liberal Arts)										
1	23HSM01	Psychology			-	3	0	0	3.0	MI
2	23HSM02	English for Media			-	3	0	0	3.0	MI
3	23HSM03	Journalism and Mass media			-	3	0	0	3.0	MI
4	23HSM04	Tourism			-	3	0	0	3.0	MI
Trans – Disciplinary Stream #2 (Statistics)										
1	23HSM05	Statistical Methods			-	3	0	0	3.0	MI
2	23HSM06	Statistical Inference			-	3	0	0	3.0	MI
3	23HSM07	Statistical Quality Control			-	3	0	0	3.0	MI
4	23HSM08	Introduction to Time Series			-	3	0	0	3.0	MI
Trans – Disciplinary Stream #3 (General Management)										
1	23MBM01	General Management			-	3	0	0	3.0	MI
2	23MBM02	Organization Behavior			-	3	0	0	3.0	MI
3	23MBM03	Entrepreneurship and Business Venture Planning			-	3	0	0	3.0	MI
4	23MBM04	Cross Culture Management			-	3	0	0	3.0	MI
Trans – Disciplinary Stream #4 (Human Resource Management)										
1	23MBM05	Human Resource Planning			-	3	0	0	3.0	MI
2	23MBM06	Compensation Management & Employee Welfare Laws			-	3	0	0	3.0	MI
3	23MBM07	Performance Management and Talent Management			-	3	0	0	3.0	MI
4	23MBM08	Talent Management			-	3	0	0	3.0	MI
B. Tech. (Honors)										
Category I										
1	23CEH01	Cognitive Management of IOT for Smart Cities			-	3	0	0	3.0	HO
2	23CEH02	Energy Efficient Buildings			-	3	0	0	3.0	HO
3	23CEH03	Structural Health Monitoring			-	3	0	0	3.0	HO
Category II										
4	23CEH04	Structural Failure Protection Using AI			-	3	0	0	3.0	HO
5	23CEH05	Architecture and Town Planning			-	3	0	0	3.0	HO
6	23CEH06	Safety Analysis and Risk Management			-	3	0	0	3.0	HO
Category III										
7	23CEH07	Intelligent Transportation Networks			-	3	0	0	3.0	HO
8	23CEH08	Building Information Modelling			-	3	0	0	3.0	HO
9	23CEH09	Traffic Engineering and Management			-	3	0	0	3.0	HO
Category IV										
10	23CEH10	Structural Health Monitoring Using IoT			-	3	0	0	3.0	HO
11	23CEH11	GIS & Remote Sensing			-	3	0	0	3.0	HO
12	23CEH12	Disaster Risk Mitigation			-	3	0	0	3.0	HO
Category V: MOOCs										
Industry Connect Courses										
1	23ICC01	Competitive Programming			-	2	0	8	6.0	ICC
2	23ICC02	Web Technologies – Theory to Practice			-	2	0	8	6.0	ICC
3	23ICC03	Java and Springboard			-	2	0	8	6.0	ICC
4	23ICC04	Robotics Process Automation (RPA)			-	2	0	8	6.0	ICC
5	23ICC05	Information Security and Forensics			-	2	0	8	6.0	ICC

6	23ICC06	Battery Technologies for EV	-	2	0	8	6.0	ICC
7	23ICC07	Blockchain Technology	-	2	0	8	6.0	ICC
8	23ICC08	Network Administration	-	2	0	8	6.0	ICC
9	23ICC09	Product Engineering	-	2	0	14	9.0	ICC
10	23ICC10	Machine Learning Engineer	-	2	0	8	6.0	ICC
11	23ICC11	Data Scientist	-	2	0	8	6.0	ICC
12	23ICC12	Industrial IoT	-	2	0	8	6.0	ICC
Certification #1 & #2								
1	23SOC07	Plumbing	-	0	0	3	3.0	SOC
2	23SOC08	Air conditioning and refrigeration	-	0	0	3	3.0	SOC
3	23SOC09	Mobile troubleshooting	-	0	0	3	3.0	SOC
4	23SOC10	Computer assembling	-	0	0	3	3.0	SOC
5	23SOC11	Digital marketing	-	0	0	3	3.0	SOC
6	23SOC12	Lathe	-	0	0	3	3.0	SOC
7	23SOC13	Electrical winding	-	0	0	3	3.0	SOC
8	23SOC14	Masonry	-	0	0	3	3.0	SOC
9	23SOC16	Automobile servicing (Basics)	-	0	0	3	3.0	SOC
Certification #3 & #4								
1	23SOC17	Industrial Safety	-	0	0	3	3.0	SOC
2	23SOC18	Equipment Maintenance and Repairing	-	0	0	3	3.0	SOC
3	23SOC19	Computer Aided Analysis and Design	-	0	0	3	3.0	SOC
4	23SOC20	Battery Management System (BMS)	-	0	0	3	3.0	SOC
5	23SOC21	3D - Printing	-	0	0	3	3.0	SOC
6	23SOC22	Computer Servicing	-	0	0	3	3.0	SOC
7	23SOC23	Front Office Management	-	0	0	3	3.0	SOC
8	23SOC24	Facility Management Service	-	0	0	3	3.0	SOC
9	23SOC25	Hotel Management	-	0	0	3	3.0	SOC

Specialization

B. Tech. (Honors)

1. Applications of IOT in Civil Engineering
2. Smart Cities
3. Structural Safety and Risk Management

B. Tech. (Minor) – Trans – disciplinary

1. Liberal Arts
2. Statistics
3. General Management
4. Personal Management

B. Tech. (Minor) – Inter – disciplinary

1. Environmental Engineering, Climate Changes and Sustainability

Curriculum with Multiple Entry & Multiple Exit (ME-ME) adhering to NEP 2020
(Academic Regulation 2023 – 2024)

Department of Civil Engineering

	Credit requirement	Exit credit requirement	Total credit	Level as per NCRF
Undergraduate Certificate[(After the one year of study)	40	10	50	L5
Diploma[(After two year of study)	80	10	90	L6
Advanced Diploma [(After two year of study) - Lateral Entrants	40	10	50	
B.Sc. in Engineering (After three years of study)	120	-	120	L7
B. Tech. (Regular) [(Four years of study)	160	-	160	L8
B. Tech. (Minor)	12 (Inclusive of 160)	-	160	L8
B. Tech. (Honors)	175	15 (160+15)	175	L8

Semester I								Category
No.	Code	Course Title	POs / PSOs	L/D[1]	T[2]	P	Credit	
1	23HSX01	Communicative English	5, 8, 10	2	0	2	2.0	HS
2	23BSX21	Engineering Chemistry	1, 2, 7	3	1	0	3.0	BS
3	23BSX11	Linear Algebra & Calculus	1, 2	3	1	0	3.0	BS
4	23ESX01	Basic Electrical and Electronics Engineering	1, 2, 3	3	0	0	3.0	ES
5	23ME101	Engineering Mechanics	1, 2	3	0	0	3.0	PC
6	23HSX02	Communicative English Lab	9, 10	0	0	2	1.0	HS
7	23BSX22	Engineering Chemistry Lab	1, 4	0	0	2	1.0	BS
8	23ESX04	Electrical and Electronics Engg. Workshop	1, 2, 4	0	0	3	1.5	ES
9	23CE101	Engineering Mechanics & Building Practices lab	1, 4	0	0	3	1.5	PC
10	23ESS01	IT Workshop	1, 2, 3, 4, 5	0	0	2	1.0	SOC
11	23CSP01	NSS/ NCC/Scouts & Guides/Community Service	7, 8, 12	-	-	1	0.5	CSP
						Sub-total	20.5	

Semester II								Category
No.	Code	Course Title	POs / PSOs	L/D[1]	T[2]	P	Credit	
1	23BSX31	Engineering Physics	1, 2, 7	3	1	0	3.0	BS
2	23BSX12	Differential Equations and Vector Calculus	1, 2, 5	3	1	0	3.0	BS
3	23ESX02	Introduction to Programming	1, 2, 3	3	0	0	3.0	ES
4	23ESX03	Basic Civil & Mechanical Engineering	1, PSO #1	3	0	0	3.0	ES
5	23BSX32	Engineering Physics Lab	1, 4	0	0	2	1.0	BS
6	23ESX06	Engineering Workshop	1	0	0	3	1.5	ES
7	23ESX07	Engineering Graphics	1, 10	2	0	2	3.0	ES
8	23ESX05	Computer Programming Lab	1, 2, 3, 4, 5	0	0	3	1.5	ES
9	23WLP01	Health, Wellness, Yoga & Sports	2, 7, 12	-	-	1	0.5	Wellness
						Sub-total	19.5	
Exit mandate at the level of I year for the award of Undergraduate Certificate[3]								
1		Certification #1		Min. 60 hours			2.0	SOC
2		Certification #2		Min. 60 hours			2.0	SOC
3		Job Specific Internship / OJT / Apprenticeship		Min. 60 Days			6.0	OJT

[1] In case of digital learning other than face-to-face learning, double the number of learning hours is mandate for the equivalent credit as per NCRF

[2] Suggested tutorials do not carry credits

[3] Students exiting at the level of first year of study must complete two skill-oriented courses and Job specific Internship/ OJT/ Apprenticeship that tunes to a total of 10 credits

Certification #1 & #2								
1	23SOC07	Plumbing	-	0	0	2	2.0	SOC
2	23SOC08	Air conditioning and refrigeration	-	0	0	2	2.0	SOC
3	23SOC09	Mobile troubleshooting	-	0	0	2	2.0	SOC
4	23SOC10	Computer Servicing	-	0	0	2	2.0	SOC
5	23SOC11	Digital marketing	-	0	0	2	2.0	SOC
6	23SOC12	Machining	-	0	0	2	2.0	SOC
7	23SOC13	Electrical winding	-	0	0	2	2.0	SOC
8	23SOC14	Masonry	-	0	0	2	2.0	SOC
9	23SOC16	Automobile servicing (Basics)	-	0	0	2	2.0	SOC

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HS 23HSX01 Communicative English **2 0 0 2**

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

Code	Course Outcomes	Mapping with POs PO 5	PO 8	PO 10	DoK
23HSX01.1	Make use of the setting, subject, and specific details from social or transactional discussions	1	1	3	L1 - L3
23HSX01.2	Identify grammatical frameworks to construct sentences and select the appropriate word forms	1	1	3	L1 - L3
23HSX01.3	Examine discourse markers to talk coherently about a subject in informal conversations	1	1	3	L1 - L3
23HSX01.4	Assessing the reader's or listener's overall comprehension of reading, listening, and summary materials	1	1	3	L1 – L6
23HSX01.5	Justify intelligible essays, resumes, and paragraphs	1	1	3	L1 – L6

All the Cos are mapped to PO12 as few self learning topics are inbuilt in syllabus promoting autonomous learning.

Unit I: HUMAN VALUES: A Power of a Plate of Rice by Ifeoma Okoye **9 Hours**
"Tomorrow is waiting" by Holli Mintzer - Strange Horizons
Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions
Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing one self and others
Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information
Writing: Mechanics of Writing - Capitalization, Spellings, Punctuation – Parts of Sentences
Grammar: Parts of Speech, Basic Sentence Structures – forming question
Vocabulary: Synonyms, Antonyms, Affixes (Prefixes/Suffixes), Root words
COs: CO1

Self Learning Topic: The Time Machine – H.G. Wells

Unit II: NATURE: Night of the Scorpion by Nissim Ezekiel (Indian & Contemporary) **9 Hours**
Patterns of a Murmuration, In billions of data points by Jy Yang - Clares World
The Brook by Alfred Tennyson (Poem)
Listening: Answering a series of questions about main ideas and supporting ideas after listening to audio texts
Speaking: Discussion in pairs/small groups on specific topics followed by short structure talks
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together
Writing: Structure of a paragraph – Paragraph writing (specific topics)
Grammar: Cohesive devices - linkers, use of articles and zero article; prepositions
Vocabulary: Homonyms, Homophones, Homographs
COs: CO2

Self Learning Topic: In Watermelon Sugar –Brautigan

Unit III: BIOGRAPHY: Elon Musk/Steve Jobs **9 Hours**

"The Life cycle of Software Objects" is a novella by American writer Ted Chiang, originally published in 2010 by Subterranean Press.
Listening: Listening for global comprehension and summarizing what is listened to
Speaking: Discussing specific topics in pairs orsmall groups and reporting what is discussed
Reading: Reading a text in detail by making basic inferences-recognizing and interpreting specific context clues; strategies to use text clues for comprehension
Writing: Summarizing, Note-making, paraphrasing
Grammar: Verbs-tenses; subject-verb agreement; Compound words, Collocations
Vocabulary: Compound words, Collocations

COs: CO3

Self Learning Topic: The Reader – Bernhard Schlink

Unit IV: Inspiration: TheToys of Peace by Saki **9 Hours**
A Story Told by a Machine The Circuitous Path to AI Writing
Listening: Making predictions while listening to conversations/transactional dialogues without video; listening with video
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions
Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/ relationships, communicate processesor display complicated data
Writing: Letter Writing: Official Letters, Resumes
Grammar: Reporting verbs, Direct & Indirect speech, Active & Passive Voice
Vocabulary: Words often confused, Jargons

COs: CO4

Self Learning Topic: The Prime of Life – Simone De Beauvoir

Unit V: MOTIVATION: The Power of Intra personal Communication (An Essay) **9 Hours**
The interplay of AI, modern lives and literature by Mimi Mondal - Hindusthan Times
Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension
Speaking: Formal oral presentations on topics from academic contexts
Reading: Reading comprehension
Writing: Writing structured essays on specific topics
Grammar: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)
Vocabulary: Technical Jargons

COs: CO5

Self Learning Topic: Do Androids Dream of electric ship? PhilipK.Dick The City and the Stars – Aarthur C. Clarke

Board of Studies	Basic Science & Humanities (English)	
Approved in: BoS No. II	October 06, 2023	
Approved in ACM: ACM No.VIII	October 21, 2023	
Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
Workshop on Drama and enactive sessions	CO5	PO5, PO8, PO10
Seminar with Language expert	CO3	PO5, PO8, PO10

Text Books

1. Path finder: Communicative English for Undergraduate Students,1st Edition, Orient Black Swan, 2023 (Units 1, 2 & 3)
2. Empowering English by Cengage Publications, 2023 (Units 4 & 5)

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Reference Books

1. Dubey, ShamJi & Co. English for Engineers, Vikas Publishers, 2020
2. Bailey, Stephen, Academic writing: A Handbook for International Students Routledge, 2014
3. Murphy, Raymond, English Grammar in Use, 4th Edition, Cambridge University Press, 2019
4. Lewis, Norman, Word Power Made Easy – The Complete Handbook for Building a Superior Vocabulary, Anchor, 2014

Web References

Grammar

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

Vocabulary

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sIpA

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	15
L2	20	30
L3	10	30
L4	10	15
L5	05	05
L6	05	05
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. List the major characters in the story
2. Who is the author of the poem "The Brook"?
3. What is the specific natural element that the poem revolves around?
4. Who is Elon Musk?
5. Can you name some of the companies founded or co-founded by Elon Musk?

L2: Understand

1. Can you summarize the plot of the story in your own words?
2. Explain the significance of the Brook's journey in the poem
3. What emotions or feelings does the poem evoke in you as a reader?
4. Explain the significance of SpaceX in Elon Musk's career and the aerospace industry
5. What are some of the major technological advancements associated with Elon Musk's companies?

L3: Apply

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1. How would you apply the lessons from this story to your own life?
2. Can you apply the poem's themes to a different natural setting or body of water that you are familiar with?
3. Describe a real-life situation or natural phenomenon that parallels the Brook's journey in the poem
4. Apply Elon Musk's philosophy on sustainable energy to a current environmental issue
5. Describe a scenario in which the principles of innovation and risk-taking, as demonstrated by Elon Musk, could be applied in a different industry

L4: Analyze

1. How does the setting contribute to the overall mood of the story?
2. How does the poem's structure, including its rhyme scheme and meter, contribute to the overall meaning and mood of the poem?
3. Explore the role of sound and sensory imagery in conveying the Brook's essence
4. How has Elon Musk's leadership style contributed to the success of his companies?
5. Compare and contrast the goals and missions of SpaceX and Tesla, Inc.

L5: Evaluate

1. Evaluate the impact of the surprise ending in the story
2. Evaluate the effectiveness of the poem in conveying its themes and emotions
3. How might different readers interpret the poem's meaning based on their personal experiences or perspectives?
4. Do you agree with Elon Musk's vision for a sustainable future and his approach to achieving it? Why or why not?
5. Assess the ethical considerations surrounding some of Elon Musk's projects, such as Neuralink or the Hyperloop

L6: Create

1. Create a modern-day version of the story, updating the setting and circumstances while retaining the central theme of sacrifice
2. Write a short paragraph or poem that continues the story of the brook after the poem ends
3. Compose a piece of music inspired by the imagery and emotions conveyed in "The Brook"
4. Write a short essay discussing the potential long-term effects of Elon Musk's ventures on the global economy and society
5. Develop a concept for a new technology or project that aligns with Elon Musk's innovative spirit and goals

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BS 23BSX21 Engineering Chemistry

L	T	P	C
3	0	0	3

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

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO7	
23BSX21.1	Compare the differences between temporary and permanent hardness of water	3	2	1	L1 - L3
23BSX21.2	Apply Nernst equation for calculating electrode, cell potentials and Pilling-Bedworth rule for corrosion	3	2	1	L1 - L3
23BSX21.3	Explain different types of polymers and their applications & solve the numerical problems based on Calorific value, octane number, refining of petroleum and cracking of oils.	3	2	1	L1 - L3
23BSX21.4	Explain the constituents of composites and its classification & the constituents of Portland cement & enumerate the reactions at setting and hardening of the cement	3	2	1	L1 - L3
23BSX21.5	Summarize the concepts of colloids, micelle and nanomaterials	3	2	1	L1 - L3

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus promoting autonomous learning

Unit I: Water Technology — **9 Hours**

Soft and hard water, Estimation of hardness of water by EDTA Method, Estimation of dissolved oxygen - Boiler troubles – Priming, foaming, scale and sludge, caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards (BIS) and World Health Organization (WHO) standards, Ion-exchange processes - desalination of brackish water, Reverse Osmosis (RO) and electro dialysis — **COs: CO1**

Self – Learning Topic: Advanced softening methods

Unit II: Electrochemical Cells and Corrosion and its Applications — **9 Hours**

Electrodes – electrochemical cell, Nernst equation, cell potential calculations.
Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad), and lithium ion batteries - working principle of the batteries including cell reactions; Fuel cells - Basic concepts, the principle and working of hydrogen-oxygen fuel cell.
Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling - Bedworth ratio and uses, factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper). — **COs: CO2**

Self – Learning Topic: Nano electrochemical sensor

Unit III: Polymers and Fuel Chemistry — **9 Hours**

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization. Thermoplastics and Thermo-setting plastics: Preparation, properties and applications of poly styrene, PVC Nylon 6,6 and Bakelite.
Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers.
Fuels – Types of fuels, calorific value of fuels, numerical problems based on calorific value; Analysis of coal (Proximate and Ultimate analysis), Liquid fuels, refining of petroleum, Octane and Cetane number-alternative fuels-propane, methanol, ethanol and bio fuel-bio diesel. — **COs: CO3**

Self – Learning Topic: Advanced techniques of synthetic petrol

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Unit IV: Modern Engineering Materials **9 Hours**

Composites-Definition, Constituents, Classification- Particle, Fibre and structural reinforced composites, properties and Engineering applications

Refractories-Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants-Classification, Functions of lubricants, Mechanism, Properties of lubricating oils–Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and applications. **COs: CO4**

Building materials-Portland Cement, constituents, Setting and Hardening of cement.

Self – Learning Topic: Design materials

Unit V: Surface Chemistry and Nanomaterials **9 Hours**

Introduction to surface chemistry, colloids, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, characterization of surface by physicochemical methods (SEM, TEM, X-ray diffraction), solid-gas interface, solid-liquid interface, adsorption isotherm, BET equation (no derivation) applications of colloids and nanomaterials – catalysis, medicine, sensors **COs: CO5**

Self – Learning Topic: Optical methods

Board of Studies		Basic Science & Humanities (Chemistry)	
Approved in: BoS No. II		October 06, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Corrosion and material protection	CO1	PO1, PO2, PO7
2	Principles and applications of chemical energy sources	CO2, CO3	PO1, PO2, PO7

Text Books

1. Jain and Jain, "Engineering Chemistry", 16th Edition, Dhanpatrai Publications, 2013
2. Peter Atkins, Julio de Paula and James Keeler, Atkins 'Physical Chemistry", 10th Edition, Oxford University Press, 2010
3. Shikha Agarwal, Engineering Chemistry: Fundamentals and Applications" 13th Edition, 2012

Reference Books

1. Lee J. D., "Concise Inorganic Chemistry", 5th Edition, Oxford University Press, 2008
2. Taylor H. F. W., "Cement Chemistry", 2nd Edition, Thomas Telford Publications, 1997

Web References

1. http://link.springer.com/chemistry
2. http://www.thphys.chemistry.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is soft water & hard water?
2. What are the salts causing hardness?
3. Define corrosion & give an example
4. Write any four applications of fuel cells
5. Define octane number
6. List any three properties of PVC
7. Define Flash point

L2: Understand

1. Explain estimation of hardness of water by EDTA Method
2. Explain Ion-exchange process with neat sketch
3. Differentiate between primary cells & secondary cells
4. Explain electroplating and electro less plating process
5. Differentiate chain growth polymerization and step growth polymerization
6. Explain about Ultimate analysis of coal
7. Explain about various types of lubricants

L3: Apply

1. Estimate the hard water can be converted into soft water by ion exchange process
2. Explain how estimation of hardness of water by EDTA method can be used to measurement of hardness
3. Discuss the challenges that need to be overcome for fuel cells to become more widely used
4. Automotive tires, gaskets for industrial machinery, or medical devices, can you choose an appropriate elastomer material based on its properties, such as elasticity, chemical resistance, and durability? Justify your answer
5. Explain the choice of refractory materials, their composition, and how they can withstand extreme temperatures, chemical reactions, and mechanical stresses
6. Describe the choice of a nanomaterial, its synthesis method, and how it enhances catalytic activity for a particular chemical reaction
7. Discuss the use of colloidal nanoparticles as catalysts in industrial processes

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BS 23BSX11 Linear Algebra and Calculus

3 0 0 3

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

Code	Course Outcomes	Mapping with POs PO1	PO2	DoK
23BSX11.1	Solve homogenous & non- homogenous linear system of equations	3	2	L1 – L4
23BSX11.2	Use Cayley- Hamilton theorem to find inverse & powers of a matrix and identify the nature of the quadratic forms using eigen values and eigen vectors	3	2	L1 – L4
23BSX11.3	Solve a given inequality using mean value theorems	3	2	L1 – L4
23BSX11.4	Make use of functions of several variables which is useful in optimization	3	2	L1 – L4
23BSX11.5	Analyze double and triple integrals using Beta and Gamma functions	3	3	L1 – L4

All the COs are mapped to PO12 as few self-learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Solving Homogeneous and Non-Homogeneous Systems of linear equations — 9 Hours

Rank of a matrix by echelon form, normal form. Inverse of Non- singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method

COs: CO1

Self – Learning Topic: Rank by using minors

Unit II: Eigen Values and Eigen Vectors, Cayley - Hamilton theorem and Quadratic forms — 9 Hours

Eigen values, Eigen vectors and their properties, Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

COs: CO2

Self – Learning Topic: Applications of Eigen Values and Eigen Vectors

Unit III: Calculus (Mean value theorems) — 9 Hours

Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems on the above theorems.

COs: CO3

Self – Learning Topic: Applications on the above theorems

Unit IV: Partial Differentiation and applications (Multi Variable Calculus) — 9 Hours

Partial Derivatives, Total derivatives, Chain Rule, Change of variables, Taylor's and Maclaurin's series expansion of functions ot two variables, Jacobians, maxima and minima of functions of two variables, method of lagrange multipliers.

COs: CO4

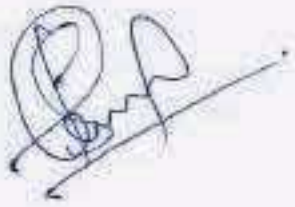
Self – Learning Topic: Jacobian of Implicit functions

Unit V: Beta and Gamma Functions & Multiple Integrals — 9 Hours

Gamma, Beta Functions and their Properties - Relation between Beta and Gamma Functions - Evaluation of Improper Integrals. Evaluation of Double triple Integrals - Direct Method

COs: CO5

Self – Learning Topic: Dirichlet's Integrals



Board of Studies	Basic Science & Humanities (Mathematics)	
Approved in: BoS No. VI	October 06, 2023	
Approved in: ACM No. VIII	October 21, 2023	
Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1 Introduction to MATLAB	CO1-CO5	PO2
Applications of Singular Value Decomposition	CO2	PO2

Text Books

1. Grewal, B. S. "Higher Engineering Mathematics", 44th Edition, 12th reprint, Khanna Publishers, 2022
2. Ramana, B. V. "Higher Engineering Mathematics",1st Edition, 35th Reprint,Tata McGraw Hill Education, 2019

Reference Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2021
2. Bali, N. P. "Engineering Mathematics",1st Edition, Lakshmi Publications, 2017
3. Peter O' Neil, "Advanced Engineering Mathematics",1st Edition, Cengage, 2010
4. Iyengar, T. K. V. Prasad, M. V. S. S. N., Ranganatham S. & B. Krishna Gandhi, "Engineering Mathematics – II", 3rd Edition, S. Chand Publications, 2020

Web References

1. http://nptel.ac.in/courses/
2. https://onlinecourses.nptel.ac.in
3. https://www.classcentral.com/course/swayam-basic-linear-algebra-13003
4. https://ocw.mit.edu/courses

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	15	15
L2	55	55
L3	20	20
L4	10	10
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. State Cayley-Hamilton theorem
2. State Euler's theorem
3. Define the rank of a matrix
4. What is an orthogonal transformation?
5. What is the necessary condition for a non-homogenous system AX=B to be consistent
6. What is the index of a quadratic form?
7. State Rolle's Theorem

L2: Understand

1. Check whether $x = r\cos\theta$ and $y = r\sin\theta$ are functionally dependent.
2. Check the consistency of the system $x+y+z=4$, $2x+3y-2z=3$, $x+7y-7z=5$
3. Find whether the homogenous system $x+y-3z+2w=0, 2x-y+2z-3w=0, 3x-2y+z-4w=0, -4x+y-3z+w=0$ possess a non-trivial solution

5. Verify Rolle's theorem for $f(x) = (x+2)^3(x-3)^4$ in [-2,3]

L3: Apply

1. Find non-singular matrices P and Q such that PAQ is in the normal form for $A=\begin{bmatrix} 2 & 3 & -1 \\ 0 & 1 & 2 \\ 3 & -4 & -2 \end{bmatrix}$
2. Reduce the matrix A to echelon form where $A = \begin{bmatrix} 1 & 2 & 4 & -3 \\ -2 & 7 & 5 & 2 \\ 4 & 13 & 0 & -4 \\ 6 & 5 & -3 & 3 \end{bmatrix}$
3. Find the shortest distance from origin to the surface $xyz^2 = 2$
4. Find the points on the surface $z^2 = xy + 1$ that are nearest to the origin

L4: Analyze

1. Consider the matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ -1 & 3 & 2 \\ 1 & -1 & 0 \end{bmatrix}$. If the characteristic polynomial of T is
   a. $C_T(\lambda) = (\lambda - 1)^p(\lambda - 1)^q$ then P =____ q =____
2. Find the minimal polynomial? what can be concluded from minimal polynomial?
3. Find a matrix S (if one exists) that diagonalizes [T]. What is the diagonal form of A of [T] produced
   i. by the matrix. **Answer:** $S = \begin{bmatrix} a & b & a \\ b & b & -c \\ -b & a & b \end{bmatrix}$ then a =____ b =____ c =_____
4. The matrices $A = \begin{bmatrix} a & 1 \\ -2 & d \end{bmatrix}$ and $B = \frac{1}{25}\begin{bmatrix} a & 1 \\ -2 & d \end{bmatrix}$ have same Eigen values then find the values
   a. of a and d
5. 5.Consider the matrix $A = \begin{bmatrix} a & 1 & 1 \\ 1 & a & 1 \\ 1 & 1 & a \end{bmatrix}$ for what ranges of values of a the matrix is positive definite?
6. Compare Rolles theorem with LMVT and identify which is the the generalized onest
7. Test whether the pair of functions $\frac{x+y}{1-xy}$ and $tan^{-1}x + tan^{-1}y$ are functionally dependent and if so find the relation between them?

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ES 23ESX01 Basics of Electrical and Electronics Engineering 3 0 0 3

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

Code	Course Outcomes	Mapping with POs				DoK
		PO1	PO2	PO3	PSO1	
23ESX01.1	Understand basic concepts of electrical circuits	3	2	-	1	L1, L2
23ESX01.2	Explain the operation of various machines and instruments	3	1	-	1	L1,L2
23ESX01.3	Understand the operation of different power plants	3	2	2	1	L1,L2
23ESX01.4	Analyze the working of electronic devices	3	-	-	1	L1 - L4
23ESX01.5	Examine the working of electronics circuits and devices	3	-	-	1	L1 - L4
23ESX01.6	Analyze various digital logic gates	3	2	2	1	L1 - L4

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus promoting autonomous learning

Unit I: DC & AC Circuits — 9 Hours

DC Circuits: Electrical circuit elements (R, L and C), Ohm's Law and its limitations, KCL & KVL, series, parallel, series-parallel circuits, Super Position theorem, Simple numerical problems.

AC Circuits: A.C. Fundamentals: Equation of AC Voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor, voltage and current relationship with phasor diagrams in R, L, and C circuits, concept of Impedance, active power, reactive power and apparent power, concept and measurement of power factor (Simple numerical problems).

COs: CO1

Self- Learning Topic: Applications of electrical circuits

Unit II: Machines and Measuring Instruments — 9 Hours

Machines: Construction, principle and operation of (i) DC Motor, (ii) DC Generator (iii) Single Phase Transformer, (iv) Three Phase Induction Motor and (v) Alternator, Applications of electrical machines.

Measuring Instruments: Construction and working principle of Permanent Magnet Moving Coil (PMMC), Moving Iron (MI) Instruments and Wheat Stone bridge

COs: CO2

Self - Learning Topic: Applications of electrical machines

Unit III: Energy Resources, Electricity Bill & Safety Measures — 9 Hours

Energy Resources: Conventional and non-conventional energy resources; Layout and operation of various power generation systems: Hydel, Nuclear, Solar & Wind power generation.

Electricity Bill: Power rating of household appliances including air conditioners, PCs, Laptops, Printers, etc. Definition of "unit" used for consumption of electrical energy, two-part electricity tariff, calculation of electricity bill for domestic consumers.

COs: CO3

Equipment Safety Measures: Working principle of fuse and miniature circuit breaker (MCB), merits and demerits. Personal safety measures: Electric Shock, Earthing and its types, safety precautions to avoid shock.

Self - Learning Topic: Importance of electrical safety measures

Unit IV: Semiconductor Devices — 9 Hours

Introduction - Evolution of electronics – Vacuum tubes to nano electronics - Characteristics of PN junction Diode — Zener Effect — Zener Diode and its characteristics, Bipolar Junction Transistor — CB, CE, CC configurations and characteristics — Elementary – Treatment of Small Signal Amplifier.

COs: CO4

Self - Learning Topic: Applications of Zener diode

Unit V: Basic Electronic Circuits and Instrumentation — 9 Hours

Rectifiers and power supplies: Block diagram description of a dc power supply, working of a full wave bridge rectifier, capacitor filter (no analysis), working of simple Zener voltage regulator. Amplifiers: Block diagram of

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Public Address system, Circuit diagram and working of common emitter (RC coupled) amplifier with its frequency response, Concept of voltage divider biasing. Electronic Instrumentation: Block diagram of an electronic instrumentation system. **COs:CO5**

Self - Learning Topic: Applications of rectifiers and amplifiers

Unit VI: Digital Electronics **9 Hours**

Logic gates including Universal Gates, BCD codes, Excess-3 code, Gray code, Hamming code, Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND, XOR and XNOR Integrated Circuits (ICs). Simple combinational circuits–Half and Full Adders. Introduction to sequential circuits, Flip flops, Registers and counters. **COs: CO6**

Self - Learning Topics: Application of logic gates

Board of Studies		Electrical and Electronics Engineering	
Approved in: BoS No. VI		October 07, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Operation of Brush-less DC motor and its applications to industry	CO 2	PO1, PO2, PO3, PSO1
2	Operation of servo motor and its applications to industry	CO 2	PO1, PO2, PO3, PSO1

Text Books

1. Kulshreshtha D. C., "Basic Electrical Engineering", Revised 1st Edition, McGraw Hill, 2021
2. Rajendra Prasad, "Fundamentals of Electrical Engineering", 3rd Edition, PHI Publishers, 2020
3. Kotari D. P. and Nagrath I. J., "Basic Electrical Engineering", 3rd Edition ,Tata McGraw Hill, 2020
4. Boylestad R. L., & Louis Nashlesky, "Electronic Devices & Circuit Theory", Pearson Education, 2021

Reference Books

1. Mehta V. K. & Rohit Mehta, "Principles of Electrical Machines", 4th Edition, S. Chand Publications, 2019
2. Sedha R. S., "A Text Book of Electronic Devices and Circuits", 3rd Edition, S. Chand & Co., 2014
3. Madhu Sahu K. B., "Basic Electrical Engineering", 4th Edition, Scitech Publications (India) Pvt. Ltd., 2019
4. Paynter R. T., "Introductory Electronic Devices & Circuits – Conventional Flow Version", 2nd Edition, Pearson Education, 2009

Web References

1. https://www.classcentral.com/course/swayam-electrical-machines-iitd-14030
2. https://onlinecourses.nptel.ac.in/noc20_ee60/preview
3. https://onlinecourses.swayam2.ac.in/nou22_ec03/preview

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	30	20
L2	70	30
L3	-	30
L4	-	20
Total (%)	100	100

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PC 23ME101 Engineering Mechanics 3 0 0 3

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

Code	Course Outcomes	Mapping with POs PO1	PO2	PSO1	DoK
23ME101.1	Develop free body diagrams for particles and rigid bodies in plane and space problems to solve the unknown forces, orientations and geometric parameters	3	1	2	L1 - L3
23ME101.2	Demonstrate the fundamental concepts in mechanics and determine the frictional forces for bodies in contact	3	1	2	L1 - L3
23ME101.3	Solve different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments	3	1	2	L1 - L3
23ME101.4	Identify the centroids, center of gravity and moment of inertia of different geometrical shapes	3	1	2	L1 - L3
23ME101.5	Make use of principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle	3	1	2	L1 - L3

All the COs are mapped to PO12 as few self learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Introduction to Engineering Mechanics **9 Hours**

Introduction to Engineering Mechanics – Basic Concepts and Applications

Systems of Forces: Coplanar Concurrent Forces – Components in Space– Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction. **COs: CO1**

Self - Learning Topic: Newton's law of motion and gravitation

Unit II: Equilibrium of Systems of Forces **9 Hours**

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorem, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of forces, Numerical examples on spatial system of forces using vector approach, Analysis of plane trusses.Principle of virtual work with simple examples **COs: CO2**

Self - Learning Topic: Distribution of forces in a plane

Unit III: Centroid, Centre of Gravity, Area moments of Inertia and Mass Moment of Inertia **9 Hours**

Centroid: Centroids of simple figures(from basic principles) – Centroids of Composite Figures

Centre of Gravity: Centre of gravity of simple body (from basic principles), Centre of gravity of composite bodies, Pappus theorems.

Area Moments of Inertia: Definition –Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **COs: CO3**

Self - Learning Topic: Centroid for two dimensional bodies

Unit IV: Kinematics, Kinetics **9 Hours**

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics –D'Alembert's Principle – Work Energy method and applications to particle motion-Impulse Momentum method **COs: CO4, CO5**

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Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

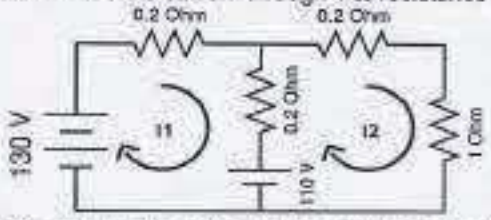
1. What is ohm's law?
2. Define RMS and peak values
3. What is form factor?
4. List any 2 types of rectifiers
5. List any 4 applications of operational amplifiers

L2: Understand

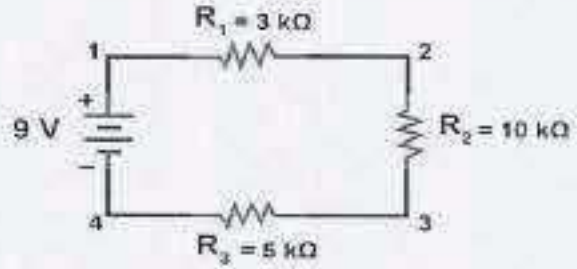
1. Explain in detail about Kirchhoff's current and voltage Law
2. Explain working principle of DC shunt generator
3. Explain the operation of single phase transformer

L3: Apply

1. Determine the current through 1 Ω resistance by using Kirchhoff's voltage law / Mesh analysis



2. By applying Kirchhoff's voltage law find current through R_3



L4: Analyze

1. Capacitors can be used for the filtering of ripples at the output of a rectifier. Suggest some other device which can work as a better filter
   a. Design the filter circuit
   b. Find the filter coefficients
   c. Analyse the form factor and ripple factor values of the rectifier by comparing them with the values of a rectifier which uses a capacitor for filtering
2. After completing the design and fabrication of an SSI-based digital system, a designer finds that one more inverter is required. However, the only spare gates in the system are a 2 input OR, a 3 input AND, and 2 input XNOR. How should the designer realize the inverter function without adding another IC?
3. For the manufacturing of a p-n junction diode we use either Germanium or Silicon semiconducting materials. Analyse the behaviour of a diode if it is made of a compound form of semiconducting materials like GaAs
   a. What change do you observe in the doping levels during the formation of p-region and n-region?
   b. What change do you observe in the V-I characteristics when compared with the characteristics of a conventional diode?

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Self -Learning Topic: Cylindrical and spherical coordinates

Unit V: Work – Energy Method **9 Hours**

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method

COs: CO5

Self - Learning Topic: Potential energy and equilibrium

Board of Studies	Mechanical Engineering
Approved in: BoS No. VI	October 07, 2023
Approved in: ACM No. VIII	October 21, 2023

Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1 Importance of engineering mechanics in design and analysis of mechanical systems	CO1 - CO5	PO1, PO2
2 Real time applications of engineering mechanics	CO1 - CO5	

Text Books

1. Timoshenko S. and Young D. H.," Engineering Mechanics", 5th Edition, Mc Graw Hill Publications, 2013
2. Bavakatti S. S.," Engineering Mechanics Statics", 4th Edition, New Age International Publications, 2012
3. Tayal A. K., "Engineering Mechanics Statics and Dynamics", 6th Edition, Umesh Publications, 2006

Reference Books

1. Kurmi R. S.," Engineering Mechanics Statics",10th Edition, S. Chand Publications, 2005
2. Vijay Kumar Reddy K. and Suresh Kumar J.," Mechanics: Statics and Dynamics", 3rd Edition, B. S Publications, 2010
3. Ferdinand P. Beer, Russell Johnston Jr .E.," Vector Mechanics for Engineers Static sand Dynamics", 9th Edition, McGraw Hill Publications, 2011

Web References

1. https://www.iitg.ac.in/rkbc/me101/Presentation/L01-03.pdf
2. https://drive.google.com/file/d/12V_O8G7OrSnZMiFDjrJhF5sOEbGXstkQ/view

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. State the conditions for equilibrium of a rigid body in three dimensions
2. What is the principle of transmissibility?
3. State the Parallel axis theorem
4. Define centroid
5. State triangular law of forces

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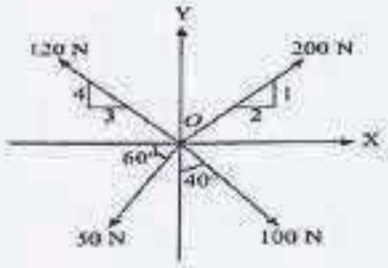
L2: Understand

1. Explain Pappus theorem I & II
2. Differentiate between polar moment of inertia and product of inertia
3. Write impulse momentum equation
4. What is a rolling body? Explain its importance
5. Explain work-energy method for a plane motion

L3: Apply

1. Two forces of magnitude 50 N and 30 N are acting at a point. If the angle between the two forces is 60° determine the magnitude and direction of the resultant force
2. A system of four forces acting on a body is shown in figure. Determine the resultant force and its direction



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HS 23HSX02 Communicative English Lab

0 0 2 1

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

Code	Course Outcomes	Mapping with POs PO10	PO9
23HSX02.1	Recognize the various facets of English language ability, with a focus on LSRW abilities	3	1
23HSX02.2	Use numerous activities for language learners to practice communication skills	3	1
23HSX02.3	To improve listening and speaking comprehension, analyze the sounds, stress, rhythm, intonation, and syllable division of English speech	3	1
23HSX02.4	Assess your professionalism when taking part in group discussions and debating	3	1
23HSX02.5	Develop compelling messaging and get ready for upcoming interviews	3	1

List of Experiments

1.	Vowels & Consonants	COs: CO1,CO2
2.	Neutralization/Accent Rules	COs: CO1,CO2
3.	Communication Skills & JAM	COs: CO3,CO4
4.	Role Play or Conversational Practice	COs: CO3,CO4
5.	E-mail Writing	COs: CO4,CO5
6.	Resume Writing, Cover letter, SOP	COs: CO4,CO5
7.	Group Discussions-methods & practice	COs: CO4,CO5
8.	Debates- Methods & Practice	COs: CO4,CO5
9.	PPT Presentations/ Poster Presentation	COs: CO4,CO5
10.	Interviews Skills	COs: CO4,CO5

Reference Books

1. Meenakshi Raman, Sangeeta-Sharma, 4th Edition, Technical Communication, Oxford Press, 2022
2. Grant Taylor: English Conversation Practice, 1st Edition,Tata McGraw-Hill Education India, 2001
3. Hewing's, Martin, Cambridge Academic English (B2), Cambridge University Press, 2012
4. Balasubramanyam T., A Text Book of English Phonetics for Indian Students, 3rd Edition, Trinity, 2022

Suggested Software

- Walden Infotech
- Young India Films

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Web Resources

Spoken English

1. www.esl-lab.com
2. www.englishmedialab.com
3. www.englishinteractive.net
4. https://www.britishcouncil.in/english/online
5. http://www.letstalkpodcast.com/
6. https://www.youtube.com/c/mmmEnglish_Emma/featured
7. https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8. https://www.youtube.com/c/engvidAdam/featured
9. https://www.youtube.com/c/EnglishClass101/featured
10. https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11. https://www.youtube.com/channel/UCV1h_cBE0Drdx19ckTM0WNw

Voice & Accent

12. https://www.youtube.com/user/letstalkaccent/videos
13. https://www.youtube.com/c/EngLanguageClub/featured
14. https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
15. https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

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23BSX22 Engineering Chemistry Lab

0	0	2	1

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

Code	Course Outcomes	Mapping with POs	
		PO1	PO4
23BSX22.1	Determine the physical properties like surface tension, adsorption and viscosity	3	3
23BSX22.2	Estimate the Iron and Calcium in cement	3	3
23BSX22.3	Explain advanced polymer materials	3	3
23BSX22.4	Compare the total hardness for different water samples	3	3
23BSX22.5	Illustrate the functioning of the instruments such as pH and Potentiometric meters	3	3

List of Experiments

1.	Determination of Mn using standard oxalic acid solution (Redox titration)	COs: CO1,CO2
2.	Determination of temporary and permanent hardness of water using standard EDTA solution	COs: CO1,CO3
3.	Determination of strength of an acid in Pb-Acid battery	COs: CO1,CO2
4.	Preparation of a polymer (Bakelite)	COs: CO3
5.	Determination of percentage of Iron in cement sample by colorimetry	COs: CO1,CO2
6.	Preparation of nanomaterials by precipitation method	COs: CO1,CO2
7.	Adsorption of acetic acid by charcoal	COs: CO1,CO2
8.	Determination of percentage moisture content in a coal sample	COs: CO1,CO2
9.	Determination of the concentration of acetic acid using sodium hydroxide (pH-Metry method)	COs: CO1,CO5
10.	Determination of viscosity of lubricating oil by Redwood Viscometer 1	COs: CO1
11.	Determination of viscosity of lubricating oil by Redwood Viscometer 2	COs: CO1
12.	Determination of calorific value of gases by Junker's gas calorimeter	COs: CO1

References

1. Mendham J., Denney R. C., Barnes J. D., Thosmas M. and Siva Sankar B. Vogel's "Quantitative Chemical Analysis" 6th Edition, Pearson Publishers, 2000
2. Lab Manual for Chemistry, Department of Basic Science and Humanities, NSRIT, 2023

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ES 23ESX04 Electrical and Electronics Engineering Workshop 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
23ESX04.1	Verify Kirchhoff's laws and theorems	3	2	3
23ESX04.2	Determine various parameters of electrical measuring instruments	3	2	3
23ESX04.3	Determine the basic characteristics of electrical machines	3	2	3
23ESX04.4	Illustrate the characteristics of various electron devices	3	2	3
23ESX04.5	Examine the operation of a logical circuit	3	2	3

List of Experiments

Part-A: Basic Electrical Engineering Lab

1.	Verification of KCL and KVL	COs: CO1
2.	Verification of superposition theorem	COs: CO1
3.	Measurement of resistance using Wheat Stone bridge	COs: CO2
4.	Magnetization characteristics of DC shunt generator	COs: CO3
5.	Conduct brake test on DC shunt motor	COs: CO3
6.	Speed control of DC shunt motor by field and armature control	COs: CO3
7.	Perform Swinburne's test on DC machine	COs: CO3
8.	Measurement of power and power factor using single - phase wattmeter	COs: CO2
9.	Measurement of earth resistance using Megger	COs: CO2
10.	Calculation of electrical energy for domestic premises	COs: CO2

Part-B: Basic Electronics Engineering Lab

1.	Plot V-I characteristics of PN Junction diode A) Forward bias B) Reverse bias	COs: CO4
2.	Plot V-I characteristics of Zener diode and its application as voltage regulator	COs: CO4
3.	Implementation of half wave and full wave rectifiers	COs: CO4
4.	Plot input & output characteristics of BJT in CE and CB configurations	COs: CO4
5.	Frequency response of CE amplifier	COs: CO4
6.	Simulation of RC coupled amplifier with the design supplied	COs: CO5
7.	Verification of truth table of AND, OR, NOT, NAND, NOR, Ex-OR, Ex-NOR gates using ICs	COs: CO5
8.	Verification of truth tables of S-R, J-K& D flip flops using respective ICs	COs: CO5

Web References

1. https://www.vlab.co.in/broad-area-electrical-engineering

References

1. Kulshreshtha D. C., "Basic Electrical Engineering", Revised 1st Edition, McGraw Hill, 2021
2. Sedha R. S., "A Text Book of Electronic Devices and Circuits", 3rd Edition, S. Chand & Co, 2014
3. Lab Manual for "Electrical and Electronics Engineering Workshop", Department of Electrical and Electronics Engineering & Department of Electronics and Communication Engineering, NSRIT

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PC 23CE101 Engineering Mechanics & Building Practices 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
23CE101.1	Evaluate the coefficient of friction between two different surfaces and between the inclined plane and the roller	3	2
23CE101.2	Verify Law of Parallelogram of forces and Law of Moment using force polygon and bell crank lever	3	2
23CE101.3	Determine the Centre of Gravity different configurations	3	2
23CE101.4	Identify the properties of various construction tools and materials	3	2
23CE101.5	Understand the quality testing and assessment procedures and principles of Non – Destructive testing and study of safety practices in construction industry	3	2
23CE101.6	Study the Plumbing, Wiring, Carpentry & Welding in buildings	3	3

List of Experiments

A: Engineering Mechanics Lab

Forces in Pin Jointed Trusses	COs: CO1
Determination of Coefficient of static and Rolling Friction	COs: CO1
Verification of Law of Moment using Rotation Disc apparatus and Bell Crank	COs: CO2
Experimental proof of Lami's theorem	COs: CO2
Verification of Law of Parallelogram of Forces	COs: CO2
Determination of the centre of gravity of different shaped plane lamina	COs: CO3

B: Building Practices Lab

To study various types of tools used in construction	COs: CO4
Study of water absorption capacity of the brick	COs: CO4
Study of alternative materials like M - Sand, Fly ash, Sea Sand, etc.	COs: CO4
Layout plan for the building	COs: CO4
Demonstration and principles of Non – Destructive testing using Rebound Hammer	COs: CO4
Study of Plumbing, Wiring, Carpentry, Welding in the buildings	COs: CO5
Safety practices in the construction industry	COs: CO5
Conducting Green audit of a building or Industry or Organisation	COs: CO5
Field visit to understand the quality testing and assessment procedures – report	COs: CO6

References

1. Lab Manual for Engineering Mechanics & Building Practices lab, Department of Civil Engineering, NSRIT

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SOC 23SOC01 IT Workshop **0 0 2 1**

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

Code	Course Outcomes	Mapping with POs / PSOs						
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
23SOC01.1	Perform Hardware troubleshooting	3	2	-	-	2	2	1
23SOC01.2	Explain the world wide web and Internet	3	2	2	-	2	2	2
23SOC01.3	Develop a working knowledge of HTML, CSS	2	2	-	-	3	2	2
23SOC01.4	Demonstrate the usage of MS-Word, MS-Excel spreadsheets	3	3	3	2	3	2	2
23SOC01.5	Show the use of MS-PowerPoint for presentations and experiment with ChatGPT AI tool	3	2	2	1	3	2	2

List of Experiments

PC Hardware **COs: CO1**

Task 1: Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

Task 2: Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also, students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

Task 3: Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

Task 4: Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot (VMWare) with both Windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

Internet & World Wide Web **COs: CO2**

Task1: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the Instructors to simulate the WWW on the LAN.

Task 2: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.

Task 3: Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

Task 4: Cyber Hygiene: Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

HTML and Introduction to CSS **COs: CO3**

Task 1: Coding Basics: Introduction to HTML syntax, HTML, head, title, & body tags headings, paragraphs, & lists, strong & em tags, doctype, lang attribute, meta tag & Unicode character set

Task 2: Coding Links: Absolute & Relative URLs, Anchor tags & hrefs Linking to other websites, Linking to pages within a website Opening a link in a new browser window/tab

Task 3: Adding Images: Break tag, image tag & source attribute using the width, height, & alt attributes, using horizontal rules

Task 4: Introduction to Cascading Style Sheets (CSS): Style tag, tag selectors, font-size, font-family, color, & line-height properties, hexadecimal color codes

WORD **COs: CO4**

Task 1: Creating project abstract Features to be covered: Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

Task 2: Creating a Newsletter: Features to be covered: Table of Content, Newspaper columns, Images from files and clipart, drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

Excel **COs: CO4**

Excel Orientation: The mentor needs to tell the importance of MS office or equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

Task 1: Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text

Task 2: Calculating GPA -. Features to be covered: Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function,

LOOKUP/VLOOKUP **COs: CO4**

Task 3: Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Power point **COs: CO5**

Task 1: Students will be working on basic power point utilities and tools which help them create basic power point presentations. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint.

Task 2: Interactive presentations - Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts.

Task 3: Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), and Inserting – Background, textures, Design Templates, Hidden slides.

AI Tools – ChatGPT **COs: CO5**

Task 1: Prompt Engineering: Experiment with different types of prompts to see how the model responds. Try asking questions, starting conversations, or even providing incomplete sentences to see how the model

completes them.

Ex: Prompt: "You are a knowledgeable AI. Please answer the following question: What is the capital of France?"

Task 2: Creative Writing: Use the model as a writing assistant. Provide the beginning of a story or a description of a scene, and let the model generate the rest of the content. This can be a fun way to brainstorm creative ideas

Ex: Prompt: "In a world where gravity suddenly stopped working, people started floating upwards. Write a story about how society adapted to this new reality."

Task 3.1: Language Translation: Experiment with translation tasks by providing a sentence in one language and asking the model to translate it into another language. Compare the output to see how accurate and fluent the translations are.

Ex: Prompt: "Translate the following English sentence to French: 'Hello, how are you doing today?'"

Task 3.2: Futuristic Predictions: Have fun by asking the model to predict future technological advancements, societal changes, or even hypothetical scenarios. Compare its responses with your own ideas.

Ex: Prompt: "Predict how artificial intelligence will transform everyday life in the next 20 years."

References

1. Vikas Gupta, "Comdex Information Technology Course tool Kit", 6th Edition, Dreamtech Press, 2005
2. Cheryl A. Schmidt, "The Complete Computer Upgrade and Repair Book", 3rd Edition, Dreamtech Press, 2002
3. ITL ESL, "Introduction to Information Technology", 2nd Edition, Pearson, 2012
4. Kate J. Chase, "PC Hardware and A+ Handbook", Microsoft Press, 2004
5. Lab Manual for IT-Workshop, Department of Computer Science & Engineering, NSRIT

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CSP **23CSP01 NSS /NCC /Scouts & Guides /Community Service Project** **0 0 1 0.5**

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

Code	Course Outcomes	Mapping with POs		
		PO7	PO8	PO12
23CSP01.1	Understand the importance of discipline, character and service motto	3	1	1
23CSP01.2	Outline the needs and problems of the community	3	1	1
23CSP01.3	Solve some societal issues by applying acquired knowledge, facts, and techniques	3	2	1
23CSP01.4	Explore human relationships by analyzing social problems	2	1	1
23CSP01.5	Determine to extend their help for the fellow beings and downtrodden people	2	2	1

Unit I: Orientation **3 Hours**

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills
ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc. **COs: CO1**
iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.
iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

Unit II: Nature & Care

Activities:

i) Best out of waste competition.
ii) Poster and signs making competition to spread environmental awareness.
iii) Recycling and environmental pollution article writing competition. **3 Hours**
iv) Organising Zero-waste day. **COs: CO2**
v) Digital Environmental awareness activity via various social media platforms.
vi) Virtual demonstration of different eco-friendly approaches for sustainable living.

Write a summary on any book related to environmental issues

Unit III: Community Service **3 Hours**

Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities-experts-etc.
ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,
iii) Conducting consumer Awareness. Explaining various legal provisions etc. **COs: CO3**
iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.
v) Any other programmes in collaboration with local charities, NGOs, etc.

General Guidelines

1. Institutes must assign slots in the Timetable for the activities
2. Institutes are required to provide instructor to mentor the students

Assessment Pattern

1. Evaluated for a total of 100 marks
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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23BSX31 Engineering Physics

3 0 0 3

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

Code	Course Outcomes	Mapping with POs PO1	PO2	PO7	DoK
23BSX31.1	Choose the experimental evidence of wave nature of light to understand interference in thin films, diffraction and polarization	3	2	1	L1 - L3
23BSX31.2	Apply the laws of physics, classify various types of lasers & optical fibers	3	2	1	L1 - L3
23BSX31.3	Interpret the concepts and applications of magnetic and dielectric materials	3	2	1	L1 - L3
23BSX31.4	Identify and summarize the crystal structures and XRD techniques	3	2	1	L1 - L3
23BSX31.5	Interpret the microscopic behaviour of matter with quantum mechanics, summerise various types of solids based on band theory and identify the type of semiconductor using Hall effect	3	2	1	L1 - L3

All the COs are mapped to PO12 as few self-learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Wave Optics — **9 Hours**

Interference: Introduction, Interference in thin films by reflection–Newton's rings (Theory, Experimental study), applications (wavelength of a source and refractive index of a liquid). Diffraction: Concept of diffraction difference between Fresnel's and Fraunhofer diffraction-Fraunhofer diffraction at single slit (quantitative), diffraction at double slit Diffraction grating. Raleigh's criteria, Resolving Power of grating. Polarization: Types of polarization, polarization by reflection, refraction and Double refraction–Nicol's prism construction and working Wave plates: half wave plate and quarter wave plate — **COs: CO1**

Self – Learning Topic: Young's double slit experiment

Unit II: Lasers and Fiber Optics — **9 Hours**

Laser: Concept of laser, Characteristics of laser, Spontaneous and Stimulated emission of radiation, Einstein's Coefficients, pumping mechanisms, Ruby laser, Helium Neon Laser-Applications of Laser (Communications, R&D, Medicinal, etc.)

Fiber Optics: Introduction to Optical fiber, Principle and structure of optical fiber, classification of optical fibers (based on modes and refractive index profile). Acceptance angle, Acceptance cone Numerical Aperture-Applications of optical fiber. (Communications, Medicinal etc.) — **COs: CO2**

Self – Learning Topic: Concepts of 3 level and 4 level LASER systems

Unit III: Magnetic Materials and Dielectric Materials — **9 Hours**

Introduction, magnetic dipole moment, Magnetic Susceptibility-Magnetic permeability–Classification of Magnetic materials–Dia, Para, Ferro, Weiss Domain theory(qualitative) Hysteresis curve, Soft and Hard magnetic materials–Applications. Dielectric Materials: Dielectric Polarization–Dielectric Polarizability, Susceptibility and Dielectric constant-types of polarizations: Electronic, Ionic and Orientational polarizations (qualitative), Lorentz internal field (qualitative), Claussius-Mossoti Equation-Applications of dielectrics — **COs: CO3**

Self – Learning Topic: Relation between D, E and P & Dielectric losses

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Unit IV: Crystallography and X-Ray Diffraction — **9 Hours**

Crystallography: Introduction, Space lattice, Basis, Unit cell, Bravais lattices–Crystal systems–structures and packing fractions of SC, BCC and FCC X-Ray Diffraction: Directions and planes in crystals–Miller indices–Separation between successive (h k l) planes–Bragg's law. Bragg's spectrometer, X-ray diffraction methods (powder and Laue) — **COs: CO4**

Self – Learning Topic: Concept of Brillouin zones

Unit V: Quantum Mechanics and Semiconductor Physics — **9 Hours**

Quantum Mechanics: Introduction De-Broglie's concept of Matter waves–Physical significance of wave function-Schrodinger Time Independent and time dependent wave equations–Particle in a one-dimensional potential box Semiconductor physics: Origin of energy band formation in solids, classification of materials into conductors, semiconductors and insulators using band diagram, Intrinsic and Extrinsic semiconductors. Hall Effect, Hall coefficient and applications of Hall Effect — **COs: CO5**

Self – Learning Topic: Density of states - Fermi energy

Board of Studies	Basic Science & Humanities (Physics)	
Approved in: BoS No. II	October 06, 2023	
Approved in ACM: ACM No. VIII	October 21, 2023	
Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1 LASER as a source in optical fiber communications	CO2	PO1, PO2, PO7
2 Merits and demerits of X-ray diffraction	CO4	PO1, PO2, PO7

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1. Avadhanulu M. N. & K Shirasagar P.G., "A Text Book of Engineering Physics", 1st Edition S. Chand Publications, 2011
2. Palanisamy P. K., "Engineering Physics", 4th Edition ,SciTech Publishers, 2014
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1. Charles Kittle, "Introduction to solid state physics", 5th Edition ,Willey India Pvt. Ltd., 2012
2. Arumugam M., "Applied Physics", 4th Edition , Anuradha Agencies, 2013
3. Bhattacharya D. K., "Engineering Physics", 2nd Edition , Oxford University Press, 2010
4. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", 1st Edition ,University Press, 2010
5. Pandey B. K. & Chaturvedi S., "Engineering Physics", 1st Edition, Cengage Learning, 2012
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1. http://link.springer.com/physics
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com
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Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	40
L2	50	50
L3	10	10
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define interference
2. Define types of polarization
3. State Dielectric polarization and electric susceptibility
4. Define types of polarization in dielectrics
5. Define Spontaneous emission of radiation

L2: Understand

1. Explain the construction and working principle of Nicol's prism
2. Demonstrate working principle of He-Ne laser with energy level diagram
3. Outline de Broglie concept of matter waves
4. Discuss polarization by reflection
5. Explain the Raleigh's criteria

L3: Apply

1. Suggest a dielectric material with high dielectric constant, high operating voltage range and also which can be eco friendly for the preparation of a capacitor. Justify your answer
2. Suggest a soft magnetic material with low retentivity and coercivity, and also which can be eco friendly for the preparation of an electromagnet. Justify your answer
3. Even though based on quantum mechanical principles quantum free theory is a partly successful theory. Justify the statement

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23BSX12 Differential Equations and Vector Calculus

3	0	0	3

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

Code	Course Outcomes	Mapping with POs PO1	PO2	PO5	DoK
23BSX12.1	Solve the first order differential equations related to various engineering fields	3	2	1	L1 - L4
23BSX12.2	Solve the second order differential equations related to various engineering fields	3	2	1	L1 - L4
23BSX12.3	Identify solution methods for partial differential equations that model physical processes	3	2	1	L1 - L4
23BSX12.4	Apply Gradient, Divergence, Curland Laplacian to scalar and vector point functions	3	2	1	L1 - L4
23BSX12.5	Interpret Gradient, Directional Derivative, Divergence, Curl and Green's, Stoke's and Gauss theorems	3	2	1	L1 - L4

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus promoting autonomous learning

Unit I: Differential Equations of First Order and first degree — **9 Hours**

Linear differential equations – Bernoulli's equations- Exact equations and equations reducible to exact form. Applications: Newton's Law of cooling – Law of natural growth and decay- Electrical circuits, Orthogonal trajectories

COs: CO1

Self – Learning Topic: Orthogonal trajectories

Unit II: Linear differential equations of higher order (Constant Coefficients) — **9 Hours**

Linear differential equations, linear differential equations with constant coefficients, The operator D, the inverse operator $\frac{1}{D}$, $\frac{1}{D-a}$, $\frac{1}{D+a}$, Homogeneous & Non-Homogeneous Differential equations, Complimentary Function, Particular Integral, General solution, Wronskian, Method of Variation of parameters, Applications to L-C-R circuit problems

COs: CO2

Self – Learning Topic: Simple Harmonic motion

Unit III: Partial Differential equations — **9 Hours**

Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial differential equations with constant coefficients.

COs: CO3

Self – Learning Topic: Classification of second order partial differential equations

Unit IV: Vector Differentiation — **9 Hours**

Scalar and vector point functions, vector operator del, del applied to scalar point functions - Gradient, del applied to vector point functions-Divergence and Curl, Laplacian operator, vector identities (without proofs).

COs: CO4

Self – Learning Topic: Geometrical meaning of all operators

Unit V: Vector Integration — **9 Hours**

Line integral – circulation - work done, surface integral - flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

COs: CO5

Self – Learning Topic: Applications of the above theorems

Board of Studies		Basic Science & Humanities (Mathematics)	
Approved in: BoS No. VI		October 06, 2023	
Approved in: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Solving one-dimensional wave equation and two-dimensional equations using MATLAB	CO3	PO1, PO2, PO5
2	Applications of vector calculus in different branches of Engineering	CO4	PO1, PO2

Text Books

1. Grewal B. S., "Higher Engineering Mathematics", 44th Edition, 12th Reprint, Khanna Publishers, 2022
2. Ramana B. V., "Higher Engineering Mathematics", 1st Edition, 35th Reprint, Tata McGraw Hill Education, 2019

Reference Books

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th Edition, Wiley India, 2021
2. Bali N .P., "Engineering Mathematics", 1st Edition, Lakshmi Publications, 2017
3. Peter O' Neil, "Advanced Engineering Mathematics", 1st Edition, Cengage Publications, 2010
4. Iyengar T. K. V., Prasad M. V. S. S. N., Ranganatham S. and Krishna Gandhi B., "Engineering Mathematics - I", 2nd Revised Edition, S. Chand Publications, 2021
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1. http://nptel.ac.in/courses/
2. https://onlinecourses.nptel.ac.in
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Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	15	15
L2	55	55
L3	20	20
L4	10	10
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define a partial differential equation
2. What is a Bernoulli's equation?
3. What is the general form of Leibnitz's equation in y?
4. What is the sufficient condition for the exactness of Mdx+Ndy=0
5. Solve the PDE z=px+qy-2√pq
6. Solve(D²+2DD1+1)z=0
7. Find the unit normal vector at (1,2,2) to the surface $x^2 + y^2 + z^2 = 9$
8. Define a line integral and explain its significance in physics or engineering contexts
9. Define a homogeneous linear partial differential equation with constant coefficients

L2: Understand

1. Solve $(D^2-DD1+D1-1)z= \cos(x+2y)+e^{y+}$
2. Find the directional derivative of the function $\emptyset = xy^2 + yz^3$ at the point (2,-1,1) in the direction of the normal to the surface x logz − y2 + 4 = 0 at (-1,2,1)
3. If $F=x^2yz$, G= xy -3z² Then find div(grad F x grad G)
4. Find the surface integral of F = xyi + z²j + 2yzk over the tetrahedron bounded by x=0, y=0, z= 0 and the plane x+ y+ z =1
5. Solve Dx + 2D'u = u, u (x ,0) = 6 e^{-3x} by the method of separation of variables
6. Solve $(1+y^2)$ dx +$(x-e^{\tan^{-1}x})$ dy=0
7. Solve (D^2+3D+2) y = 4 cos2x
8. Explain the process of forming a partial differential equation by eliminating arbitrary constants and arbitrary functions from a given expression
9. Explain how the Wronskian is used to determine linear in dependence of solutions
10. Explain the geometric interpretation of the dot product and cross product of two vectors. How are these operators used in vector calculus

L3: Apply

1. Find the area of the circle $x^2+ y^2 =a^2$ using double integral in polar coordinates
2. Find the volume of the sphere $x^2 +y^2+z^2=a^2$ using spherical coordinates
3. Find by double integration the area lying between the parabolas $y^2=4ax$ and $x^2=4ay$
4. Find the scalar potential of the vector F= (x^2-yz) i + (y^2-zx) j + (z^2-xy)k, if exists
5. Evaluate by Gauss divergence theorem $F=(x^3-yz)i-2x^2yj-zk$ taken over the surface of the cube formed by the planes $x=y=z=a$
6. Analyze the implications of having complex roots in the characteristic equation of a second order differential equation
7. Given the PDE $u_x + 2u_t =0$, solve it using Lagrange's method to find the general solution

L4: Analyze

1. If $f(x, y, z) = 4x^2+7xy +3xz^2$, what is the direction in which the function f(x, y, z) increases more rapidly at the point P=(1.0.2)
2. List some physical examples of scalar and vector fields
3. From Stoke's theorem, analyze the form of Green's function for a curve lying in
   i. xy - plane ii. zx - plane
4. Asses the circulation of the field F = yi + (x+2y) j around the closed path $x^2 +y^2=4$ where circulation in counter clockwise direction
5. Evaluate $\int (x + \sqrt{y})$ dS along a curve C, where c is given by C = $C_1 + C_2$ such that $C_1 = \{x = t, y = t2\}$ from (0,0) to (1,1) and $C_2 = \{x = t, y = t\}$ from (1,1) to (0,0)

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ES 23ESX02 Introduction to Programming

3 0 0 3

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

Code	Course Outcomes	Mapping with POs / PSOs					DoK
		PO1	PO2	PO3	PSO1	PSO2	
23ESX02.1	Illustrate basics of computers, problem solving approach and algorithmic thinking	3	3	2	3	2	L1, L2
23ESX02.2	Demonstrate the control structures, branching and looping statements	3	3	3	3	2	L1 – L3
23ESX02.3	Make use of arrays, pointers and string fundamentals	3	3	3	3	2	L1 – L3
23ESX02.4	Develop Modular program aspects in solving complex problems	3	3	3	3	2	L1 – L3
23ESX02.5	Identify the use of userdefined data types and files	3	3	3	3	2	L1 – L3

All the COs are mapped to PO12 as few self learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Introduction to Programming and Problem Solving — 9 Hours

Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem Solving, Problem Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

COs : CO1

Self - Learning Topics: Compilation and Interpretation

Unit II: Basics of C Programming — 9 Hours

Introduction, Structure of a C Program, Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements, Operators, Type Conversion, Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else-if, switch, Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

COs: CO2

Self - Learning Topic: Escape Sequence

Unit III: Arrays, Pointers and Strings — 9 Hours

Introduction, Operations on Arrays, Two Dimensional Arrays, Multidimensional Arrays. Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer. Strings: String Fundamentals, String handling functions.

COs: CO3

Self - Learning Topic: String pattern matching

Unit IV: Functions — 9 Hours

Introduction to Function: Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Arrays as Function Arguments, Pointers as Function Arguments, Command Line Arguments, Variable Storage Classes, Recursion.

COs: CO4

Self - Learning Topic: Implementation of recursion

Unit V: User Defined Data types, File Handling — 9 Hours

Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type — Enum variables, Using Typedef keyword, Bit Fields. Data Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

COs: CO5

Self - Learning Topics: Binary files and operations on binary files

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Board of Studies		Computer Science and Engineering	
Approved in: BoS No. VI		October 06, 2023	
Approved in ACM: ACM No. VIII		October 21, 2023	
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs / PSOs**
1	Logic building using C Programming	CO1 – CO6	PO1, PO2, PO3, PO12, PSO1, PSO2
2	Real time applications of C Proramming	CO2 – CO6	PO1, PO2, PO3, PO12, PSO1, PSO2

Text Books

1. Behrouz A. Forouzan., Richard F. Gilberg, "A Structured Programming Approach Using C", 3rd Edition, Cengage, 2007
2. Dromey R. G., "How To Solve It By Computer", 1st Edition, Pearson Education, 2014
3. Byron Gottfried, "Programming with C", 3rd Edition, Tata McGraw Hill, 2017
4. Herbert Schildt, "C The Complete Reference", 4th Edition, TMH, 2017
5. Ajay Mittal, "Programming In C A-Practial Approach", 1st Edition, Pearson, 2010

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1. Balagurusamy E., "Computing fundamentals and C Programming", 2nd Edition, McGraw-Hill Education, 2017
2. Rema Theraja, "Programming in C", 2nd Edition,OUP India, 2016
3. Prasad F. E. V, "C Programming: A Problem-Solving Approach", Giliberg, Cengage Learning, 2010
4. Yashavant Kanetkar, "Let Us C", 16th Edition, BPB, 2017

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1. https://www.geeksforgeeks.org/c-programming-language
2. https://www.tutorialspoint.com/cprogramming/index.html
3. https://www.javatpoint.com/c-programming-language-tutorial

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 do you mean by flowchart?
2. What are the components in the flowchart?
3. What are various storage classes in C?
4. What is a string?
5. Write a C program to copy one string to another
6. Write a C program to read and display the content of a file
7. What is recursive function?
8. What are the constraints for defining a recursive function with an example?
9. Why switch statement is more advantageous than nested if-else statement?
10. What is meant by a variable in C programming?
11. Write a C program to count number of vowels and consonants in a string using pointers

L2: Understand

1. Explain about enumerated types with example
2. Explain counter controlled and exit controlled loops with examples
3. Write a program to compare two strings for equality without using strcmp() function
4. Demonstrate about declaration and initialization of string in C. How strings are displayed with different formats? Explain with examples
5. Illustrate a C program to find the sum of first and last digit of a number
6. Illustrate a C program to merge two files into single file
7. Explain different looping statement with syntax and example
8. Explain function prototype and different methods to call the function
9. Explain in detail about array of structure and pointer to structure with example
10. Discuss the usage of bitwise logical operators used in C? Compare them from logical operators with suitable program
11. Explain about call by value and call by reference with reference to functions with example
12. Explain the term dynamic memory allocation and the terms malloc(), calloc() and realloc() functions

L3: Apply

1. Write a C program to check whether the given number is palindrome or not
2. Write a C program to solve the factorial of a given number using for loop
3. Write an algorithm, flowchart and pseudo code to identify largest of given 3 numbers using conditional operator
4. Write a C program to perform the operation of multiplication of two matrices
5. Write a C program to interchange the largest and smallest elements in an array
6. Write a C program by applying pointers to count number of vowels and consonants in a string
7. Write a C program to select any arithmetic operations using switch cases
8. Write a C program to find given number is Armstrong or not
9. Write a C program to check whether the given string is palindrome or not
10. List file handling functions. Utilize file handling functions with an example
11. Design a modular banking application using C programme that can facilitate transactions such as deposit and withdrawal of funds
12. How can you design an efficient algorithm to generate a list of the first n prime numbers? Can you analyse the time complexity of your algorithm? Implement and test your program to ensure it works correctly for a range of input values
13. Write a C program that finds the second largest element in an array of integers. Explain how you handle different cases such as empty array, array with only one element, array with duplicate elements, etc
14. Write a C program that simulates a simple calculator that can perform addition, subtraction, multiplication, and division operations on two operands. Explain how you handle user input, error checking, and precedence of operators
15. Write a C program that reads a text file and counts the number of words, lines, and characters in it. Explain how you handle different types of delimiters and end-of-file conditions

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ES 23ESX03 Basics of Civil and Mechanical Engineering 3 0 0 3

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

Code	Course Outcomes	Mapping with POs PO1	Mapping with POs PSO1	DoK
23ESX03.1	Comprehend the evolution of civil engineering, scope, functions and various building elements and materials	3	2	L1, L2
23ESX03.2	Demonstrate the principles of surveying	3	2	L1, L2
23ESX03.3	Calculate the required quantity of water and the purification process involved, solid waste management along with the sewage systems	3	2	L1, L2
23ESX03.4	Outline the role of mechanical engineering in the society and study of various metals and materials	3	2	L1, L2
23ESX03.5	Demonstrate the different manufacturing process, working principles of thermal systems	3	2	L1, L2
23ESX03.6	Illustrate the working principles of various power plants, Power transmission systems and fundamentals of robotics	3	2	L1, L2

All the COs are mapped to PO12 as few self-learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Introduction to Civil Engineering **9 Hours**

History and development of civil engineering – scope for the civil engineering – Functions of civil engineering. Characteristics of good building materials like stone, brick, tile, timber, cement aggregate and concrete. General concepts relating to Buildings: Selection of site – Basic functions of buildings – Major components of buildings. Foundations - Purpose of a foundation – Bearing capacity of soils – types of foundations and their uses. **COs: CO1**

Self - Learning Topic: Representation of the building plan

Unit II: Surveying **9 Hours**

Surveying: Definition and purpose – classification – Basic principles – Measurement of length by chains and tapes – Calculation of area of a plot – Introduction to Bearings, basic problems of Bearing - Levelling instruments used for levelling, calculation of the instrument height. Types of Highways, Types of pavements, Cross-section of the pavements, Camber **COs: CO2**

Self - Learning Topics: Rise & fall method, Materials used for the various pavements

Unit III: Water supply & Sanitary Engineering **9 Hours**

Sources of water supply – Quantity of water requirements – Purification of water involving sedimentation, filtration and disinfection. Definition of terms – Collection and disposal of solid wastes – Sewage systems – Septic tanks – Oxidation ponds. **COs: CO3**

Self - Learning Topics: Methods of water distribution, types of filters

Unit IV: Introduction to Mechanical Engineering **9 Hours**

Role of mechanical engineering in industries and society - Technologies in different sectors such as energy, Manufacturing, Automotive, Aerospace, and Marine sectors.
Engineering Materials – Metals - Ferrous and Non-ferrous, Ceramics, Composites, Smart materials. **COs: CO4**

Self - Learning Topic: Nanomaterials

Unit V: Manufacturing Processes & Thermal Engineering **9 Hours**

Principles of Casting, Forming, joining processes, Machining, Introduction to CNC machines, 3D printing, and Smart manufacturing.
Thermal Engineering – Working principle of Boilers, Otto cycle, Diesel cycle, Refrigeration and air-conditioning **COs: CO5**

cycles, IC engines, 2-Stroke and 4-Stroke engines, SI/CI Engines, Components of Electric and Hybrid Vehicles.

Self - Learning Topic: Surface finishing

Unit VI: Power plants, mechanical power transmission and Robotics **9 Hours**

Power plants – Working principle of Steam, Diesel, Hydro, Nuclear power plants.
Mechanical Power Transmission - Belt Drives, Chain, Rope drives, Gear Drives and their applications.
Introduction to Robotics – Joints & links, configurations, and applications of robotics. **COs: CO6**

Self - Learning Topic: Kinematics of robotics

Board of Studies	Civil Engineering & Mechanical Engineering	
Approved in: BoS No. VI	October 06, 2023	
Approved in: ACM No. VIII	October 21, 2023	
Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1 Importance of the safe bearing capacity of soils	CO1	PO1
2 Real time applications of mechanical systems	CO4 - CO6	PO1

Text Books

1. Shanmugam G. and Palanisamy M. S., "Basic Civil and the Mechanical Engineering", 4th Edition, Tata McGraw Hill Publications (India) Pvt. Ltd., 2013
2. Bhavikatti S. S.," Basic Civil Engineering", 3rd Edition, New Age International Publishers, 2022
3. Ganesan V., "Internal Combustion Engines", Tata McGraw Hill Publications (India) Pvt. Ltd., 2017
4. Rattan S. S., "A Tear book of Theory of Machines", Tata McGraw Hill Publications, (India) Pvt. Ltd., 2012

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1. Punmai B. C.," Surveying Volume-1", 16th Edition, Laxmi Publications Pvt Ltd, 2006
2. Duggal S. N., "Environmental Engineering-1", 8th Edition, Tata McGraw Hill Publications (India) Pvt. Ltd., 2013
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5. Mahesh M Rathore, "Thermal Engineering", 5th Edition, Tata McGraw Hill Publications (India) Pvt. Ltd., 2010
6. Rao P. N, "Manufacturing Technology" – Vol. 1, 4th Edition, Tata McGraw Hill publications (India) Pvt. Ltd., 2017
7. Rao P. N, "Manufacturing Technology" – Vol. 2, 4th Edition, Tata McGraw Hill publications (India) Pvt. Ltd., 2018

Web References

1. https://www.youtube.com/watch?v=f2uuyKh02n4
2. https://www.youtube.com/watch?v=jdVgwbXZef8
3. https://nptel.ac.in/courses/112/103/112103019/

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 are the properties of good stone?
2. What are the basic principles of surveying?
3. What are the sources of water supply?
4. What are ferrous metals?
5. List any two joining process
6. Define Robot
7. What is meant by pulverization?

L2: Understand

1. Identify the requirements in the selection of site for a construction
2. Illustrate the way to find the levels at various points of the plain area which is irregular in shape
3. Demonstrate the procedure which you want to follow in collecting and disposing the waste in your own community
4. How to calculate the area for the given plot by the use of conventional practice?
5. How to calculate the quantity of water requires for the given area?
6. Explain the role of mechanical engineer in manufacturing industry
7. Classify various engineering materials
8. Compare two stroke and four stroke IC engines
9. Explain the working principle of Hydro - electric power plant
10. Differentiate between two stroke and four stroke engines
11. Explain the working of overfeed and underfeed fuel beds
12. Explain the auxiliaries of a diesel power plant with neat sketch

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BS 23BSX32 Engineering Physics Lab

0	0	2	1

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

Code	Course Outcomes	Mapping with POs PO1	PO4
23BSX32.1	Relate the principle of physics in engineering field and compare the results with theoretical calculations	3	3
23BSX32.2	Demonstrate modern engineering physics techniques and tools in real time applications in engineering studies	3	3
23BSX32.3	Develop the laboratory skills in handling of electrical and optical instruments	3	3
23BSX32.4	Demonstrate the interference and diffraction phenomena of light	3	3
23BSX32.5	Analyse the effect of sound on physical parameters	3	3

List of Experiments

1.	Determination of Radius of Curvature of Plano Convex Lens by Newton's rings	COs: CO1-CO4
2.	Determination of wavelength of a source using Diffraction Grating Normal incidence method	COs: CO1-CO4
3.	Determination of thickness of thin Object- Air wedge method	COs: CO1-CO4
4.	Determination of wavelength of Laser source	COs: CO1-CO4
5.	Verify the relation between frequency and volume- Using Volume resonator	COs: CO1,CO5
6.	Determination of Rigidity modulus of material (wire)- (torsional pendulum)	COs: CO1,CO2
7.	Verify magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus	COs: CO1-CO3
8.	Determination of dispersive power of prism	COs: CO1-CO3
9.	Determine acceleration due to gravity and radius of gyration using compound pendulum	COs: CO1,CO2
10.	To find the Energy Band gap of a Semiconductor using p - n junction	COs: CO1-CO3
11.	Study the characteristics of a Thermistor and obtain its temperature coefficient	COs: CO1-CO3
12.	Determination of dielectric constant using charging discharging method	COs: CO1-CO3
13.	Determination of resolving power of a grating	COs: CO1-CO4
14.	Verification of laws of stretched string by using Sonometer	COs: CO1,CO5
15.	Estimation of Planck's constant using photo electric effect	COs: CO1-CO4
16.	Study the variation of B versus H by magnetizing the magnetic material (B-H curve)	COs: CO1-CO4
17.	Verification of Brewster's law	COs: CO1,CO2, CO4
18.	Determination of frequency of electrically maintained tuning fork by Melde's experiment	COs: CO1-CO3

Note: In the above experiments at least 10 assessment experiments should be completed in a semester, out of which 2 experiments may be conducted in virtual mode

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1. Balasubramanian S., Srinivasan M. N. ,"A Text Book of Practical Physics"- S. Chand Publishers, 2017
2. Lab Manual for Engineering Physics, Department of Basic Science and Humanities, NSRIT, 2023

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ES 23ESX06 Engineering Workshop 0 0 3 1.5

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

Code	Course Outcomes	Mapping with POs PO1
23ESX06.1	Demonstrate the workshop tools and their operational capabilities	1
23ESX06.2	Employ workshop tools for various joints and fitting.	1
23ESX06.3	Interpret the development of sheet metal using tin smithy tools	1
23ESX06.4	Illustrate the house wiring	1
23ESX06.5	Make use of moulding tools prepare a pattern	1

List of Experiments

Student shall **do two experiments** from five trades

Demonstration: Safety practices and precautions to be observed in workshop.

1	Wood Working: Familiarity with different types of woods and tools used in wood working and make following joints. a) Half –Lap joint b) Mortise and Tenon joint c) Corner Dovetail joint or Bridle joint	COs:CO1, CO2
2	Sheet Metal Working: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets. a) Tapered tray b) Conical funnel c) Elbow pipe d) Brazing	COs:CO1, CO2
3	Fitting: Familiarity with different types of tools used in fitting and do the following fitting exercises. a) V-fit b) Dove tail fit c) Semi-circular fit d) Bicycle tyre puncture and change of two-wheeler tyre	COs:CO1, CO2
4	Electrical Wiring: Familiarity with different types of basic electrical circuits and make the following connections. a) Parallel and series b) Two-way switch c) Go-down lighting d) Tube light e) Three phase motor f) Soldering of wires	COs:CO1, CO3
5	Foundry Trade: Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.	COs:CO1, CO4

Add-on Experiments

1	Welding Shop: Demonstration and practice on Arc Welding and Gas welding, Preparation of Lap joint and Butt joint	COs: CO1
2	Plumbing: Demonstration and practice of Plumbing tools, Preparation of Pipe joints with coupling for same diameter and with reducer for different diameters	COs: CO1

References

1. Lab Manual for Engineering Workshop, Department of Mechanical Engineering, NSRIT

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ES 23ESX07 Engineering Graphics 1 0 3 3

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

Code	Course Outcomes	Mapping with POs PO1	PO10	PSO1	DoK
23ESX07.1	Demonstrate the principles of engineering drawing, including engineering curves, scales, orthographic and isometric projections.	3	3	2	L1 - L3
23ESX07.2	Construct the orthographic projections of points and lines in front and top views.	3	3	2	L1 - L3
23ESX07.3	Construct the systems of projection of planes and solids with respect to the observer, object and the reference planes	3	3	2	L1 - L3
23ESX07.4	Develop the concepts of sectional views to represent details of solids in simple positions.	3	3	2	L1 - L3
23ESX07.5	Develop the ability to draw isometric views and orthographic views and should be able to convert isometric views to orthographic views and vice versa.	3	3	2	L1 - L3

All the COs are mapped to PO12 as few self learning topics are inbuilt in syllabus promoting autonomous learning

Unit I: Introduction of Geometrical Constructions **9 Hours**

Introduction: Lines, Lettering and Dimensioning, Geometrical Constructions and Constructing regular polygons by general methods.

Curves: construction of ellipse, parabola and hyperbola by general, Involutes, Normal and tangent to Curves.

Scales: Plain scales, diagonal scales and vernier scales. **COs: CO1**

Self - Learning Topic: Construct polygons by special methods

Unit II: Introduction of Orthographic Projections **9 Hours**

Orthographic Projections: Reference plane, importance of reference lines or Plane, Projections of a point situated in any one of the four quadrants.

Projections of Straight Lines: Projections of straight lines parallel to both reference planes, perpendicular to one reference plane and parallel to other reference plane, inclined to one reference plane and parallel to the other reference plane. Projections of Straight Line Inclined to both the reference planes **COs: CO2**

Self - Learning Topic: Traces of lines

Unit III: Projections of Planes and Solids **9 Hours**

Projections of planes: Regular planes perpendicular to both reference planes, parallel to one reference plane and inclined to the other reference plane; plane inclined to both the reference planes

Projections of solids: Types of solids: Polyhedra and Solids of revolution. Projections of solids in simple positions: Axis perpendicular to horizontal plane, Axis perpendicular to vertical plane and Axis parallel to both the reference planes, Projection of solids with axis inclined to one reference plane and parallel to other **COs: CO3**

Self - Learning Topic: Auxiliary views of planes

Unit IV: Projection and Section of solids **9 Hours**

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Projections of Solids Projection of Solids with axis inclined to one reference plane and parallel to other Sections of Solids: Perpendicular and inclined section planes, Sectional views and True shape of section, Sections of solids in simple position only. **COs: CO4, CO5**

Self - Learning Topic: Development of surfaces

Unit V: Conversion of Views **9 Hours**

Conversion of Views: Conversion of isometric views to orthographic views and vice versa.

Computer graphics: Creating 2D & 3D drawings of objects including PCB and Transformations using Auto CAD (Not for end examination). **COs: CO5**

Self - Learning Topic: Isometric Projection

Board of Studies	Mechanical Engineering	
Approved in: BoS No. VI	October 07, 2023	
Approved in: ACM No. VIII	October 21, 2023	
Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1 Real time applications of engineering graphics	CO4 - CO5	PO1, PO10
2 Spatial Visualization	CO4 - CO5	PSO1

Text Books

1. Bhatt N.D.," Engineering Drawing", 53rd Edition, Chariot Publications, 2018
2. Agarwal and Agarwal," Engineering Drawing", 3rd Edition, Tata McGraw Hill Publishers, 2017
3. Sham Tickoo," Auto CAD 2017", Engineers & Designers", 23rd Edition, Dreamtech Press, 2016

Reference Books

1. Narayana K. L. and Kannaiah P.," Engineering Drawing", 5th Edition, Scitech Publishers, 2017
2. Varghese P.I," Engineering Graphics", Mc Graw Hill Publishers, 2013
3. Venugopal K. Prabhu Raja V.," Engineering Drawing + Auto Cad", 5th Edition, New Age Publications, 2011

Web References

1. https://nptel.ac.in/courses/112/103/112103019/

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	20	10
L2	40	30
L3	40	60
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

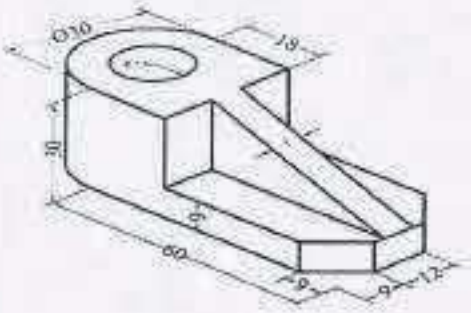
1. Divide a straight-line AB of 60 mm long into eight numbers of equal parts
2. How to draw an Octagon given the length of side 25 mm
3. Draw an equilateral triangle of 75 mm side and inscribe a circle in it
4. Show a regular pentagon in a circle of 100 mm diameter

L2: Understand

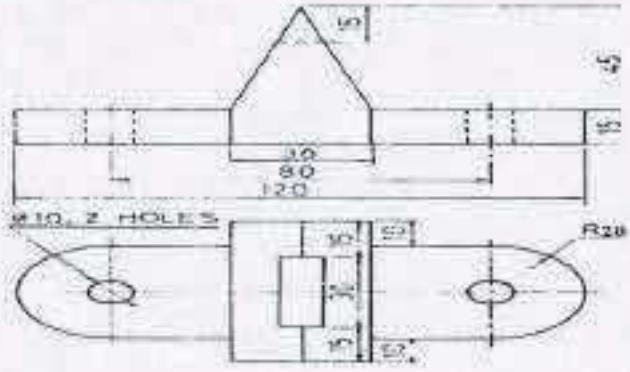
1. Cconstruct a cycloid for a generating circle of radius 30 mm. Also draw a tangent and normal at any point on the cycloid
2. A line AB is on HP and its one end A is 20 mm in front of VP. The line makes an angle of 45° with VP and its front view is 60 mm long. Draw the projections of the line and determine the true length
3. A regular hexagon of 40 mm side has a corner in the HP. Its surface inclined at 45° to the HP. And the top view of the diagonal through the corner which is in the HP. makes an angle of 60° with the VP. Demonstrate its projections
4. A pentagonal pyramid has an edge of the base in the VP and inclined at 30° to the HP, while triangular face containing that edge makes an angle of 45° with the VP. Illustrate the three views of the pyramid. Length of side of the base is 30 mm, while that of the axis is 65 mm

L3: Apply

1. A thin circular plate of 45mm diameter with its centre 35 mm above HP and 40 mm in front of VP is perpendicular to VP and inclined to HP at angle of 30°. Develop the projections of the plate
2. A square pyramid of base 40 mm and height 60 mm is on HP with one of its base edges so that the axis is making 45° with HP and the base edge making 30° with VP. Construct the projections
3. Construct a scale of 1.5 inches = 1 foot to show inches and long enough to measure up to 4 feet
4. Draw (i) Front View (ii) Top View (iii) Left Hand Side View



5. Build the Isometric view



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Board of Studies (ME)

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ES 23ESX05 Computer Programming Lab

0	0	3	1.5

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

Code	Course Outcomes	Mapping with POs / PSOs						
		PO1	PO2	PO3	PO4	PO5	PSO1	PSO2
23ESX05.1	Demonstrate the use of basic language features	2	2	2	1	3	2	1
23ESX05.2	Apply the right control structure for solving the problem	3	3	3	3	3	3	2
23ESX05.3	Implement simple programs to solve computing problems using user defined functions	3	3	3	3	3	3	2
23ESX05.4	Develop programs using arrays and pointers	3	3	3	3	3	3	2
23ESX05.5	Experiment with user defined data types and file operations	3	3	3	3	3	3	2

List of Experiments

1.	Write C programs to familiarization with programming environment		COs: CO1
2.	Write simple C programs with printf(), scanf() functions		COs: CO1
3.	Write C programs to simple computational problems using arithmetic expressions		COs: CO1
4.	Write C programs to computational problems using the operator precedence and associativity		COs: CO1
5.	Write C programs involving if-then-else structures		COs: CO2
6.	Write C programs on while and for loops		COs: CO2
7.	Write C programs on 1D array manipulation, linear search		COs: CO4
8.	Write C programs on matrix, string operations		COs: CO4
9.	Write C programs on functions, call by value, scope and extent		COs: CO3
10.	Write C programs to implement recursive functions		COs: CO3
11.	Write C programs on simple functions using call by reference, dangling pointers		COs: CO4
12.	Write C programs on pointers, structures and dynamic memory allocation		COs: CO4
13.	Write C programs on bitfields, self-referential structures		COs: CO4
14.	Write C programs to implement file operations		COs: CO5
15.	Domain Specific Applications		
	(i)	Write a program to implement employee management system	COs: CO5
	(ii)	Write a program to implement election system	COs: CO4
	(iii)	Calculate the Eluer's load for a column with various end conditions	COs: CO2
	(iv)	Calculate the Shear force and Bending Moments for a beam under the various loading condition	COs: CO2
	(v)	Write a C program for resolution of forces	COs: CO3
	(vi)	Write a C program for calculation of coefficient of discharge	COs: CO2
	(vii)	Write a C program to find the efficiency of the DC motor for different values of time T	COs: CO2
	(viii)	Write a C program to derive the transfer function of a DC motor for given values	COs: CO2

Exercise problems

1. Basic Linux environment and its editors like Vi, Vim & Emacs etc.
2. Exposure to Turbo C, gcc
3. Writing simple programs using printf(), scanf()
4. Write a C program to find sum and average of 3 numbers

5. Conversion of Fahrenheit to Celsius and vice verse
6. Simple interest calculation
7. Finding the square root of a given number
8. Finding compound interest
9. Area of a triangle using heron's formulae
10. Distance travelled by an object
11. Evaluate the following expressions
    a. A+B*C+(D*E)+F*G
    b. A/B*C-B+A*D/3
    c. A+++B---A
    d. J= (i++)+(++i)
12. Find the maximum of three numbers using conditional operator
13. Take marks of 5 subjects in integers, and find the total, average in float
14. Write a C program to find the max and min of four numbers using if-else
15. Write a C program to generate electricity bill
16. Find the roots of the quadratic equation
17. Write a C program to simulate a calculator using switch case
18. Write a C program to find the given year is a leap year or not
19. Find the factorial of given number using any loop
20. Find the given number is a prime or not
21. Compute sine and cos series
22. Checking a number palindrome
23. Construct a pyramid of numbers
24. Find the min and max of a 1-D integer array
25. Perform linear search on 1D array
26. The reverse of a 1D integer array
27. Find 2's complement of the given binary number
28. Eliminate duplicate elements in an array
29. Addition of two matrices
30. Multiplication two matrices
31. Write a C program to concatenate two strings without built-in functions
32. Write a C program to find reverse a string using built-in and without built-in string functions
33. Write a C function to calculate NCR value
34. Write a C function to find the length of a string
35. Write a C function to transpose of a matrix
36. Write a C function to demonstrate numerical integration of differential equations using Euler's method
37. Write a recursive function to generate Fibonacci series
38. Write a recursive function to find the lcm of two numbers
39. Write a recursive function to find the factorial of a number
40. Write a C program to swap two numbers using call by reference
41. Demonstrate Dangling pointer problem using a C program
42. Write a C program to copy one string into another using pointer
43. Write a C program to find no of lowercase, uppercase, digits and other characters using pointers
44. Write a C program to find the sum of a 1D array using malloc()
45. Write a C program to find the total, average of n students using structures
46. Enter n students data using calloc() and display failed students list
47. Write a C program to implement realloc()
48. Read student name and marks from the command line and display the student details along with the total marks
49. Create and display a singly linked list using self-referential structure
50. Demonstrate the differences between structures and unions using a C program
51. Write a C program to shift/rotate using bitfields
52. Write a C program to copy one structure variable to another structure of the same type
53. Write a C program to write and read text into a file
54. Write a C program to write and read text into a binary file using fread() and fwrite()
55. Write a C program to copy the contents of one file to another file

56. Write a C program to merge two files into the third file using command-line arguments
57. Write a C program to find no. of lines, words and characters in a file
58. Write a C program to print last n characters of a given file

References

1. Ajay Mittal, "Programming in C – A Practical Approach", 1st Edition, Pearson, 2010
2. Behrouz A. Forouzan, Richard F. Gilberg, "A Structured Programming Approach Using C", 3rd Edition, Cengage, 2007
3. Forouzan, Gilberg, Prasad, "C Programming: A Problem - Solving Approach", 1st Edition, Cengage Learning, 2011
4. Lab Manual for Computer Programming, Department of Computer Science & Engineering, NSRIT

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Board of Studies (CSE)

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Wellness **23WLP01 Health And Wellness, Yoga and Sports** 0 0 1 0.5

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

Code	Course Outcomes	Mapping with POs PO7	PO12
23WLP01.1	Be physical fit to perform daily routine without undue fatigue	1	1
23WLP01.2	Be mentally alert and socially cohesive	1	1
23WLP01.3	Consider success and failure equally	2	1
23WLP01.4	Develop positive personality	1	1
23WLP01.5	Improve leadership qualities	2	1

Unit I: Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups. **3 Hours**

Activities

i) Organizing health awareness programmes in community
ii) Preparation of health profile **COs: CO1**
iii) Preparation of chart for balance diet for all age groups

Unit II: Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation,stress management and yoga, Mental health and yoga practice. **3 Hours**

Activities

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar **COs: CO2**

Unit III: Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games. **3 Hours**

Activities

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.Practicing general and specific warm up, aerobics **COs: CO3**
ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running

General Guidelines

1. Institutes must assign slots in the timetable for the activities of Health/Sports/Yoga
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students

Assessment Pattern

1. Evaluated for a total of 100 marks
2. A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks
3. A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject

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SOC 23SOC18 Plumbing **0 0 0 2**

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

Code	Course Outcomes
23SOC18.1	Demonstrate the principles of designing plumbing systems for different types of fluids, including gas, air, steam, sewage and water
23SOC18.2	Demonstrate competency in the use of specialized tools and equipment essential for professional pipe installation
23SOC18.3	Diagnose and troubleshoot common plumbing problems in residential, commercial and industrial settings

Min. 60 Hours

Plumbing tools, levelling instruments, valves and meters, soft soldering, rigging and hoisting, Pipe Materials & Joining Methods, Plumbing Fixture, Distribution Piping, Drain, Waste & Vent System, Water Heating / Fuel Storage Equipment, Site & Drain Design, installing water supply piping, septic systems, storm ater and sumps, reapiring water supply systems, supporting and testing pipe.

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SOC 23SOC17 Refrigeration and Air Conditioning 0 0 0 2

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

Code	Course Outcomes
23SOC17.1	Develop the knowledge and practical skills required to install, troubleshoot, and repair a wide range of R&AC systems, including heating, ventilation, air conditioning, furnaces, and water heaters
23SOC17.2	Demonstrate the procedures for conducting warranty services, including documenting issues, ordering replacement parts, and completing repairs within warranty coverage
23SOC17.3	Learn to assess and identify maintenance issues in refrigeration and air condition equipment, as well as recommend preventive measures to improve system longevity and performance

Min. 60 Hours

Refrigeration and Air Conditioning: Types of refrigerants, study of refirgeartion cycles, Vapour absorption system, Vapour compression refrigeration test rig, study of compressors, valves, types of air conditioning, Summer and winter air conditioning, Fitting and Welding,Thermal Insulation,Commercial RAC Plants & Car Air Conditioner,Commercial Compressor & Capacity Control,Water Softening Plants & Chiller, three fulid refrigeration

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SOC 23SOC09 Mobile TroubleShooting

0 0 0 2 1

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

Code	Course Outcomes
23SOC09.1	Demonstrate the Basic electronics concepts and Basics of mobile communications and different mobile technologies.
23SOC09.2	Gain proficiency in various components of PCB and different Sections on Motherboard and Different ICs used in MotherBoard.
23SOC09.3	Gain proficiency in Hardware and Software tools and troubleShootings.

Min. 60 Hours

Basic Electronics - Current, Voltage, AC Current & DC Current, Resistor, Transistor, Capacitor, Diode, Inductor / Coil, Transformer, Integrated Circuit , Study of Digital Electronics, Study of Various components inside the mobile phone, Assembling and disassembling of various models of mobile phones,Study of various tools and equipment used in mobile phone repairs, Using a multi-meter, Use of DC Power Supply, Introduction and study of Printed Circuit Board (Motherboard), Details of various components on the PCB, Circuits and Different Sections on Motherboard: Power Circuit, Charging Circuit, SIM Circuit, Display Circuit, Keypad Circuit, Touch Screen Circuit, Audio Circuit, Memory card Circuit, Speaker and Microphone Circuit, Network Circuit, Bluetooth Circuit, Wi-fi Circuit, Testing of various parts and components, Study of different ICs (chips) used on the motherboard, How to recognize various ICs, Soldering & de-soldering of components by using a soldering iron, Soldering & de-soldering of components by using a rework station, Reheating and mounting of various BGA and SMD chips, Use of various secret codes, Fault finding, troubleshooting and repairing of various faults, Common repair procedure for hardware related faults, Common repair procedure for software related faults, Water damaged repair techniques, Circuit tracing, jumper techniques and solutions, Troubleshooting through schematic diagrams, Advanced troubleshooting techniques.

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SOC 23SOC21 Computer Servicing 0 0 0 2

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

Code	Course Outcomes
23SOC21.1	Demonstrate system Assembling and hardware troubleshooting
23SOC21.2	Identify automated backups of your system
23SOC21.3	Build systems to safeguard from various types of user activities
23SOC21.4	Solve and configure Networking related issues

Min. 60 Hours

Identify motherboard components and connections, understand error code for fault troubleshooting, verify components with the configuration of CMOS BIOS set up, Test and understand various beep sounds in case of trouble, Assemble and disassembling a Computer System, Upgrade RAM, HDD and other parts. Test fault finding and troubleshooting techniques, Configuration of camera, mic, WLAN and Bluetooth etc, install any popular antivirus software – View its various options, Explore Firewall options, use various disk cleanup utilities to remove junk files from hard disk, create automated backups, Identify various Network devices – Switch, Router, Rack, crimping LAN cables, installing a printer and carrying self-test, Replacement of toner cartridge of laser printers.

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SOC 23SOC11 Digital Marketing

0 0 0 2

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

Code	Course Outcomes
23SOC11.1	Identify the Market and the behaviour of the customer and how the digital marketing will be useful
23SOC11.2	Search engines, methods to identify the search engines and their optimization in both on page and off page
23SOC11.3	Exercise on the Social media marketing and Email Marketing and gaining the reputation through online management
23SOC11.4	Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets

Min. 60 Hours

Introduction to Digital Marketing: Nature and Scope of Digital Marketing, Evolution of Digital Marketing, Traditional versus digital marketing, Integration of Market Place from conventional to the virtual, Social Media and Communication Mix – Benefits & Challenges – social media and Customer Engagement – ROC – New Role of Customers – The Social Business Eco system – REAN, RACE, integrating social media with Overall Market efforts – Developing Social Media Marketing plan. Social Media Business Blocks: Segmenting B2C Market – B2B Markets – managing the cyber social Campaign – Joining the Conversation – Lurking and Listening – Engagement with Audience – Staying Engaged – Engagement on the Social Web – Social Objects – Social graph – Social Applications – leveraging Search Engine Optimization (SEO) for social media – Optimizing social media for Search Engines. Digital Media Mix: Blogs, Podcasts, Vlogs – Blog – Create a Podcast – Producing the Video cast – Measuring Blogging, Podcasting, Vlogging Metrics using any social media like Facebook, Twitter, LinkedIn etc. Measuring the Results – Other Social Media Marketing Sites – Communities.

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SOC 23SOC13 Electrical Winding

0 0 0 2

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

Code	Course Outcomes
23SOC13.1	Examine various tools and know their usage
23SOC13.2	Explain different joints, soldering practice andexecute wiring circuits
23SOC13.3	Perform various methods of earthing

Min. 60 Hours

Identify size, shape, purpose, speed and use of electrical wiring tools with respect to screw drivers, pclers, drilling machines, Rawl plug jumpers, Line tester, Splicers, Standard wire gauge, Identify different types of electrical wiring accessories with respect to switches, Ceiling roses, Lamp holders and adcpters, Sockets, Plug, Fuses, Identify different types of main switches with respect to SP, DP mains, TP, ICDP, ICTP, SPDT, DPDT, TPDT, Change over-Knife type, Rotary, Micro, Modular switches, 2-pole and 3-pole MCBs. Prepare straight joint/Married joint, T joint, Western union joint, Pig tail joint, Femialirisation to use soldering tools and components and soldering of simple electronic circuits on PCB. Make a circuit with one lamp controlled by one switch with PVC surface conduit system, two lamps controlled by two switches with PVC surface conduit system, Make a circuit with one lamp controlled by one switch and provision of 2/3-pin socket. Make a circuit for stair case wiring, Make a circuit for godown wiring, Control two lamps by series - Parallel connection using one 1-way switch & two 2-way switches with PVC surface conduit system, Controlt wosub – circuits through energy meter, MCB's and two1-way switches, Prepare switch board with star delta starter, MCB, Pilot lamps for 3 phase motor, Control and practice the wiring for fluorescent lamp, Connect computer by main switch board with a miniature circuit breaker. Prepare pipe earthing and plate earthing.

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23SOC14 Masonry

0 0 0 2

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

Code	Course Outcomes
23SOC19.1	Identify the tools required for various purposes and its working in construction activity
23SOC19.2	Preparing the cement sand motor mix in appropriate proportions based on the suitability and type of work
23SOC19.3	Undergo the types of openings, floors and need for the slope and ceiling finish as per the drawings and standards

Min. 60 Hours

Introduction to the tools and their usage, materials, properties, ratios of the mix, types masonry, types of bonds in masonry, height and width of rooms based on the purpose, types of partition, materials for partition, openings, requirements of openings, height and width of openings and ventilators, types of materials used as ventilators, provision of grooves in the brick work, finishing materials, thickness of finish, motor ratio for the finishings, types of shuttering, checking of the level by the Plum bob or liquid levels. Performing the RCC works by rod cutting, bending & placing. Making of the different floors with various materials with determination and formation of slopes, performing the ceilings finishing for the slabs must be done as per the standards and with drawing specifications maintaining the accuracy.

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SOC 23SOC20 Automobile Servicing and Maintenance 0 0 0 2

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

Code	Course Outcomes
23SOC20.1	Identify parts in a diesel and petrol engine of LMV/ HMV
23SOC20.2	Observe and report the reading of Tachometer, Odometer, temp. and Fuel gauge under ideal and on load condition
23SOC20.3	Engage in practical exercises to discern variances in the constituents of gasoline and diesel engines, and acquire hands-on experience in disassembling both light and heavy motor vehicle engines following established protocols

Min. 60 Hours

Description of internal & external combustion engines, Classification of IC engines, Principle & working of 2 & 4 - stroke diesel engine (Compression ignition Engine (C.I)), Principle of Spark Ignition Engine(SI), differentiate between 2-stroke and 4 stroke, C.I engine and S.I Engine, Direct injection and Indirect injection, Technical terms used in engine, Engine specification, Study of various gauges/instrument on a dash board of a vehicle- Speedometer, Tachometer, Odometer and Fuel gauge, and Indicators such a gearshift position, Seat belt warning light, Parking-brake-engagement warning light and an Engine- malfunction light.

Different type of starting and stopping method of Diesel Engine Procedure for dismantling of diesel engine from a vehicle.

Petrol Engine Basics: 4-stroke spark-ignition engines- Basic 4-stroke principles. Spark-ignition engine components - Basic engine components, Engine cams & camshaft, Engine power transfer, Scavenging, Counter weights, Piston components. Intake & exhaust systems – Electronic fuel injection systems, Exhaust systems. Intake system components, Air cleaners, Carburettor air cleaners, EFI air cleaners, Intake manifolds, Intake air heating.

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Civil Engineering

Preamble: The Curriculum of B. Tech. (Civil Engineering) program offered by the Department of Civil Engineering under Academic Regulation 2023 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 (ECA) 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 organisations and Parents to capture their voice of the respective stakeholders.

The Curriculum design, delivery, and assessment, the major pillars of academic system is completely aligned in line with Outcome Based Education (OBE) to assess and evaluate the learning outcomes 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

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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	JNTU - GV	NSRIT (A)
HS	Humanities and Social Sciences	8 -9%	8%	3.125%
BS	Basic Sciences	12 – 16%	13%	15.6%
ES	Engineering Sciences	10 - 18%	14%	10.3%
PC	Professional Core	30 - 36%	34%	38.4%
PE	Professional Elective	19 - 23%	21%	15.6%
MI	Inter- / trans - disciplinary Electives			
	Internship (s), Project & Seminars	8 - 11%	10%	10.3%
SC	Skill Oriented Courses	-	-	7.5%
	Mandatory Courses	-	-	-
AC	Audit Course	-	-	-

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Curriculum with Multiple Entry & Multiple Exit (ME-ME) adhering to NEP 2020 (Academic Regulation 2023 – 2024)

	Credit requirement	Exit credit requirement	Total credit	Level as per NCRF
Undergraduate Certificate| (After the one year of study)	40	10	50	L5
Diploma| (After two year of study)	80	10	90	L6
Advanced Diploma | (After two year of study) - Lateral Entrants	40	10	50	
B.Sc. in Engineering (After three years of study)	120	10	130	L7
B. Tech. (Regular) | (Four years of study)	160	-	160	L8
B. Tech. (Minor)	12 (Inclusive of 160)	-	160	L8
B. Tech. (Honors)	175	15 (160+15)	175	L8

Semester III								Category
No.	Code	Course Title	POs / PSOs	L/D	T	P	Credits	
1	23BSX13	Numerical and Statistical Methods	3, 4, 7	3	0	0	3.0	BS
2	23HSX03	Universal Human Values–Understanding Harmony & Ethical Human Conduct	8, 9, 10	2	1	0	3.0	HS
3	23CE303	Surveying	1, 2, 12	3	0	0	3.0	ES
4	23CE304	Strength of Materials	1, PSO #1	3	0	0	3.0	PC
5	23CE305	Fluid Mechanics	1, 3, PSO #2	3	0	0	3.0	PC
6	23CE306	Surveying laboratory	1, 2, 10, 12	0	0	3	1.5	PC
7	23CE307	Strength of Materials laboratory	1, 4	0	0	3	1.5	PC
8	23DSS01	Python Programming	1, 2, 5, PSO #1	0	1	2	2.0	SOC
9	23ACX01	Environmental Science	7	2	0	0	-	MC
						Sub-total	**20.0**	
Semester IV								Category
No.	Code	Course Title	POs / PSOs	L/D	T	P	Credits	
1	23HSX04	Managerial Economics & Finance analysis; Business Environment Organizational Behavior	11	2	0	0	2.0	HS
2	23CE402	Engineering Geology		3	0	0	3.0	ES
3	23CE403	Building Materials & Concrete Technology	1, 2, 6, 8,12	3	0	0	3.0	PC
4	23CE404	Structural Analysis	1, 3, PSO #1	3	0	0	3.0	PC
5	23CE405	Hydraulics & Hydraulic Machinery	1, 4	3	0	0	3.0	PC
6	23CE406	Concrete Technology lab	1, 2, 4	0	0	3	1.5	PC
7	23CE407	Engineering Geology Lab	1, 4, 12	0	0	3	1.5	PC
8	23SCX01	Soft Skills	1, 10	0	1	2	2.0	SOC
9	23ESX08	Design Thinking and Innovations	1 – 3, 6,7, 9, 10	1	0	2	2.0	ES
10	Mandatory Community Service Centric Internship of 6-8 weeks duration during summer vacation							
						Sub-total	**21.0**	
Exit mandate at the level of I year for the award of Diploma[1]								
1		Certification #3		Min. 60 hours			2.0	SOC
2		Certification #4		Min. 60 hours			2.0	SOC
3	23SOC02	Job Specific Internship/OJT/Apprenticeship		Min. 60 Days			6.0	OJT

[1] Students exiting at the level of second year study must complete two skill-oriented courses and Job specific Internship/ OJT/ Apprenticeship that tunes to a total of 10 credits

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Certification #3 & #4								
1	23SOC17	Industrial Safety	-	0	0	3	3.0	SOC
2	23SOC18	Equipment Maintenance and Repairing	-	0	0	3	3.0	SOC
3	23SOC19	Computer Aided Analysis and Design	-	0	0	3	3.0	SOC
4	23SOC20	Battery Management System (BMS)	-	0	0	3	3.0	SOC
5	23SOC21	3D - Printing	-	0	0	3	3.0	SOC
6	23SOC22	Computer Servicing	-	0	0	3	3.0	SOC
7	23SOC23	Front Office Management	-	0	0	3	3.0	SOC
8	23SOC24	Facility Management Service	-	0	0	3	3.0	SOC
9	23SOC25	Hotel Management	-	0	0	3	3.0	SOC

Specialization

B. Tech. (Honors)

1. Applications of IOT in Civil Engineering
2. Smart Cities
3. Structural Safety and Risk Management

B. Tech. (Minor) – Trans – disciplinary

1. Liberal Arts
2. Statistics
3. General Management
4. Personal Management

B. Tech. (Minor) – Inter – disciplinary

1. Environmental Engineering, Climate Changes and Sustainability

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BS 23BSX13 Numerical and Statistical Methods **3 0 0 3**

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

Code	Course Outcomes	PO1	DoK PO2	
23BSX13.1	Apply numerical methods to solve algebraic and transcendental equations	3	2	L1 – L4
23BSX13.2	Derive interpolating polynomials using interpolation formulae	3	2	L1 – L4
23BSX13.3	Solve differential and integral equations numerically	3	2	L1 – L4
23BSX13.4	Identify real life problems into Mathematical Models.	3	2	L1 – L4
23BSX13.5	Apply the probability theory and testing of hypothesis in the field of civil engineering Applications.	3	3	L1 – L4

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus (italic) promoting autonomous learning

Unit I: Solution of Algebraic & Transcendental Equations **9 Hours**

Introduction-Bisection Method-Iterative method, Regula-falsi method and Newton-Raphson method System of Algebraic equations: Gauss Elimination Gauss Siedal method. **COs: CO1**

Self Learning Topic: Jacobi's method

Unit II: Interpolation **9 Hours**

Finite differences-Newton's forward and backward interpolation formulae, Lagrange's formulae, Newton's Divided Difference interpolation formulae, **COs: CO2**

Curve fitting: Fitting of straight line, second-degree and Exponential curve by method of least squares

Self Learning Topic: Fitting a power curve by method of least squares

Unit III: Solution of Initial value problems to Ordinary differential equations **9 Hours**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's and -Runge-Kutta methods (second and fourth order). **COs: CO3**

*Self Learning Topic: M*odified Euler's methods

Unit IV: Estimation and Testing of hypothesis, large sample tests **9 Hours**

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems **COs: CO4**

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Self Learning Topic: *Test for single proportion, difference of proportions*

Unit V: Small sample tests **9 Hours**

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence of attributes. **COs: CO5**

Self Learning Topic: Test for observed Correlation and Regression Coefficients

Textbooks:

1. S S Sastry, Introductory Methods of Numerical Analysis, PHI Learning Private Limited.
2. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2017, 44th Edition
3. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.India.

ReferenceBooks:

1. ErwinKreyszig, AdvancedEngineeringMathematics, JohnWiley&Sons, 2018, 10th Edition.
2. R.K.JainandS.R.K.Iyengar,AdvancedEngineeringMathematics,AlphaScienceInternationalLtd.,2021 5th Edition(9th reprint).
3. Ronald E. Walpole, Probability and Statistics for Engineers and Scientists, 9th edition, december 2010, PNIE
4. H. K Das, Er. Rajnish Verma,Higher Engineering Mathematics, S. Chand Publications,2014, Third Edition (Reprint 2021)

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc17_ma14/preview
2. https://onlinecourses.nptel.ac.in/noc24_ma05/preview
3. http://nptel.ac.in/courses/111105090

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	Expert talk (To be delivered by SMEs from industries)	**COs**	**POs**
1	Introduction to MATLAB	CO1-CO5	PO2, PO5
2	Solving ODEs using MATLAB	CO3	PO3

Textbooks

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	15	15
L2	55	55
L3	20	20
L4	10	10
Total (%)	100	100

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Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Prove that (1+Δ)(1-∇)=1
2. Identify the root lies between the values x^3-5x+1=0
3. Define Population and Sample
4. Define the types of errors in test of hypothesis
5. Write the normal equations in fitting a parabola by using the principle of least squares

L2: Understand

1. Find the root of the equation $\cos x = xe^x$ using the Falsi-method correct to four decimal places.

2.Using Lagranges interpolation formula, find the polynomial of the given data:

x	-1	0	3	6
f(x)	3	-6	39	822

3. Using Newton's forward interpolation formula, find the value of f(1.6), if

x	1	1.4	1.8	2.2
y	3.49	4.82	5.96	6.5

4. .A Population consists of five members 2,3,6,8 and 11.Consider all possible samples of size two each can be drawn with replacement from the population find

(a) Population mean
(b) Standard deviation of the population
(c) The mean of the sampling distribution of means

The Standard deviation of the sampling distribution of means

5.Explain the Procedure of hypothesis testing ?

L3: Apply

1. The area A of a circle of diameter d is given for the following values. Calculate the area of a circle of diameter 105.

d	80	85	90	95	100
A	5026	5674	6362	7088	7854

2.Using the method of separation of symbols, prove that

$u_0 + u_1 + u_2 + u_3 + \ldots\ldots + u_n = (n+1)C_1 u_0 + (n+1)C_2 \Delta u_0 + (n+1)C_3 \Delta^2 u_0 + \ldots\ldots (n+1)C_{n+1} \Delta^n u_0$

3 . 7 coins are tossed and no.of heads are noted .The experiment is repeated 128 times and follow the distribution is obtained

No.of heads	0	1	2	3	4	5	6	7
Observed frequencies	7	6	19	35	30	23	7	1

Fit a binomial distribution from the above data and check the goodness of fit if coin is unbaised

4.The 9 items of a sample have the following values 45,47,50,52,48,47,49,53,51.Does the mean of these values differ significantly from the assumed mean 47.5?use a 0.05 level of significance.

5. The following table gives the number of breakdowns in a factory in various days of a week

Day	Mon	Tue	Wed	Thu	Fri	Sat	Sun

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No.of breakdowns	14	22	16	18	12	19	11

Check whether the breakdowns are uniformly distributed or not

L4: Analyze:

1) Twelve cars were equipped with radial tires and driven over a test course. Then the same 12 cars (with the same drivers) were equipped with regular belted tires and driven over the same course. After each run, the cars' gas economy (in km/l) was measured. Is there evidence that radial tires produce better fuel economy? (Assume normality of data, and use □ = .05.)

Car Gas eco.	1	2	3	4	5	6	7	8	9	10	11	12
Y1 (radial)	4.2	4.7	6.6	7.0	6.7	4.5	5.7	6.0	7.4	4.9	6.1	5.2
Y2 (belted)	4.1	4.9	6.2	6.9	6.8	4.4	5.7	5.8	6.9	4.7	6.0	4.9

2) A gambler plays a game that involves throwing 3 dice in a succession of trials. His winnings are directly proportional to the number of sixes recorded. If the dice are fair,what is the probability distribution that governs the outcome of each throw?
The frequencies of the sixes observed in100 trials are recorded, together with their expected values, in the following table:

Number of sixes	Expected Count	Observed Count
0	58	47
1	34.5	35
2	7	15
3	0.5	3

You are asked to assess whether it is likely that the dice have been unfairly weighted, using a chi-square test of goodness of fit.

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23HSX03 Universal Human Values

3 0 0 3

Version 01.00

Pre-requisite: -

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

Code	Course Outcomes	Mapping with POs			DoK
		PO8	PO9	PO10	
23HSX03.1	Develop holistic vision of life	3	2	1	L1, L2, L3
23HSX03.2	Improve socially responsible behaviour	3	2	1	L1, L2, L3
23HSX03.3	Familiarize environmentally responsible work	3	2	1	L1, L2, L3
23HSX03.4	Develop ethical human conduct	3	2	1	L1, L2, L3
23HSX03.5	Identify Competence and Capabilities for Maintaining Health and Hygiene	3	2	1	L1, L2, L3

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

Unit I Introduction to Value Education — **9 hours**

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to Fulfil the Basic Human Aspirations — **COs: CO1**

Practice Session: Sharing about Oneself, Exploring Human Consciousness, Exploring Natural Acceptance

Unit II Harmony in the Human Being — **9 hours**

Understanding Human being as the Coexistence of the Self and the Body, distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health — **COs: CO2**

Practice Session: Exploring the difference of Needs of Self and Body, Exploring Sources of Imagination in the Self, Exploring Harmony of Self with the Body

Unit III Harmony in the Family and Society — **9 hours**

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-to-Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order — **COs: CO3**

Practice Session: Exploring the Feeling of Trust, Exploring the Feeling of Respect, Exploring Systems to fulfill Human Goal

Unit IV: Harmony in the Nature/Existence — **9 hours**

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence — **COs: CO4**

Practice Session: Exploring the Four Orders of Nature, Exploring Co-existence in Existence

Unit V Implications of the Holistic Understanding – a Look at Professional Ethics — **9 hours**

Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession — **COs: CO5**

Practice Session: Exploring Ethical Human Conduct, Exploring Humanistic Models in Education, Exploring Steps of Transition towards Universal Human Order

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Expert talk

BASIC HUMANITIES AND SCIENCES

COs POs

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1	Seminar with Socialists	CO1	PO8

Text Books

1. The Textbook: A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 47-1
2. The Teacher's Manual Teachers': Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53

Reference Books

1. JeevanVidya: EkParichaya, A Nagaraj, JeevanVidyaPrakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book)
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
6. Small is Beautiful - E. F Schumacher

Internal Assessment Pattern

CognitiveLevel	InternalAssessment#1(%)	InternalAssessment#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 is Value education?
2. Write any two naturally accepted situations as your real-life experiences.
3. What is the basic unit of human interaction?
4. What is self-regulation?

L2: Understand

1. Briefly explain the self-exploration as the process for value education.
2. Explain the basic unit of interaction.
3. Explain 'respect' as the right evaluation.

L3: Apply

1. Discuss the role of a family dynamics play in shaping an individual's understanding of values and holistic well-being.
2. In what aways can holistic understandings of societal issues influence the values we prioritize as individuals and communities?
3. Discuss how can educational institutions integrate value-based teachings to cultivate a holistic understanding of societal harmony within students?

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ES 23CE303 Surveying **3 0 0 3**
Pre – requisite: Nil **Version 01.00**

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

Code	Course Outcomes	Mapping with POs PO1	PO2	PO12	DoK
23CE303.1	Apply the principle and methods of surveying and measuring of horizontal and vertical- distances and angles	3	2	2	L2
23CE303.2	Identify the source of errors and rectification methods	3	2	2	L3
23CE303.3	Apply surveying principles to determine areas and volumes	3	2	2	L2
23CE303.4	Setting out curves and using modern surveying equipment's	3	2	2	L3
23CE303.5	Apply the basics of Photogrammetry Surveying in field	3	2	1	L4

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

Level of correlation: 1: Weakly Correlated 2: Strongly Contributing for the attainment of respective Pos
Blooms Taxonomy: L1: Remember L2: Understand L3: Apply L4: Analyze L5: Evaluate L6: Create DoK: Depth of Knowledge

Unit I: Chain, Compass and Plane Table Surveying **09 + 03 hours**

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Surveying accessories. Introduction to Compass, levelling and Plane table surveying.

Linear distances- Approximate methods, Direct Methods- Chains- Tapes, ranging, Tape corrections.

Prismatic Compass- Bearings, included angles, Local Attraction, Magnetic Declination, and dip – systems and W.C.B and Q.B systems of locating bearings. **COs: CO1**

Surveyor compass

Unit II: Levelling Contouring & Area and volumes **09 + 03 hours**

Levelling- Types of levels, methods of levelling, and Determination of levels, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, methods of contour surveying.

Areas - Determination of areas consisting of irregular boundary and regular boundary. **COs: CO2**

Volumes -Determination of volume of earth work in cutting and embankments for level section, capacity of reservoirs.

Levelling staffs

Unit III: Theodolite and Traversing **09 + 03 hours**

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Theodolite Surveying: Types of Theodolites, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrical levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Introduction to Omitted measurements.

COs: CO3

Tacheometry

Unit IV: Curves and modern surveying methods — **09 + 03 hours**

Curves: Types of curves and their necessity, elements of simple, compound, reverse curves.

Introduction to Tacheometric Surveying.

Modern Surveying Methods: Principle and types of E.D.M. Instruments, Total station- advantages and Applications. Introduction to Global Positioning System. Introduction to Drone survey and LDAR Survey (Light Detection And Ranging).

COs: CO4

Planimeter

Unit V: Photogrammetry Surveying: — **09 + 03 hours**

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo-plotting instruments, mosaics, map substitutes.

COs: CO5

Raster and vector measurements

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Approved in : ACM No. VI

Expert talk (To be delivered by SMEs from industries)		COs	POs
1	GIS & Geomatics applications in Civil Engineering	CO #5	

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,"7thEdition, Wiley, 2015
3. Peter Alan Burrough, Rachael A., Mc Donnell, "Principles of Geographical Information Systems",2ndEdition, 2002
4. Duggal S.K., "Surveying", Volume I, 4th Edition, Tata McGraw Hill Ltd., Reprint 2015
5. Duggal S.K., "Surveying", VolumeII, 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

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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 30m 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 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 diimensions. Centre height in cut:1 m Formation width: 22 m Side slope in cut:1 to 1 Side

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slope in fill: 2 to 1 Transverse slope: 5.5 to 1

5. Two horizontal distances of 30m and 70m 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

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23CE304 Strength of Materials

3 0 0 3
Version 01.00

Pre-requisite: Engineering Mechanics

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

Code	Course Outcomes	Mapping with POs PO1	PO2	DoK
23CE304.1	To understand the basic materials behavior under the influence of different external loading conditions and the support conditions.	3	2	L2
23CE304.2	To draw the diagrams indicating the variation of the key performance features like axial forces, bending moment and shear forces in structural members	2	1	L3
23CE304.3	To acquire knowledge of bending concepts and calculation of section modulus and for determination of stresses developed in the beams	2	2	L2
23CE304.4	To analyze the deflections due to various loading conditions.	1	2	L3
23CE304.5	To assess stresses across section of the thin, thick cylinders and columns to arrive at optimum sections to withstand the internal pressure using Lame's equation	2	1	L4

Unit I : Simple Stress and Strains **9 + 3hours**

Elasticity and plasticity — Types of stresses and strains — Hooke's law — Factor of safety, Poisson's ratio - Relationship between Elastic constants — Bars of varying section — stresses in composite bars. **CO1**

Stress strain curve for mild steel

Unit II: Shear force and Bending Moment **9 + 3hours**

Definition of beam — Types of beams — Concept of shear force and bending moment — Point of contra flexure — Relation between S.F., B.M and rate of loading at a section of a beam; S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, partial uniformly distributed loads, couple, and combination of these loads. **CO2**

Uniformly varying loads

Unit III: Flexural and Shear Stresses: **9 + 3hours**

Flexural Stresses: Theory of simple bending — Assumptions — Derivation of bending equation, Neutral axis — Determination of bending stresses — section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections — Design of simple beams

Shear Stresses: Derivation of formula — Shear stress distribution across various beam sections like rectangular, circular, I, T Angle sections. **CO3**

Torsion *– circular shafts only.*

Unit IV: Deflection of Beams **9 + 3hours**

Double integration and Macaulay's methods — Determination of slope and deflection for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed loads, uniformly varying loads, partial uniformly distributed loads, couple and combination of these loads. Moment area method application to simple cases of cantilever. **CO4**

Mohr's theorem

Unit V: Columns and Cylinders **9 + 3hours**

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Introduction – Classification of columns – Axially loaded compression members – Euler's crippling load theory – Derivation of Euler's critical load formulae for various end conditions – Equivalent length – Slenderness ratio – Euler's critical stress – Limitations of Euler's theory – Rankine – Gordon formula – Eccentric loading and Secant formula – Prof. Perry's formula.

Thin and Thick cylindrical shells — Derivation of formula for longitudinal and circumferential stresses — hoop, longitudinal and volumetric strains — changes in diameter, and volume of thin cylinders., Derivation of Lames formulae, distribution of hoop and radial stresses across the thickness, compound cylinders-distribution of stresses **CO5**

Lames theory for thick cylinders

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Expert talk (To be delivered by SMEs from industries)		Cos	Pos
1	Practical applications of the Stress & Strains, Shear force and Bending Moments calculations	CO #1, 2	PO #1, PSO #1
2	Designing of Compression members and how concept of cylinders are applied	CO #4, 5	PO #1, PSO #1

Textbooks

1. Bansal R. K., "Text Book of Strength of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 2012
2. Thomas Lillesand, Ralph W., Kiefer, Jonathan Chipman, "Remote Sensing and Image Interpretation", 7th Edition, Wiley, 2015
3. Rajput R. K., "Strength of Materials", S.Chand & Company Ltd., New Delhi, 2015
4. Punima B. C., Ashok K. Jain, Arun Kumar Jain, "Mechanics of Materials", Laxmi Publications Pvt. Ltd., New Delhi
5. Subramanian R., "Strength of Materials", 2nd Edition, Oxford University Press, New Delhi, 2010
6. Tarun Gupta, Dharamvir Mangal, "Strength of Materials", 2nd Edition, Vayu Education of India, 2020

Reference Books

1. Beer F. P. and Johnston E. R., "Mechanics of Materials", Tata McGraw Hill, New Delhi,2014
2. Egor P. Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2009
3. Ramamrutham S., "Strength of materials", Dhanpati Rai Publishing Company, New Delhi, 2014
4. Timoshenko S., "Strength of Materials", C. B. S Publishers & Distributors, New Delhi, 2002
5. Rattan, "Strength of Materials", Tata McGraw Hill Education, India,
6. Gunneswara Rao T. D. and Mudambi Andal, "Strength of Materials - Fundamentals and Applications", 1st Edition, Cambridge University Press, 2018
7. 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

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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 Young's modulus
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/mm^2

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23CE305 Fluid Mechanics

3 0 0 3
Version 01.00

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PSO #2	
23CE305.1	Understand the principles of fluid statics, kinematics and dynamics	3	1	1	L2
23CE305.2	Apply the laws of fluid statics and concepts of buoyancy	3	3	1	L3
23CE305.3	Understand the fundamentals of fluid kinematics and differentiate types of fluid flows	3	1	2	L2
23CE305.4	Apply the Principle of conservation of energy for flow measurement.	3	2	2	L3
23CE305.5	Analyse the losses in pipes and discharge through pipe network.	3	3	2	L4

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

Unit I **09hours**

Basic concepts and definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; Variation of viscosity with temperature, Newton law of viscosity; Vapor pressure, Boiling point, Surface tension, Capillarity, Bulk modulus of elasticity, Compressibility **COs: CO1**

Bulk modulus of elasticity

Unit II: Fluid statics: **09 hours**

Fluid statics: Fluid Pressure: Pressure at a point, Pascal's law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodie **COs: CO2**

Buoyancy and stability of floating bodies

Unit III: Fluid kinematics: **09 hours**

Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three - Dimensional continuity equations in Cartesian coordinates. **COs: CO3**

stream function, velocity potential function

Unit IV: Fluid Dynamics: **09 hours**

Fluid Dynamics: Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – Derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturi meter, orifice meter and Pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number. **COs: CO4, CO5**

Reynolds Number

Unit V: Analysis Of Pipe Flow **09 hours**

:nergy losses in pipelines; Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy ine; Concept of equivalent length – Pipes in Parallel and Series **COs: CO6**

Hydraulic Grade Line

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Expert talk (To be delivered by SMEs from industries) COs POs

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1	Fluid Kinematics & Fluid Dynamis	CO # 1, 2 ,3
2	Hydraulic Machinery	CO # 4, 5

Textbooks

1. ModiP.N.andSethS.M."HydraulicsandFluidMechanics",22nd Edition,S.B.H.Publishers,NewDelhi,2019
2. RajputR.K.,"FluidMechanicsandHydraulicMachines,6th Edition,S.ChandPublishers,2016
3. JainA.K., "FluidMechanics",12th Edition, KhannaPublishers,Delhi,1998
4. AroraK.R.,"FluidMechanics,HydraulicsandHydraulicMachines,9th Edition,StandardPublishers,2005
5. SubramanyaK.,"FlowinOpenChannels",3rd Edition,TataMcGrawHill,2009
6. Anup Goel, ., "Fluid Mechanics", 1st Edition, Technical Publications, 2021

Reference Books

1. StreeterV. L., "FluidMechanics",9th Edition,McGrawHillPublishers,2017
2. RobertW. FoxOgukuo, Orutcgardm H. andAlan T. Mc Donald, "Introduction to Fluid Mechanics", Student 7th Edition,Wiley,India,2011
3. SomS.K.andBiswasG.,"IntroductiontoFluidMachines",3rd Edition, TataMcGrawHillPublishersPvt.Ltd.,2013
4. FrankM.White,"FluidMechanics",7th Edition,McGrawHill,2011
5. MohantyA.K., "FluidMechanics",2nd Edition,PrenticeHallofIndiaPvt.Ltd.,NewDelhi,2006
6. NarayanaPillaiN.,"PrinciplesofFluidMechanicsandFluidMachines",4th Edition,UniversityPress,2011
7. KumarD.S.,"FluidMechanicsandFluidPowerEngineering",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 Pascal 'slaw?
3. Define Buoyancy
4. What is center of pressure?

L2: Understand

1. Explain Pascal's law
2. Explain the measurementofpressureusingmanometers
3. Derivetheprincipleofconservationofenergyinfluiddynamics
4. DeriveBernoulli'sequation
5. Explain bout parallel and seriesinpipes

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 thematerialofthecylinderis0.65, find the metacentric height and comment on the stability of the body

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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
4. 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 14m, respectively. Find the slip of the pump and power required to drive the pump. Neglect the effect of piston rod area

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PC **23CE306 Surveying Lab** **0 0 3 1.5**

Version 01.00

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs PO1	PO2	PO10	PO12
23CE306.1	Handle various linear and angular measuring instruments	2	2	2	3
23CE306.2	Measure the linear and angular measurements	2	2	2	3
23CE306.3	Calculate the area and volume by interpreting the data obtained from surveying activities	2	2	1	2
23CE306.4	Handle modern equipment such as total station	3	3	1	3
23CE306.5	Prepare field notes from survey data	3	3	2	2

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

(1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), - : No Correlation; Slight, Moderate and Substantial indicates the level of correlation between CO and PO, PSO mapping)

List of Experiments

1. Chain survey of road profile with offsets in case of road widening.
2. Determination of distance between two inaccessible points by using compass.
3. Plane table survey ;finding the area of a given boundary by the method of Radiation
4. Fly levelling : Height of the instrument method (differential leveling)
5. Fly levelling: rise and fall method.
6. Theodolite survey: determining the horizontal and vertical angles by the method of repetition method
7. Theodolite survey: finding the distance between two in accessible points.
8. Theodolite survey: finding the height of far object.
9. determination of area perimeter using total station.
10. determination of distance between two inaccessible point by using total station.
11. Setting out a curve
12. Determining the levels of contours

References

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

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23CE307 Strength of Materials Lab

0 0 3 1.5
Version 01.00

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs PO1	PO4	PO12
23CE307.1	Conduct tensile strength test and draw stress-strain diagrams for ductile metals	3	2	1
23CE307.2	Perform bending test and determine load-deflection curve of steel/wood	3	2	1
23CE307.3	Able to conduct torsion test and determine torsion parameters	3	2	1
23CE307.4	Perform hardness, impact and shear strength tests and calculate hardness numbers, impact and shear strengths	3	2	1
23CE307.5	Able to conduct tests on closely coiled and open coiled springs and calculate deflections	3	2	1

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing for the Program Outcome

List of Experiments

1. Tension test.
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simply supported beam.
4. Torsion test.
5. Hardness test.
6. Compression test on Open coiled springs
7. Tension test on Closely coiled springs
8. Compression test on wood/ concrete
9. Izod / Charpy Impact test on metals
10. Shear test on metals
11. Use of electrical resistance strain gauges.
12. Continuous beam – deflection test.

References

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

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SOC 23DSS01 Python Programming 0 1 2 2.0

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

Code	Course Outcomes	Mapping with POs / PSOs					
		PO1	PO2	PO3	PO5	PSO1	PSO2
23DSS01.1	Illustrate the use of basic concepts and control structures of python programming	3	3	2	1	2	1
23DSS01.2	Apply python programming concepts like functions, strings to solve a variety of computational problems	3	3	2	1	2	1
23DSS01.3	Exhibit competence in implementing and manipulating fundamental data structures such as lists, tuples, sets, dictionaries	3	3	2	1	2	1
23DSS01.4	understand the principles of object-oriented programming (OOP) in Python, including classes, Objects, inheritance, polymorphism, and encapsulation, and apply them to design and implement Python programs	3	3	2	1	2	1
23DSS01.5	Become proficient in using commonly used Python libraries such as JSON, NumPy, pandas	3	3	2	1	2	1

Unit-I:

History of Python Programming Language, Thrust Areas of Python, Installing Anaconda Python Distribution, Installing and Using Jupyter Notebook.

Parts of Python Programming Language: Identifiers, Keywords, Statements and Expressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation, Comments, Reading Input, Print Output, Type Conversions, the type () Function and Is Operator, Dynamic and Strongly Typed Language.

Control Flow Statements: if statement, if-else statement, if...elif...else, Nested if statement, while Loop, for Loop, continue and break Statements.

Sample Programs:

1. Write a program to find the largest element among three Numbers.
2. Write a program to swap two numbers without using a temporary variable.
3. Demonstrate the following Operators in Python with suitable examples.
   i) Arithmetic Operators ii) Relational Operators iii) Assignment Operators iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators
4. Write a program to add and multiply complex numbers
5. Write a program to print multiplication table of a given number.
6. Write a Program to display all prime numbers within an interval

Unit-II:

Functions: Built-In Functions, Commonly Used Modules, Function Definition and Calling the function, return Statement and void Function, Scope and Lifetime of Variables, Default Parameters, Keyword Arguments, *args and **kwargs, Command Line Arguments.

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Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters in String by Index Number, String Slicing and Joining, String Methods, Formatting Strings.

Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In Functions Used on Lists, List Methods, del Statement.

Sample Programs:

7. Write a program to define a function with multiple return values.
8. Write a program to define a function using default arguments.
9. Write a program to find the length of the string without using any library functions.
10. Write a program to check if the substring is present in a given string or not.
11. Write a program to count the number of vowels in a string (No control flow allowed).
12. Write a program to create, display, append, insert and reverse the order of the items in the array.
13. Write a program to add, transpose and multiply two matrices.
14. Write a program to perform the given operations on a list:
    i. Addition ii. insertion iii. slicing
15. Write a program to perform any 5 built-in functions by taking any list.

Unit-III:

Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs in Dictionaries, Built-In Functions Used on Dictionaries, Dictionary Methods, del Statement.

Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing and Slicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists, Relation between Tuples and Dictionaries, Using zip() Function, Sets, Set Methods, Frozenset.

Sample Programs:

16. Write a program to create tuples (name, age, address, college) for at least two members and concatenate the tuples and print the concatenated tuples.
17. Write a program to check if a given key exists in a dictionary or not.
18. Write a program to add a new key-value pair to an existing dictionary.
19. Write a program to sum all the items in a given dictionary.

Unit-IV:

Files: Types of Files, Creating File, Reading and Writing Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSV Files, Python os and os.path Modules.

Object-Oriented Programming: Classes and Objects, Creating Classes in Python, Creating Objects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes Vs Data Attributes, Encapsulation, Inheritance, Polymorphism, Catching Exceptions Using try and except Statement.

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Sample Programs:

20. Write a program to sort words in a file and put them in another file. The output file should have only lower-case words, so any upper-case words from source must be lowered.
21. Python program to print each line of a file in reverse order.
22. Python program to compute the number of characters, words and lines in a file.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and Perimeter. Implement subclasses for different shapes like circle, triangle, and square.

Unit-V:

GUI Library: tkinter
Mathematical Libraries: JSON, NumPy, Pandas, Matplotlib

Sample Programs:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array () function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a) Apply head () function to the pandas data frame
    b) Perform various data selection operations on Data Frame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

References

1. Gowri shankar S, Veena A., Introduction to Python Programming, CRC Press.
2. Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Online Learning Resources/Virtual Labs:

1. https://www.coursera.org/learn/python-for-applied-data-science-ai
2. https://www.coursera.org/learn/python?specialization=python#syllabus

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BS 23ACX01 Environmental Science

2 0 0 0

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

Code	Course Outcomes	Mapping with POs PO1	PO12	DoK
23ACX01.1	Gain in-depth knowledge on importance of environment,natural resources utilization and exploitation	3	1	L1, L2, L3
23ACX01.2	Classify the various types of an eco systems and Identify their interconnections	3	1	L1, L2, L3
23ACX01.3	Illustrate the impacts of ever increasing environmental pollution and understand the issues on global environment.	3	1	L1, L2, L3
23ACX01.4	Understand various acts formulated by Govt.of India and apply the knowledge gained in conserving energy and environmental protection	3	1	L1, L2, L3
23ACX01.5	Explain the importance of Environment and human health.	3	1	L1, L2, L3

Unit I: Multidisciplinary Nature of Environmental Studies & Natural Resources — **4 hours**

Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources

COs: CO1

Unit II: Ecosystems& Biodiversity and its Conservation : — **4 hours**

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

COs: CO2

Biodiversity and its Conservation : Introduction ,Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

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Unit III: Environmental Pollution& Solid Waste Management : **4 hours**

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

COs: CO3

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Unit IV: Social Issues and the Environment: **4 hours**

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

COs: CO4

Unit V: Human Population and the Environment: **4 hours**

Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

COs: CO5

Textbooks

1. Textbook of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.AzeemUnnisa, "Environmental Studies" Academic Publishing Company
4. K.RaghavanNambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

Reference Books

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House

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6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

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HS 23HSX04 Managerial Economics and Financial Analysis 2 0 0 2

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

Code	Course Outcomes	Mapping with POs PO11	PO12	DoK
23HSX04.1	Understand the theoretical concepts of managerial economics to make decisions for business problems	2	1	L1,L2
23HSX04.2	Gain adequate theoretical knowledge on production function and cost concepts to perform successful business operations	2	1	L2,L3
23HSX04.3	Understand the types of market structure and pricing strategies	2	1	L1,L2
23HSX04.4	Apply investment decisions and maximize returns to make successful longterm investment decisions.	2	1	L2,L3
23HSX04.5	Analyze accounting concepts and interprete financial strength of business	2	1	L2,L3

Strength of Mapping (High, Medium, Low) | Strength contributing for the attainment of respective Pos
Understand | Apply | Analyze | Evaluate | Create DoK Depth of Knowledge

Unit I : Introduction to Managerial Economics and Demand Analysis 6 Hours

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

Unit II: Production and Cost Analysis 6 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, Break-Even Point.

Unit III: Business Organisation and Markets 6Hours

Introduction – Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies -. Types of Markets Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition—Price-Outp Determination - Pricing Methods and Strategies

Unit IV: Introduction to Capital Planning 6 Hours

Cocept of Capital – Types of Capital - Capital Budgeting -: Meaning of Capital-Capitalization-Meaning of Capital Budgeting--Traditional Methods – Pay back period method, accounting rate of return, Modern Methods- net present value , internal rate of return, profitability index.

Unit V : Financial Accounting and Ratio Analysis 6 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. Introduction to Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, Capital structure Ratios , Profitability ratios.

Text Books

1. AppaRao 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
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

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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	50	25
L2	35	30
L3	15	45
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
6. 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
7. Calculate Net Profit Ration from the following data

   Sales returns Rs.100000 — Administration expences Rs.10000
   Gross Profit Rs.40000 — Selling expences Rs.10000
   Income from investment Rs.5000 — Loss on account of fire Rs.3000

L3: Apply

1. From the following particulars findout

   Selling price Rs.200 per unit
   Variable cost Rs.100 per unit
   Total fixed cost Rs.96000

   i) Break even units and values
   ii) Sales to earn a profit Rs.20000

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2. 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. Findout
   A) Sales
   B) Cost of goods sold
   C) Closing stock
   D) Opening stock

3. A Project cost is Rs.144000. The average annual cash inflows are likely to be Rs.45000 for a period of 5 Years calucalte IRR for the project
4. The cost of project is Rs.50000 The annual cash iunflows for the next 4 years are Rs.25000 what is the PBP for the project
5. A firm is considering two different investment options A & B detailes 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

6. ARR method (ARR on original investment)
   Inintial investment Rs.1200000

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

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23CE402 Engineering Geology 3 0 0 3

Pre – requisite: Nil **Version** 01.00

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

Code	Course Outcomes	Mapping with POs PO1	PO2	PO12	DoK
23CE402.1	Understand the significance of geological agents on Earth surface and its significance in Civil Engineering.	3	1	1	L1, L2
23CE402.2	Identify and understand the properties of Minerals and Rocks.	2	1	1	L1, L2
23CE402.3	Understand the concepts of Groundwater and its geophysical methods.	3	2	1	L1, L2
23CE402.4	Classify and measure the Earthquake prone areas, Landslides and subsidence to practice the hazard zonation.	3	3	2	L1, L2
23CE402.5	Investigate the project site for mega/mini civil engineering projects and site selection for mega engineering projects like Dams, Reservoirs and Tunnels.	3	3	2	L1, L2

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing | L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create

Unit I: Introduction 09 + 03 hours

Branches of Geology, Importance of Geology in Civil Engineering with case studies, Weathering of rocks, Geological agents, weathering process of Rock, Rivers and geological work of rivers. COs: CO1

Rocks , Minerals

Unit II: Mineralogy And Petrology 09 + 03 hours

Definitions of mineral and rock-Different methods of study of mineral and rock. Physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Common rock forming minerals: Feldspar, Quartz Group, Olivine, Augite, Hornblende, Mica Group, Asbestos, Talc, Chlorite, Kyanite, Garnet, Calcite and ore forming minerals are Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Chromite, Magnetite and Bauxite. Classification, structures ,textures and forms of Igneous rocks, Sedimentary rocks, Metamorphic rocks, and their megascopic study of granite varieties, (pink, gray, green). Pegmatite, Dolerite, Basalt etc., Shale, Sand Stone, Lime Stone, Laterite, Quartzite, Gneiss, Schist, Marble, Khondalite and Slate. COs: CO2

properties of rocks , Minerals

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Unit III: Structural Geology — **09 + 03 hours**

Strike , Dip and Outcrop study of common geological structures associating with the rocks such as Folds, Faults, Joints and Unconformities- parts, types, mechanism and their importance in Civil Engineering.

COs: CO3

Geological structures ,

Unit IV: Ground water , Earth quake , Landslides and Geophysics — **09 + 03 hours**

Ground Water: Water table, Cone of depression, Geological controls of Ground Water Movement, Ground Water Exploration Techniques.
Earthquakes and Land Slides: Terminology, Classification, causes and effects, Shield areas and Seismic bells, Richter scale intensity, Precautions of building constructions in seismic areas. Classification of Landslides, Causes and Effects, measures to be taken prevent their occurrence at Landslides.
Geophysics: Importance of Geophysical methods, Classification, Principles of Geophysical study by Gravity method, Magnetic method, Electrical methods, Seismic methods, Radiometric method and Electrical resistivity, Seismic refraction methods and Engineering properties of rocks.

COs: CO4

Seismic bells , refraction

Unit V: Geology of Dams, Reservoirs and Tunnels — **09 + 03 hours**

Geology of Dams, Reservoirs and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site. Geology consideration for successful constructions of reservoirs, Life of Reservoirs. Purpose of Tunnelling, effects, Lining of Tunnels. Influence of Geology for successful Tunneling.

COs: CO5

Tunnels , Lining

Board of Studies
Approved in : BoS No. IV
Approved in : ACM No. VI
Expert talk (To be delivered by SMEs from industries) COs POs

Text Books

1. Engineering Geology by N. ChennaKesavulu, Laxmi Publications . 2ndEdn 2014.
2. Engineering & General Geology by Parbin Singh Katson educational series 8th 2023

Reference Books

1. Engineering Geology by Subinoy Gangopadhay Oxford University press 1st edition, 2012.
2. Engineering Geology by D. Venkat Reddy, Vikas Publishing, 2ndEdn , 2017,

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3. Geology for Engineers and Environmental Society' Alan E Kehew, 3rd edn., 2013) Pearson publications.
4. 'Environmental Geology' (2013) K.S.Valdiya, 2nd ed., McGraw Hill Publications.

Web References

1. http://nptel.iitm.ac.in/video.php?subjectId=105105106
2. http://nptel.iitm.ac.in/video.php?courseId=1055&p=1
3. http://nptel.iitm.ac.in/video.php?courseId=1055&p=3
4. http://nptel.iitm.ac.in/video.php?courseId=1055&p=4

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 Geology
2. List out all the physical properties of minerals
3. list the classification of Geophysics

L2: Understand

1. Describe the importance of Structural Geology
2. Explain any two groundwater exploration techniques
3. Explain the geological considerations for selection of a dam site

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23CE403 Concrete Technology

3 0 0 3
Version 01.00

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs					DoK
		PO1	PO2	PO6	PO8	PO12	
23CE404.1	Familiarise the basic ingredients of concrete and their role in the production of concrete and its behaviour in the field.	3	3	3	3	1	L1, L2
23CE404.2	Test the fresh concrete properties and the hardened concrete properties. Understand the basic concepts of concrete. Design the concrete mix by BIS method.	3	3	3	3	1	L2
23CE404.3	Evaluate the ingredients of concrete through lab test results. realise the importance of quality of concrete	3	3	3	3	1	L3
23CE404.4	Understand the behaviour of concrete in various environments.	3	3	3	3	1	L3
23CE404.5	Familiarize the basic concepts of special concrete and their production and applications.	3	3	3	3	1	L3
All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning							

Unit I: **09 hours**

CEMENTS: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement – Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substances – Soundness – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Maximum aggregate size- Quality of mixing water **COs: CO1**

Cement Ingredients, Definition of Fine Aggregates and Coarse Aggregates

Unit II: **09 hours**

FRESH CONCRETE: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing – including various types in each stage. Properties of fresh concrete-Workability – Factors affecting workability – Measurement of workability by different tests, setting times of concrete, Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete **COs: CO2**

Concrete Ingredients, Uses of Admixture

Unit III: **09 hours**

HARDENED CONCRETE: Water / Cement ratio – Abram's Law – Gel/space ratio – Nature of strength of concrete –Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength – Curing, Testing of Hardened Concrete: Compression test – Tension test – Factors affecting strength – Flexure test –Splitting test – Non-destructive testing methods – Codal provisions for NDT. **COs: CO3**

Durability of Concrete, Destructive Testing Methods

Unit IV: **09 hours**

ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage –types of shrinkage **COs: CO4, CO5**

Glazed Door, Glazed Window

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Unit V: **09 hours**

MIX DESIGN AND SPECIAL CONCRETES: Ready mixed concrete, Fibre reinforced concrete – Different types of fibres – Factors affecting properties of FRC, High performance concrete – Self consolidating concrete, Self-healing concrete.

COs: CO6

Factors in the choice of mix proportions –Quality control of concrete- Statistical methods- Acceptance Criteria- Concepts Proportioning of concrete mixes by ACI method and IS Code method

High Density Concrete, Self-Healing Concrete

Board of Studies
Approved in: BoS No. VII
Approved in: ACM No. IX

Expert talk (To be delivered by SMEs from industries)	COs	POs
1 Various Non – Destructive tests	CO #3	PO #1,2,6,8,12
2 Applications of Special concretes	CO #5,6	PO #1,2,6,8,12

Textbooks

1.Properties of Concrete by A.M. Neville – PEARSON – 4th edition
2.Concrete Technology by M.L. Gambhir. – Tata Mc.Graw Hill Publishers, New Delhi 5th edition 2013.
3.Concrete Technology by Job Thomas, Cengagae Publications, 1st edition, 2015

Reference Books

1. Concrete Microstructure, Properties of Materials by P.K. Mehta and Moterio. McGraw Hill 4th edition 2014
2. Concrete Technology, J.J. Brooks and A. M. Neville, Pearson, 2019, 2nd Edition.
3. Concrete Technology by M. S. Shetty. – S. Chand & Co.; 2004
4. Concrete Technology by A.R. Santha Kumar, Oxford University Press, New Delhi

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

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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

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23CE404 Structural Analysis

3 0 0 3
Version 01.00

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PSO #2	
23CE404.1	Apply energy theorems to analyze trusses	3	1	1	L2
23CE404.2	analyze indeterminate structures by using Castigliano 's– II theorem	3	3	1	L3
23CE404.3	Analysis of fixed and continuous beams	3	1	2	L2
23CE404.4	Analyze continuous beams and portal frames by using slope-deflection method	3	2	2	L3
23CE404.5	Analyze continuous beams and portal frames by using Moment – distribution method	3	3	2	L4

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

Unit I ENERGY THEOREMS: **09hours**

Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces – Castigliano 's first theorem Deflections of simple beams and pin jointed trusses **COs: CO1**

Unit II: ANALYSIS OF INDETERMINATE STRUCTURES: **09 hours**

Indeterminate Structural Analysis – Determination of static and kinematic indeterminacies – Solution of trusses with upto two degrees of internal and external indeterminacies – Castigliano's–II theorem **COs: CO2**

Unit III: FIXED BEAMS & CONTINUOUS BEAMS : **09 hours**

Introduction to statically indeterminate beams with uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads – Shear force and Bending moment diagrams – Deflection of fixed beams effect of sinking of support, effect of rotation of a support **COs: CO3**

Unit IV: SLOPE-DEFLECTION METHOD: **09 hours**

Introduction-derivation of slope deflection equations- application to continuous beams with and without settlement of supports - Analysis of single bay portal frames without sway. **COs: CO4, CO5**

Unit V: MOMENT DISTRIBUTION METHOD: **09 hours**

ıtroduction to moment distribution method- Application to continuous beams with and without settlement of upports-Analysis of single bay storey portal frames without sway **COs: CO6**

Board of Studies
Approved in : BoS No. VII
Approved in : ACM No. IX

Expert talk (To be delivered by SMEs from industries)	COs	POs
1 Analysis of structures by various methods	All COs	PO #1,3, PSO #1

Textbooks

1.Analysis of Structures – Vol-I&II by V.N.Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.
2.Basic Structural Analysis by C.S.Reddy., Tata McGraw Hill Publishers. 3rd edition 2017.

Reference Books

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1.Structural analysis by Aslam Kassimali Cengage publications 6th edition 2020.
2.Structural analysis Vol.I and II by Dr.R.Vaidyanathan and Dr.PPerumal– Laxmi publications. 3rd 2016
3.Introduction to structural analysis by B.D.Nautiyal, New Age international publishers, New Delhi.
4.Structural Analysis – D.S.Prakasarao -Univeristy press.
5.Strength of Materials and Mechanics of Structures by B.C.Punmia, Khanna Publications, New Delhi.

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 Levels

L1: Remember

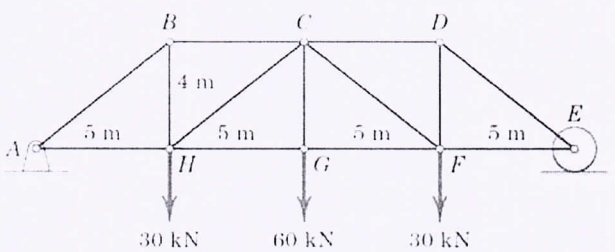
1. What is carry over factor?
2. What is distribution factor?
3. What is relative stiffness?
4. What is point of contra flexure?
5. What are the fixed end moment for a fixed beam of length L and subjected to udl of w kN/m?

L2: Understand

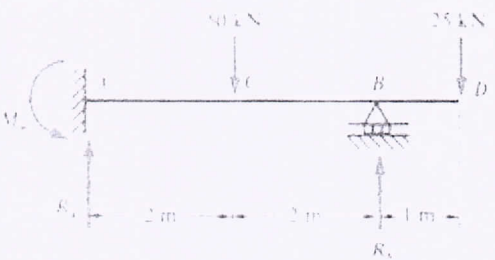
1. Explain the Clapeyron"s theorm of three moments.
2. What do you understand by an Influence line diagram (ILD).
3. Difference between 'Beam-action' and 'Arch-action'.
4. What is the concept of the influence line?

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 proppedcantilever beam with an overhang shown



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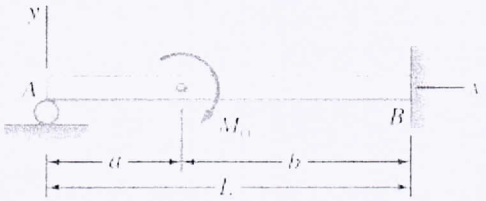
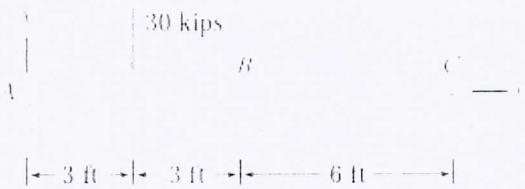
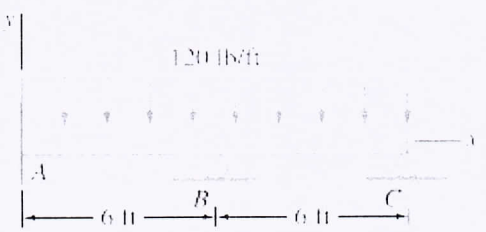
3. Solve the following problem by choosing MA and MB as the redundant reactions. Determine all the support reactions for the propped cantilever beam shown in the figure



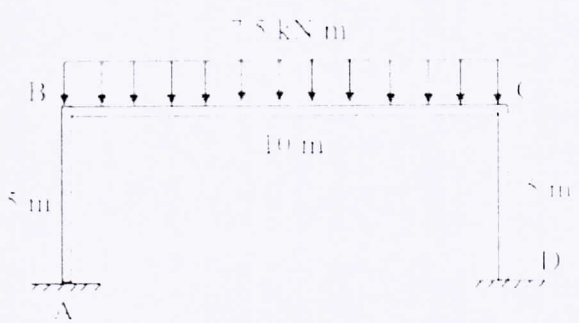
4. Find all the support reactions for the beam shown below:



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



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23CE405 HYDRAULICS AND HYRAULIC MACHINERY

3 0 0 3
Version 01.00

Pre-requisite: Fluid Mechanics

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

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO3	PSO #2	
23CE405.1	Understand the characteristics of laminar and turbulent flows.	3	3	3	L2
23CE405.2	Apply the knowledge of fluid mechanics to address the uniform flow problems in open channels.	3	3	3	L3
23CE405.3	Solve non-uniform flow problems and hydraulic jump phenomenon in open channel flows.	3	3	3	L3
23CE405.4	Evaluate the performance of impact of jets on plates and design Pelton wheel, Francis and Kaplan turbine	3	3	3	L4
23CE405.5	Understand the principles, losses and its efficiencies of centrifugal pumps L2 Course Articulation Matrix:	3	3	3	L5
	All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning				

Unit I Laminar & Turbulent flow in pipes **09 hours**

: Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke 's law, Measurement of viscosity. Reynolds experiment, Transition from laminar to turbulent flow. Resistance to flow of fluid in smooth and rough pipes-Moody 's diagram – Introduction to boundary layer theory **COs: CO1**

Reynolds experiment

Unit II: Uniform flow in Open Channels: Open Channel Flow **09 hours**

Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Hydraulically efficient channel sections: Rectangular, trapezoidal, and triangular channels, Energy and Momentum correction factors **COs: CO2**

Velocity Distribution of channel section

Unit III: Non-Uniform flow in Open Channels **09hours**

Specific energy, critical flow, discharge curve, Specific force, Specific depth, and Critical depth. Measurement of Discharge and Velocity – Gradually Varied Flow- Dynamic Equation of Gradually Varied Flow. Hydraulic Jump and classification - Elements and characteristics- Energy dissipation **COs: CO3**

Dynamic Equation of Gradually Varied Flow.

Unit IV: Impact of Jets **09 hours**

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes - Velocity triangles at inlet and outlet - Work done and efficiency Hydraulic Turbines: Classification of turbines; Pelton wheel and its design. Francis turbine and its design - efficiency - Draft tube: theory - characteristic curves of hydraulic turbines. Cavitation: causes and effects **COs: CO4, CO5**

Classification of turbines

Unit V: Pumps **09 hours**

Working principles of a centrifugal pump, work done by impeller; heads, losses and efficiencies; minimum starting speed; Priming; specific speed; limitation of suction lift, net positive suction head (NPSH); Performance and characteristic curves; Cavitation effects; Multistage centrifugal pumps; troubles and remedies **COs: CO6**

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Cavitation effects

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Approved in : BoS No. VII
Approved in : ACM No. IX

Expert talk (To be delivered by SMEs from industries)		COs	POs
1	Fluid Kinematics & Fluid Dynamis	CO # 1, 2 ,3	
2	Hydraulic Machinery	CO # 4, 5	

Textbooks

1. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House 22nd, 2019.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2nd edition 2018

Reference Books

1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi 11th edition, 2024.
2. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.
3. Fluid Mechanics by Frank M. White, Henry Xue, Tata McGraw Hill, 9th edition , 2022.
4. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.
5. Introduction to Fluid Mechanics & Fluid Machines by S K Som, Gautam Biswas, S Chakraborty Tata McGraw Hill, 3rd edition 2011

Web References

https://archive.nptel.ac.in/courses/112/105/112105269/
https://nptel.ac.in/courses/112104118
https://nptel.ac.in/courses/105103192

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 Pascal's law?
3. Define Buoyancy
4. 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 about parallel and series in pipes

L3: Apply

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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
4. 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

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23CE406 Concrete Technology lab

0 0 3 1.5
Version 01.00

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs			
		PO1	PO2	PO4	PO12
23CE406.1	Outline importance of testing cement and its properties	3	3	3	1
23CE406.2	Assess different properties of Aggregates	3	3	3	1
23CE406.3	Assess fresh concrete properties and their relevance to hardened concrete	3	3	3	1
23CE406.4	Assess hardened concrete properties	3	3	3	1

1: Slightly (Low) 2: Moderately (Medium) 3: Strongly Contributing for the attainment of respective Pos

Detailed Syllabus:

1.Tests on Cement

Normal Consistency and Fineness of cement.

Initial setting time and Final setting time of cement.

Specific gravity and soundness of cement.

Compressive strength of cement.

2.Tests on Fine Aggregates

Grading and fineness modulus of Fine aggregate by sieve analysis.

Specific gravity of fine aggregate

Water absorption and Bulking of sand.

3.Tests on Coarse Aggregates

Grading of Coarse aggregate by sieve analysis.

Specific gravity of coarse aggregate

Water absorption of Coarse aggregates

4.Tests on fresh Concrete

Workability of concrete by compaction factor method

Workability of concrete by slump test

Workability of concrete by Vee-bee test.

5.Tests on Hardened Concrete

Compressive strength of cement concrete and Modulus of rupture

Young's Modulus and Poisson's Ratio

Split tensile strength of concrete.

Non-Destructive testing on concrete (for demonstration)

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23CE407 Engineering Geology Lab

0 0 3 1.5

Version 01.00

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs PO1	PO4	PO12
23CE407.1	Identify Megascopic minerals & their properties	3	2	1
23CE407.2	Identify Megascopic rocks & their properties	3	2	1
23CE407.3	Identify the site parameters such as contour, slope & aspect for topography.	3	2	1
23CE407.4	Know the occurrence of materials using the strike & dip problems	3	2	1

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing [illegible]

List of Experiments

1. Physical properties of minerals: Mega-scopic identification of
   a. Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc…
   b. Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc…
2. Megascopic description and identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite &Biotiteschist, Marble, Khondalite, etc.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.
5. Bore hole data.
6. Strength of the rock using laboratory tests.
7. Field work – To identify Minerals, Rocks, Geomorphology& Structural Geology.

LAB EXAMINATION PATTERN:

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Question on Interpretation of a Geological map along with a geological section.
4. TWO Questions on Simple strike and Dip problems.
5. Bore hole problems.
6. Project report on geology.

REFERENCES:

1. 'Applied Engineering Geology Practicals' by M T Mauthesha Reddy, New Age International Publishers, 2nd Edition.
2. 'Foundations of Engineering Geology' by Tony Waltham, Spon Press, 3rd edition, 2009.

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SOC **23SCX01 Soft Skills** **0 1 2 2**

Version 01.00

Pre-requisite: None. Soft Skills (Desirable)

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

Code	Course Outcomes	Mapping with POs PO8 PO9 PO10	DoK
23SCX01.1	List out various elements of soft skills		L1, L2
23SCX01.2	Describe methods for building professional image		L1, L2
23SCX01.3	Apply critical thinking skills in problem solving		L3
23SCX01.4	Analyse the needs of an individual and team for well-being		L4
23SCX01.5	SA the situation and take necessary decisions		L5
23SCX01.6	Create a productive workplace atmosphere using social and work-life skills ensuring personal and emotional well-being		L6

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

MODULE I: Soft Skills & Communication Skills **6+3 hours**

Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques.

Activities:

Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity.

Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film

Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.

Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation.

COs: CO1

MODULE 2: Critical Thinking **6+3hours**

Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection

Activities:

Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues –placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis

COs: CO2

MODULE 3: Problem Solving & Decision Making **6+3hours**

Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles

Activities:

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision- Case Study & Group Discussion.

COs: CO3

MODULE 4: Emotional Intelligence & Stress Management **4+2 hours**

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Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips

Activities:

Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. **COs: CO4**

Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates

MODULE 5: Corporate Etiquette **6+3+3 hours**

Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips -Overcoming challenges **COs: CO5. CO6**

Activities

Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games

Board of Studies		BASIC HUMANITIES AND SCIENCES	
Approved in : BoS No. IV			
Approved in : ACM No. VI			
Expert talk (To be delivered by SMEs from industries)		COs	POs
1	Seminar with Socialists	CO1	PO10

Prescribed Books:

1. Mitra Barun K, Personality Development and Soft Skills, Oxford University Press, Pap/Cdr edition 2012
2. Dr Shikha Kapoor, Personality Development and Soft Skills: Preparing for Tomorrow, I K International Publishing House, 2018

Reference Books

1. Sharma, Prashant, Soft Skills: Personality Development for Life Success, BPB Publications 2018.
2. Alex K, Soft Skills S.Chand & Co, 2012 (Revised edition)
3. Gajendra Singh Chauhan & Sangeetha Sharma, Soft Skills: An Integrated Approach to Maximise Personality Published by Wiley, 2013
4. Pillai, Sabina & Fernandez Agna, Soft Skills and Employability Skills, Cambridge University Press, 2018
5. Soft Skills for a Big Impact (English, Paperback, Renu Shorey) Publisher: Notion Press
6. Dr. Rajiv Kumar Jain, Dr. Usha Jain, Life Skills (Paperback English) Publisher : Vayu Education of India, 2014

Online Learning Resources:

1. https://youtu.be/DUIsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q
2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHIsQFwJZeI_j2PUy0pwjVUgj7KlJ

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3. https://youtu.be/-Y-R9hDI7IU
4. https://youtu.be/gkLsn4ddmTs
5. https://youtu.be/2bf9K2rRWwo
6. https://youtu.be/FchfE3c2jzc
7. https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/
8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview
9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview

ASSESSMENT:

This is a mandatory course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation

- Assessment by faculty mentor: 10 m
- Self-assessment: 10 marks
- Assessment by peers: 10 marks
- Socially relevant project/Group Activities/Assignments: 20 marks
- Semester End Examination: 50 marks
- The overall pass percentage is 40%.In case the student fails , he/she must repeat the course

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HS 23ESX08 Design Thinking & Innovations 3 0 0 3

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

Code	Course Outcomes	DoK PO1	DoK PO2	DoK
23ESX08.1	Explain the fundamentals of Design Thinking and innovation .	3	2	L1 – L4
23ESX08.2	Emphatize and Analyze the model action plan in implementing the process in driving innovations	3	2	L1 – L4
23ESX08.3	Evaluate the value of creativity & Analyse to work in a multidisciplinary environment	3	2	L1 - L4
23ESX08.4	Describe the principles of innovation and idea generation in product design	3	2	L1 – L4
23ESX08.5	Formulate specific problem statements of real time issues	3	3	L1 – L4

All the COs are mapped to PO12 as few self-learned topics are inbuilt in syllabus (italic) promoting autonomous learning

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 **COs: CO1**

Self learning topic

Unit II: Design Thinking Process **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, brainstorming, product development

Activity: Every student presents their idea in three minutes, Every student can present design process in the form of flow diagram or flow chart etc. Every student should explain about product development. **COs: CO2**

Self Learning Topic:

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.

Activity: Debate on innovation and creativity, Flow and planning from idea to innovation, Debate on value-based innovation. **COs: CO3**

Self Learning Topic

Unit IV: Product Design **9 Hours**

Problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications- Innovation towards product design- Case studies

Activity: Importance of modelling, how to set specifications, Explaining their own product design. **COs: CO4**

Self Learning Topic:

Unit V: Design Thinking in Business Processes **9 Hours**

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles that redefine business – Business challenges: Growth, Predictability, Change, Maintaining Relevance, Extreme competition, Standardization. Design thinking to meet corporate needs- Design thinking for Startups- Defining and testing Business Models and Business Cases- Developing & testing prototypes. **COs: CO5**

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Activity: How to market our own product, About maintenance, Reliability and plan for startup

Self Learning

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Approved in : ACM No. VIII			
Expert talk (To be delivered by SMEs from industries)		**COs**	**POs**
1	Design Thinking-Overview	CO1-CO5	PO2, PO3
2	Success Stories of Companies benefited from Design Innovations	CO5	PO2, PO3

Textbooks:

1. Tim Brown,Change by design, Harper Bollins (2009)
2. Idris Mootee, Design Thinking for Strategic Innovation, 2013, John Wiley & Sons.

Reference Books:

1. David Lee, Design Thinking in the Classroom, Ulysses press
2. Shrutin N Shetty, Design the Future, Norton Press
3. William Lidwell,Universal Principles of Design- Kritinaholden, Jill Butter.
4. Chesbrough.H, The Era of Open Innovation – 2013

Online Learning Resources:

https://nptel.ac.in/courses/110/106/110106124/
https://nptel.ac.in/courses/109/104/109104109/
https://swayam.gov.in/nd1_noc19_mg60/preview

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	15	15
L2	55	55
L3	20	20
L4	10	10
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What do you mean by Design Thinking?
2. What are the tools of design Thinknig?
3. What are the new materials in the industry?

L2: Understand

1. Explain the elements of Design
2. Differentiate between innovation and creativity
3. Why new materials are important for industry?

L3: Apply

1. How design thinking helped financial sector to gain the customer trust?
2. Explain the method of implementing Design thinking process driving inventions

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3. What are some contemporary examples of design thinking in action.

L4: Analyze

1. How can organizations capture and evaluate the value of creativity in their design innovations?
2. Evaluate the impact and value of creativityin the context of design innovations?

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SOC 23SOC19 Computer Aided Analysis and Design 0 0 0 2

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

Code	Course Outcomes
23SOC19.1	Proficiently use industry-standard CAD software tools (such as AutoCAD, SolidWorks) to create detailed 2D and 3D models, apply geometric constraints, and develop complex assemblies..
23SOC19.2	Interpret results from finite element analysis (FEA) simulations using software like ANSYS.
23SOC19.3	Apply design optimization techniques and integrate CAD and CAE tools to validate and improve engineering design

Min. 60 Hours

Module 1: Introduction to Computer Aided Design (8 hours)

- Overview of CAD Systems: Introduction to CAD systems, history, and evolution.
- Benefits and Applications: Benefits of CAD in various industries, applications in design and manufacturing.
- CAD Software Introduction: Overview of popular CAD software (AutoCAD, SolidWorks).

Module 2: Basic CAD Modeling Techniques (12 hours)

- 2D Sketching and Drawing: Basics of 2D sketching, drawing tools, and techniques.
- Geometric Constraints and Dimensions: Applying constraints and dimensions to 2D sketches.
- 3D Modeling Concepts: Introduction to 3D modeling, creating and editing 3D models.
- Practice Sessions: Hands-on practice with CAD software to create basic models.

Module 3: Advanced CAD Modeling (16 hours)

- Surface Modeling: Techniques for creating complex surface models.
- Assembly Modeling: Building assemblies from individual parts.
- Feature-Based Modeling: Using features to create complex geometries.
- Parametric Design: Introduction to parametric modeling and design.
- Practice Sessions: Advanced modeling exercises with CAD software.

Module 4: Computer Aided Analysis (16 hours)

- Finite Element Analysis (FEA): Introduction to FEA, types of analysis (structural, thermal, fluid).
- Setting Up FEA Models: Creating FEA models, defining material properties, and boundary conditions.
- Meshing Techniques: Mesh generation and refinement techniques.
- Running Simulations: Performing simulations and interpreting results.
- Practice Sessions: Hands-on practice with FEA software.

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Module 5: Integration of CAD and CAE (8 hours)

- Computer-Aided Engineering (CAE): Overview of CAE and its integration with CAD.
- CAD-CAE Integration Workflow: Steps for integrating CAD and CAE tools.
- Data Transfer: Techniques for transferring data between CAD and CAE software.

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SOC 23SOC21 3-D Printing

0 0 0 2

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

Code	Course Outcomes
23SOC21.1	Acquire knowledge and skills related to 3D printing technologies and the selection of material, equipment and development of a product for Industry 4.0
23SOC21.2	Understand the various software tools, process and techniques for digital manufacturing.
23SOC21.3	Apply these techniques into various applications

Min. 60 Hours

Introduction, Process, Classifications, Advantages, Additive v/s Conventional, Manufacturing processes, Applications. CAD for Additive Manufacturing , CAD DESIGN Data formats, Data translation, Data loss, STL format. Additive Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology, Process, Process parameter-Process Selection for various applications-Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools -Polymers, Metals, Non-Metals, Ceramics Process, Process parameter, Process Selection for Various applications. Various forms of raw material- Liquid, Solid, Wire, Powder-Powder Preparation and their desired properties, Polymers and their properties, Support Materials, Process Equipment- Design and process parameters, Common faults and troubleshooting, AM Process Design, Processing: Requirement and Techniques Support Removal, Sanding, Acetone treatment, polishing, Inspection and testing - Defects and their causes

Practicals:

- 3D Modelling of a single component. Assembly of CAD modelled Components
- Exercise on CAD Data Exchange.
- Generation of .stl files.
- Identification of a product for Additive Manufacturing and its process plan.
- Printing of identified product on an available AM machine.
- Post processing of additively manufactured product.
- Inspection and defect analysis of the additively manufactured product.
- Comparison of Digital fabrication / Additively manufactured products 3D printed via CAD model & 3D Scan Model Design optimization etc.

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HO 23CEH01 Cognitive Management of IoT for Smart Cities 3 0 0 3

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

Code	Course Outcomes
23CEH01.1	Understand the system of smart materials implemented in structures
23CEH01.2	Understand the techniques and its implementation.
23CEH01.3	Understand the concepts of Internet of Things and to Know basic communication protocols in IoT
23CEH01.4	Develop planning, scheduling of development activities.
23CEH01.5	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 Electrostrictive Material – Magnetostructure Material – Shape Memory Alloys – Electro orheological Fluids– Electro magnetic 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 & leveling, 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.

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)

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HO 23CEH02 Energy Efficient Buildings 3 0 0 3

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

Code	Course Outcomes
23CEH02.1	Describe awareness among stakeholders and promote green agenda and green initiatives in theirworking environments leading to green movement.
23CEH02.2	Recognize objectives of green building and roads
23CEH02.3	Understand and know the utility of solar energy in buildings and know about Green composites in buildings
23CEH02.4	Understand the Urban environment and Green Buildings
23CEH02.5	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.Management of 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

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. Robert Bent, "Energy: Science, Policy, and the Pursuit of Sustainability", ISBN13:9781559639118, ISBN10: 1559639113, Island Press, 2002
3. Jagadish K. S., Venkataramareddy B. U. and Nanjundarao K. S., "Alternative BuildingMaterials and Technologies", New Age International, 2014

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1. https://nptel.ac.in/courses/105/102/105102175/
2. https://pdf4pro.com/view/lecture-notes-on-energy-efficiency-in-building-construction-4923d1.html

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HO 23CEH03 Structural Health Monitoring 3 0 0 3

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

Code	Course Outcomes
23CEH03.1	Diagnose the distress in the structure understanding the causes and factors
23CEH03.2	Assess the health of structure using static field methods
23CEH03.3	Assess the health of structure using dynamic field tests
23CEH03.4	Suggest repairs and rehabilitation measures of the structure
23CEH03.5	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

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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

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HO 23CEH04 Structural failure Protection Using AI **3 0 0 3**

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

Code	Course Outcomes
23CEH02.1	Diagnose the distress in the structure understanding the causes and factors
23CEH02.2	Assess the health of structure using static field methods
23CEH02.3	Assess the health of structure using dynamic field tests
23CEH02.4	Explore the Neural Networks and its functioning
23CEH02.5	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

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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

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HO 23CEH05 Architecture and Town Planning 3 0 0 3

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

Code	Course Outcomes
23CEH05.1	Gain knowledge of design elements of architecture
23CEH05.2	Review the industrial revolution
23CEH05.3	Understand the concepts of town planning
23CEH05.4	Apply the general principles and techniques of town planning
23CEH05.5	Understand the town planning standards and technique

Unit I: Elements and Principles 9 Hours

Elements of Design: Line direction. Shape, size, texture, value and colour, balance, scale and proportion.
Principles of Design: Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 D compositions.

Unit II: The Industrial Revolution 9 Hours

The Industrial Revolution: The age of revivals, the emergence of engineer, new materials and techniques and the evolution of balloon frame and steel frame.
Origin of Modern Architecture: definition and concept of modern architecture, various pioneers of modern architecture.

Unit III: Town Planning 9 Hours

Definition and meaning, age of planning, scope and motives of planning, brief history of town planning, its origin and growth, historically development of town planning in ancient valley civilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planning New Concepts: Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburm, La-cite industrille, Radiant city to present day planning.

Unit IV: Planning Principles 9 Hours

Types of town and their functions, types of town planning – Grid Iron, Radial,Spider webs, Irregular and Mixed, their advantages and disadvantages.

Unit V: Planning Practice and Techniques 9 Hours

Zoning – its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan – Meaning, preparation and realization, the scope of city planning – cityrehabilitation and slum clearance.

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,"Urban Planning Problems" Board Hill, London,1974
2. Sundaram, K. V., "Urban and Regional Planning in India", Vikas Publishing House Pvt. Ltd., New Delhi, 2000
3. Gallion, A. B. and Eisner, S., "The Urban Pattern" Van Nostrandreinhold, New York, 1993

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1. NPTEL :: Architecture - NOC:Introduction to Urban Planning
2. NPTEL :: Architecture - NOC:Housing Policy & Planning
3. Architecture and Town Planning lectures - Bing

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HO 23CEH06 Safety Analysis and Risk Management 3 0 0 3

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

Code	Course Outcomes
23CEH02.1	Gain knowledge in devising safety policy and procedures to be adopted to implement total safety in a plant
23CEH02.2	Become a skilled person in hazopard hazarel analysis and able to find out the root cause of an accident
23CEH02.3	Illustrate how to handle the risk and analyzing the consequences.
23CEH02.4	Analyze the consequence of risk.
23CEH02.5	Manage the safety activities in the construction Industry with various case studies.

Unit I: Concepts of safety 9 Hours

Hazard classification chemical, physical, mechanical, ergonomics, biological and noise hazards – Hazards from utilities like air, water, steam.

Unit II: Hazard identification 9 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 9 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 9 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 9 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.

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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**

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HO 23CEH07 Intelligent Transportation Networks 3 0 0 3

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

Code	Course Outcomes
23CEH07.1	Understand ITS, AVL& GIS
23CEH07.2	Understand ITS Systems and TMC
23CEH07.3	Understand ATMS,ATIS and CVO New technologies AVCS, APTS and ARTS
23CEH07.4	Explain the Advanced Transportation Management System
23CEH07.5	Summarize ITS issues in terms of various factors and emerging issues

Unit I: Introduction to Intelligent Transportation Systems (ITS) **9 Hours**

Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

Unit II: Telecommunications in ITS **9 Hours**

Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Vehicle – Road side communication – Vehicle Positioning System.

Unit III: ITS functional areas **9 Hours**

Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced RuralTransportation Systems (ARTS).

Unit IV: ITS User Needs and Services **9 Hours**

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

Unit V: ITS Applications **9 Hours**

Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developedcountries, ITS in developing countries

Text Books

1. Kan Paul Chen, JohnMiles, "ITS Hand Book 2000: Recommendations for World Road Association (PIARC)"
2. Sussman, J. M., "Perspective on ITS, Artech House Publishers", 2005
3. US Department of Transportation, "National ITS Architecture Documentation", (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)

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HO 23CEH08 Building Information Modeling 3 0 0 3

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

Code	Course Outcomes
23CEH03.1	Specify the components and systems, by design process to the engineers and contractors
23CEH03.2	Make use of BIM tools for analyzing
23CEH03.3	Be able to plan the use of BIM in building projects and provide the right level of detail.
23CEH03.4	Be able to comply legal and project collaboration requirements
23CEH03.5	Provide the total analysis in a report manner

Unit I: Introduction 9 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 9 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 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 IV: Miscellaneous 9 Hours

Miscellaneous Applications of BIM Cost Estimating - Energy Modelling - Conflicts/Interference checking - Future of BIM

Unit V : Report Writing 9 Hours

Submission of the output compiled by the Software

Text Books

1. 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

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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.

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HO 23CEH09 Traffic Engineering and Management 3 0 0 3

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

Code	Course Outcomes
23CEH09.1	Carry out traffic surveys
23CEH09.2	Implement traffic system management
23CEH09.3	Carry out intersection design for safety
23CEH09.4	Record and analyse accident data and suggest counter measures
23CEH09.5	Carry out road safety audit

Unit I: Traffic Stream Characteristics 9 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 9 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 9 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 9 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. Roadway lighting.

Unit V: Road Safety Audit 9 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 Transportation Planning", 3rd Edition, Khanna Publishers, 2004
2. Mannering and Kilareski, "Highway Engineering and Traffic Analysis", 3rd Edition, John Wiley Publications, 2007
3. Roger P. Roess, Elena S. Prassas, William R. Mc Shane, "Traffic Engineering", 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, Truls Vaa and Michael Sorensen, "The Handbook of Road Safety Measures", Emerald Group Publishing Limited, 2009
5. ITE, Highway Safety Manual, ITE, 2010

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1. https://nptel.ac.in/courses/105/101/105101008/
2. https://www.youtube.com/watch?v=5zKC_aq4ypM&list=PLI_6Sjd3m1Meef4k2EpO7q2K-bsTWGa1M

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23CEH10 Structural Health Monitoring using IoT

3 0 0 3

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

Code	Course Outcomes
23CEH04.1	Diagnose the distress in the structure understanding the causes and factors
23CEH04.2	Assess the health of structure using static field methods
23CEH04.3	Assess the health of structure using dynamic field tests
23CEH04.4	Suggest repairs and rehabilitation measures of the structure
23CEH04.5	Understand the concepts of Internet of Things and to Know basic communication protocols in IoT

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 : 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.

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

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HO 23CEH11 GIS and Remote Sensing 3 0 0 3

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

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO4	
23CEH11.1	Understand the basic principles of Remote Sensing and GIS techniques	3	2	3	L1, L2
23CEH11.2	Understand the types of sensors and platforms	3	2	2	L1, L2
23CEH11.3	Understand the concepts of visual and digital image analyses	3	2	3	L1, L2
23CEH11.4	Understand the principles of spatial analysis	3	2	2	L1, L2
23CEH11.5	Understand theapplication of RS and GIS to Civil Engineering	3	2	3	L1, L2

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

UnitI: Fundamental Of Remote Sensing 9 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 9 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 9 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 9 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 9 Hours

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.

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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.

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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

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HO 23CEH12 Disaster Risk Mitigation **3 0 0 3**

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

Code	Course Outcomes	Mapping with POs				DoK
		PO3	PO6	PO7	PO12	
23CEH12.1	Identify various types of natural disasters, their causes, effects & mitigation measures	2	3	3	1	L1,L2
23CEH12.2	Identify various types of man made disasters, their causes, effects	3	3	3	1	L1, L2
23CEH12.3	Demonstrate the understanding of various phases of disaster management cycle and createvulnerability and risk maps.	2	3	3	1	L2,L3
23CEH12.4	Understand the use of emergency management system to tackle the problems	3	3	3	1	L2, L3
23CEH12.5	To be in a position to provide the first line response in times of disaster.	2	3	3	1	L2, L3

1: Weakly Contributing | 2: Moderately Contributing | 3: Strongly Contributing

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create

UNIT I: Natural Disasters **09 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: **09 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: **09 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: **09 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: **09 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, PargatishilProkashak,Kolkata.

Reference books

1. Sahni, P., 2002. Disaster Mitigation Experiences and Reflections, Prentice Hall of India , 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

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MI 23CEO01 Environmental Pollution and Control

3 0 0 3
Version 01.00

Pre-requisite: Environmental science and sustainability

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

Code	Course Outcomes	Mapping with POs			DoK
		PO3	PO4	PO7	
23CEO04.1	Understand the basic ideology on human and environment relationship	1	2	3	L1, L2
23CEO04.2	Understand the concept of pollution control and monitoring	2	3	3	L1, L2
23CEO04.3	Apply the waste management rules and methods for controlling pollution	1	2	3	L1, L2
23CEO04.4	Use the applications of EIA in developmental projects	2	3	3	L1, L2
23CEO04.5	Know the regulations to control environmental degradation	3	3	3	L1, L2
23CEO04.6	Know the policies to control environmental degradation	3	3	3	L1, L2

All the COs are by default mapped to PO12 as few topics are inbuilt in syllabus promoting autonomous learning

Unit I: Human communities and Environment **09 hours**

Human population growth - Impacts on Environment, human health and welfare, resettlement and rehabilitation of project affected persons, Types of life supporting systems, Disaster management - Floods, earthquakes, cyclones and landslides. Environmental movements - Chipko, silent valley, Bishnoi's of Rajasthan, Role of Indian and other religious and cultures in environment conservation, communication and public awareness **COs: CO1**

Risk mitigation, Ecology and ecosystem

Unit II: Pollution monitoring and control **09 hours**

Quality standards of air, water and soil, Types of air pollutants, methods for monitoring and control of air, water and soil pollution, effects of pollution on plants, animals and human being, Effects and control of noise pollution, noise levels. **COs: CO2**

CPCB, MoEF , Pollution control

Unit III: Solid waste Management **09 hours**

Definition, types, sources, Solid waste generation, collection, segregation, storage, transport and disposal Effects of poor solid waste management, protective measures and municipal solid waste management rules 2016 **COs: CO3**

E-waste, Plastic waste, biological waste

Unit IV: EIA **09 hours**

Definition, scope, Procedure, Public involvement, EIA Methodologies - Ad hoc, Matrices, Networking, Overlays, Cost benefit analysis, Environmental management planning, Applications of EIA in developmental projects and Environment **COs: CO4**

EIS, EMP

Unit V: Environmental laws and policy **09 hours**

Article 48 A, Article 51A, Forest act 1865, The air act 1981, The water act 1974, EPA 1986, The motor vehicle act 1988, The biological diversity act 2002, noise pollution rules 2000, Role of MoEF and CPCB, Stockholm conference 1972, Rio de Janeiro, Montreal protocol 1987, Kyoto protocol 1997 **COs: CO5**

Pollution monitoring and control

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Approved in : ACM No. IX

Expert talk (To be delivered by SMEs from industries)		COs	POs
1	Applications of EIA in the project development	CO #4	PO #3, PO #4, PO #7
2	Know the policies to control environmental degradation	CO #6	PO #3, PO #4, PO #7

Textbooks

1. H S Bhatia, Environmental pollution control, 1st Edition, JDM Publishers & Distributors, 2022.
2. Gilbert M Masters, Introduction to Environmental Engineering and Science, 3rd Edition, Pearson Education India, 2015.
3. CS Rao, Environmental pollution Control Engineering, 3rd Edition, New age international publishers, 2018.

Reference Books

1. Santosh Kumar Garg, Sewage disposal and air pollution Engineering, Volume 2, 41st Edition, Khanna publications, 1979.
2. Debapriya De & Debasish De, Fundamentals of Environment and Ecology, 2nd Edition, S. Chand publications, 2023.

Web References

1. https://byjus.com/biology/solid-waste-management/#:~:text=Municipal%20solid%20waste%20can%20further,%2C%20bulb%2C%20batteries%2C%20etc.
2. https://gmch.gov.in/sites/default/files/documents/Solid%20Waste%20Management.pdf
3. https://www.iitr.ac.in/wfw/web_ua_water_for_welfare/education/Teachers_Manual/Teacher_manual_master_EIA.pdf
4. **https://iced.cag.gov.in/?page_id=256**

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 Disaster management
2. List the types of air pollutants
3. Recall the concept of pollution monitoring and control

L2: Understand

1. Explain the consequences and control measures for earthquakes and cyclones
2. Discuss the concept of EIA and explain the criteria for selecting EIA methods
3. write a brief note on
    a. EPA 1986
    b. Role of MoEF and CPCB

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MI 23CEO02 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 — 09 hours

Definition of air pollution, Sources and causes of air pollution, Types and classification of air pollution - Natural contaminants, Particulate, Gases and Vapours, Primary and secondary air pollutants — COs: CO1

Unit II: Meteorology — 09 hours

General atmospheric circulation, Atmospheric stability, Effect of meteorology on Plume dispersion, Inversion, Wind profiles and stack plume patterns — COs: CO2

Unit III: Effects of Air Pollution — 09 hours

Effects of air pollution on human beings, plants and animals and properties. Global effects-Greenhouse effect, Ozone depletion, heat island, dust storms, Automobile pollution sources and control, Photochemical smog — COs: CO3

Unit IV: Air Pollution Control — 09 hours

Particulate matter and gaseous pollutants - Settling chambers, Cyclone separators, Scrubbers, Filters & Electrostatic precipitator — COs: CO4, CO5

Unit V: Air Quality Sampling and Monitoring — 09 hours

Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants — COs: CO6

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Approved in : ACM No. VI

Expert talk (To be delivered by SMEs from industries) COs POs

1
2

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

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MI 23CEO03 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 for securing 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

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MI 23CEO04 Sustainability and pollution prevention practices 3 0 0 3

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

Code	Course Outcomes	Mapping with POs				DoK
		PO2	PO3	PO4	PO5	
20CEM03.1	Concept of sustainability and its goals	3	3	3	3	L1,L2
20CEM03.2	Sources and effects of environmental pollution	3	3	3	2	L1, L2
20CEM03.3	Identify the prevention measures for environmental protection	2	3	3	2	L2,L3
20CEM03.4	Approach for analysis and assessment of developmental activities and their impacts on environment	3	3	3	3	L2, L3
20CEM03.5	Objevtives and components of environmental management	2	3	3	2	L2, L3

DoK- Depth of Knowledge

Unit -1 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 -2 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-3 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-4 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-5 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,2009,Improving the Sustainable Development Goals: Strategies and the Governance Challenge
2. Herman KorenBest Practices for Environmental Health: Environmental Pollution, Protection, Quality and Sustainability, 21 April 2017
3. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
4. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.

Reference Books

1. Environmental Chemistry - A.K. De, New Age Int. Pub. Co., New Delhi, 1990
2. Toxic Chemicals, health and the Environment, Lave, L.B and Upton, A.C. 1987. The Hopkins Press Ltd., London.
3. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.

Web References

https://en.unesco.org
2. http://mcic.ca
3. https://www.drishtiias.com
https://www.oecd.org

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4. https://www.jica.go.jp
https://p2infohouse.org

Internal Assessment Pattern

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

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