NSRIT

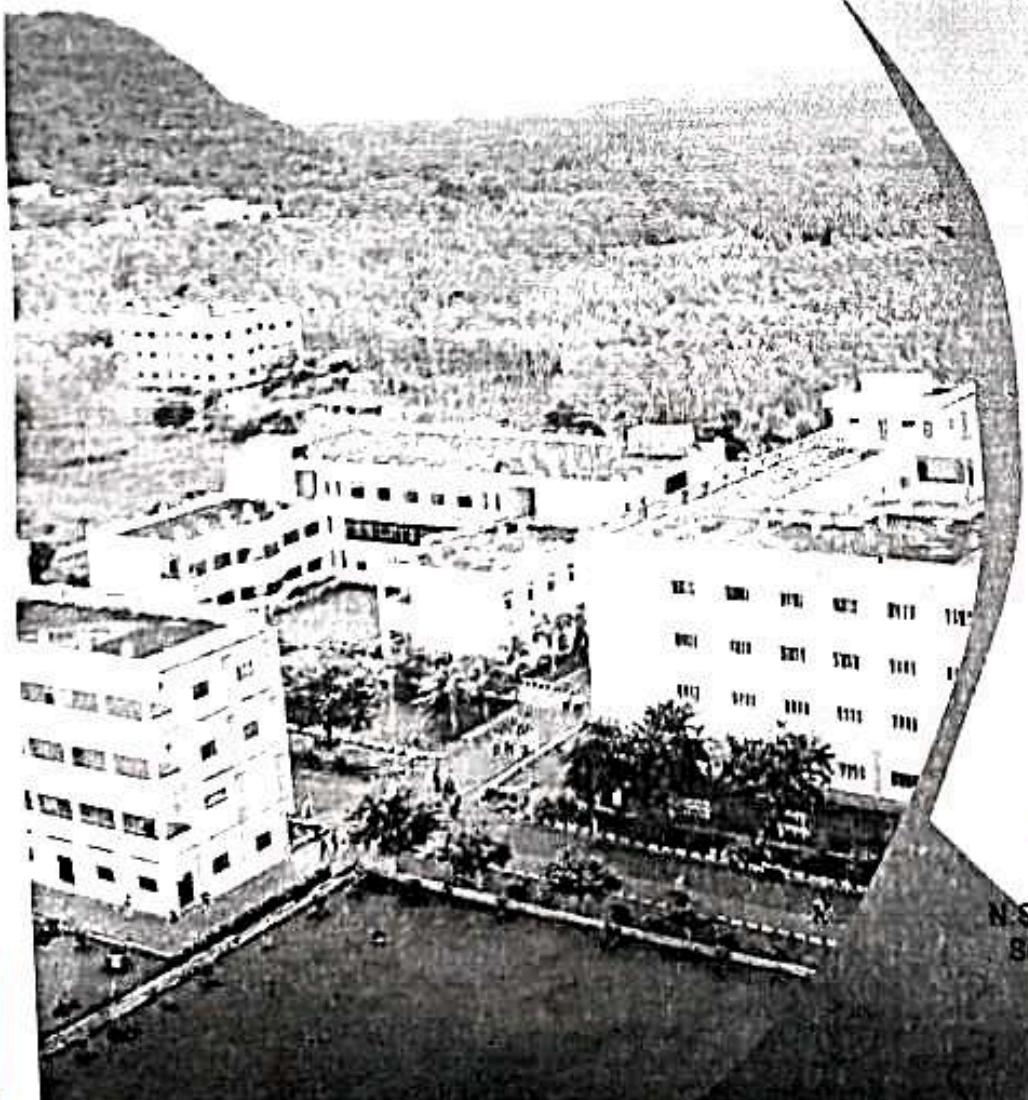
AUTONOMOUS

ACADEMIC RULES & REGULATIONS

2020

U. G. PROGRAMS

www.nsrit.edu.in



Pg No.- 168 to 265

Head of the Depar
Dept. of Civil
N.S. Raju Institute o
Sontyam, Visak

NSRIT

AUTONOMOUS

ACADEMIC RULES & REGULATIONS

2020

U. G. PROGRAMS

www.nsrit.edu.in

Academic Rules and Regulations

2020

Undergraduate Programs

Choice Based Credit & Semester System (CBCSS)

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

Contents

1. Preliminary Definitions and Nomenclature…… iv
2. Eligibility for Admission…… iv
3. Duration and Medium of Instruction of the Program…… iv
4. Program of Study…….. v
5. Structure of Programs…….. v
   - 5.1. Categorization of Courses……... v
   - 5.2. Nomenclature of Credit Distribution…… vi
   - 5.3. Structure of Curriculum…… vi
   - 5.4. Credit Distribution for each Category…… vi
   - 5.5. Assessment Pattern for Courses…… vii
   - 5.6. Internship…… vii
   - 5.7. Project Work…….. vii
   - 5.8. Statutory Mandatory Course and Audit Courses…….. viii
   - 5.9. MOOCs, Self Study Courses and Choice Based Semester System…… viii
   - 5.10. Industry Supported Courses…… viii
   - 5.11. Semester Away Program to Promote Multi-disciplinary Skills…… ix
   - 5.12. Procedure for Awarding Marks for Continuous Assessment…….. ix
6. Attendance Finalization and Result Declaration……... xi
7. Promotion Policies…… xi
8. Eligibility for the Award of the Degree…… xii
9. Award of Grades…… xii
10. Classification of the Degree Awarded…… xii
11. Flexibility to Add or Drop Self Study Courses…….. xiii
12. Withdrawal from the Examination…….. xiii
13. Transitory Regulations…… xiv
14. B. Tech. (Honors)…….. xv
15. B. Tech. (Minor with Specialization)…… xv
16. Temporary Break of Study from the Program…… xv
17. Revision of the Academic Calendar…… xvi
18. Representation of Special Cases…… xvi

The Vision

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

The Mission

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

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

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

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

1. Preliminary Definitions and Nomenclature

In this regulation, unless the context otherwise requires:

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

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

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

d. "**University**" means Jawaharla Nehru Technological University Kakinada (JNTUK, Kakinada)

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

2. Eligibility for Admission

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

2.2. With regard to the students admitted through Lateral Entry Scheme, the students shall be admitted directly into semester III of the second year of B. Tech. programs. Under this scheme 10% seats of the sanctioned intake will be available in each program of study as supernumerary seats. Admissions to this three 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 six consecutive academic years from the date of joining

3. Duration and Medium of Instruction of the Program

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

Tech. program during the above said extended duration shall forfeit the degree in B. Tech. program of study. The medium of instruction during the program of study is English.

Academic Calendar: As already mentioned, each academic year will have two semesters. Each academic year, an academic calendar will be issued by the Office of the Controller of Examinations (CoE) indicating the duration of instruction period, mid-term tests, semester-end examinations, practical examinations and eventually evaluation. Normally each semester will have sixteen weeks of instruction, one week of practical examinations and three to four weeks for descriptive examinations. In total, each semester will span for a maximum duration of 16 – 19 weeks.

4. Programs of Study

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

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

5. Structure of Programs

5.1. Categorization of Courses

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

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

5.2. Nomenclature of Credit Distribution

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

5.3. Structure of Curriculum

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

5.4. Credit Distribution for each Category

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

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

5.5. Assessment Pattern for the Courses

With the true spirit of implementing Outcome Based Education (OBE), each course is designed with customized assessment pattern addressing the various cognitive levels of Revised Bloom's Taxonomy (RBT) with appropriate proportion covering the breadth and depth of the courses. The percentage of various conginitve levels of RBT pertaining to each course is indicated in the syllabus to enable the examiner to develop the assessment instrument in the form of question paper to measure the attainment of course outcomes (COs) that contributes to the attainment of Program Outcomes (POs).The question papers shall be designed with a combination of short answer (40% may be from self study topics) and long answer questions or MCQ that fits best to the assessment. With regard to the assessment pattern for the skill oriented courses, appropriate assessment instrument shall be developed by the respective department that suits to assess the skills that are expected from the courses by taking approval from the competent authority of the Institution before deploying for assessment.

5.6. Internship

As per the guidelines specified in these regulations, each student is expected to undergo internship in the form of summer and Full Semester Internship (FSI) during the program of study and it is mandate for all the students. The curriculum offers two summer internships i.e., one at the end of second year and the other one is at the end of third year of study; each one spans for a duration of six weeks. With regard to the FSI, the curriculum provides flexibility at two different slots during VII and VIII semesters with a span of 12 weeks – 16 weeks. The students who are opting FSI either during semester VII or VIII shall register for the course during the semester V through the Head of the department and the same shall be forwarded to the Office of Controller of Examination (CoE) and Internship Cell. To ensure effective implementation of FSI, the Institute shall depute 50% of the interns during semester VII and the rest during semester VIII. Accordingly, the courses pertaining to the semesters shall be inter-changed. The students who are opting for FSI in semester VIIIshall be permitted to take up the capstone projectat the industries along with the FSI in the same industry,if he/she is interested and submit a separate report along with internship/training report. Students will be evaluated by a panel of internal and external subject matter experts (SMEs) nominated by the Office of the CoE.

5.7. Project Work

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

who opted FSI in the semester VII shall take up the courses as precirbed in the curriculum during semester VIII along with the capstone project.

5.8. Statutory Mandatory Courses and Audit Courses

Mandatory courses are those courses which are designed 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 conitnuos assessment as well as fulfilling the attendance requirement. A minimum of 40% of marks (average of two continuous assessment) is required to complete the course and the status of completion will be indicated in the grade memo. In addition to the above, the curriculum provides flexibility to nurture employability skills through audit courses and it mandatory for all students to complete the audit courses for the award of the degree and it will not be counted for the calculation of CGPA.

5.9. MOOCs and Self Study Courses

The Curriculum provides adequate flexibility for the students to take up MOOCs through self-study mode enabling them to learn the courses on independent mode with minimal guidance of faculty mentor to earn credits for the award of the degree B. Tech. (Regular) and B. Tech. (Honors & Minor with specialization) and the attendance is not mandatory. The courses shall be opted from MOOCs platform viz. NPTEL, SWAYAM or any other platforms as approved by the respective Board of Studies (BoS). The evaluation and assessment pattern for such courses which are part of the curriculum for the B. Tech. (Regular) Degree shall be carried out as similar to other regular theory courses. However, the evaluation and assessment of MOOCs for B. Tech. (Honors) and B. Tech. (Minor with speciliazation) shall be inline with the agencies or the platforms offering these courses. Further, if the grade is not specified by the particular agency or platform, the office of CoE shall follow the institutional SOP for the award of the grade and take necessary approval from the Academic Council through circulation. MOOCs shall be identified by the respective department taking necessary approval from the BoS and shall be intimated well in advance to the students. Futher, in case, if the student is preferred to undergo Semester Away Programme as per Clause 5.11 during semester VII, the credits earned through self-study courses shall be compensated for the calculation of CGPA. This semester away program provides flexibility to the students to select the semester VII either with regular courses as specified in the curriculum or with the semester away program.

5.10. Industry Supported Courses

a. Students can opt for one-credit courses, offered by experts from industry/research organizations which are approved by academic council. Students can register such coursesfrom his/her second year of study as and when these courses are conducted by various departments. A student is also permitted to register for the courses of other departments, provided the student has fulfilled the necessary pre-requisites of the course being offered andsubject to the approval of both the Heads of Departments. There is no limit to the number of one credit or two credit courses a student can register during the programme of study. However, a student can register for only one course in a semester. These courses are evaluated by the respective course coordinator of the programme. The

maximum number of credits that can be earned from industry supported courses is limited to four

b. If a student does not successfully complete the registered industry supported one- credit or two credit courses in a semester, the registration of that course will be considered as cancelled. Further, it will not be treated as arrear and no supplementary examination will be conducted; alternatively, if he/she wishes, he/she can re-register for the same course in the ensuing semesters and successfully complete it as and when it is offered subsequently
c. The credits earned through these courses will be treated over and above the credit requirement for the award of the B. Tech. (Regular, Honours and Minor with specialization) programs

5.11. Semester Away Programme (SAP) to Promote Multi-disciplinary Skills (Choice Based Semester System): The interested students can have the option of undergoing Semester Away Programme leveraging Choice Based Semester System during semester VII with Higher Learning Institutions at Foreign Countries or Institutions of National Repute or Research Organizations in India, by earning necessary equivalent credits in the semester VII through course study, projects or whatever terms and conditions as prescribed by the respective organization.In addition to the above, the students can opt a combination of 1-, 2-, 3-, 4-credit courses to compensate the credits required for semester VII on self study mode in case of shortage of credits.The students who are interested to opt for SAP shall register to the office of CoE during the beginning of semester III and initiate self-study mode for futuristic compensation of credits. The registration for this SAP is valid as long as the students maintain 7.5 CGPA in all semesters with no history of arrears. Incase, if the student fails to register during the above said period, he/she may register for the same by taking prior permission from the respective Head of the Department. Further, the students are encouraged to opt inter-disciplinary courses of their interest (need not be in the area of the program of study). The Controller of Examinations shall ensure that necessary approvals are taken from the Academic Council well before the time period of their SAP. In case of any uncertain circumstances, if the student fails to complete SAP, the registration will be cancelled automatically and he/she can earn the credits required for that particular semester through self-study mode.

5.12. Procedure for Awarding Marks for Continuous Assessment

Theory (Internal: 30 Marks | External 70 Marks)

Continuous Internal Examination #1 and #2

Descriptive Examination	: 20 Marks
Objetive Type Examination	: 05 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

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

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

There shall be two internal tests in a semester for 15 marks each and final marks will be calculated by considering 80% of marks secured in the best of the two internal tests and 20% marks secured in the other internal test. The marks obtained will be added to the marks secured during the continuous assessment process.

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	: 20 Marks (Presentation)
Report	: 30 Marks

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

Skill Oriented Courses (Internal: 50 Marks)

Interim Assessment and Report Writing	: 20 Marks
Outcomes	: 20 Marks
Final Presentation	: 10 Marks

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

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

Distribution of Marks (Continuous Internal Assessment)	
Innovativeness of the Project	: 10 Marks
Literature Survey	: 05 Marks
Experimentation/ Simulation	: 15 Marks
Presentation, Interpretation &	
Analysis of Results	: 20 Marks
Interim Review #1(Presentation)	: 05 Marks

Interim Review #2 (Presentation)	: 05 Marks
Product Development	: 20 Marks
Terminal Presentation	: 10 Marks
Report	: 10 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% (24 and above out of 70 marks) of marks for each course in the semester end examinations Continuous Internal Assessent (CIA) and Semester End Examinations (SEE) and
- A minimum of 40% marks (16 and above out of 30 marks) for each course considering both CIA and SIE taken together

6. Attendance Finalization and Result Declaration

6.1. Procedure

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

6.2. Attendance Requirements and Result Declaration Procedure

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

e. Academic regulations applicable to the semester in which re-admission is sought shall be applicable to the re-admitted student
f. In case if there are any professional electives and/or open electives, the same may also be re-registered if offered by the respective program of study. However, if those electives are not offered in the later semesters, alternatively, the students may opt other electives from the same set of elective courses offered under that category in that particular semester

7. Promotion Policies

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

8. Eligibility for the Award of the Degree

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

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

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

9. Award of Grades

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

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

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

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

10. Classification of the Degree Awarded

a. **B. Tech. (Honors):** In addition to the requirement as cited in (10.c), if the student secures 20 additional credits in accordance with the clause (14), he/she shall be declared with B. Tech. (Honors)
b. **B. Tech. (Minor with Specialization):** In addition to the requirement as cited in (10.c), if the student secures 20 additional credits in accordance with the clause (15), he/she shall be declared with B. Tech. (Minor with Specialization)
c. **B. Tech. (Regular) - First Class with Distintion:** The student who qualifies for the award of the B. Tech. degree in the chosen program of study with 160 credits (Regular) and 121 credits (Lateral) within five consecutive academic years (Considering the formal approval for the break of study from the competent authority) from the date of admission at his/her first attempt maintaining 7.5 CGPA and above shall be declared to have passed in first class with distintion and should not have been prevented from appearing end semester examinations for the want of attendance requirements
d. **B. Tech. (Regular) - First Class:** The student who qualifies for the award of the B. Tech. degree in the chosen program of study with 160 credits (Regular) and 121 credits (Lateral) within four consecutive academic years from the date of admission maintaining 6.75 CGPA and above shall be declared to have passed in first class and should not have been prevented from appearing end semester examinations for the want of attendance requirements
e. **B. Tech. (Regular) - Second Class:** The student who qualifies for the award of the B. Tech. degree in the chosen program of study with 160 credits (Regular) and 121 credits (Lateral) within eight consecutive academic years from the date of admission maintaining 5.75 CGPA and above and less than 6.75 CGPA shall be declared to have passed in second class
f. **B. Tech. (Regular) - Pass:** All other students who have not covered and qualifies for the award of the degree maintaining 5.00 CGPA and above and less than 5.75 CGPA shall be declared to get Pass with minimum credit requirement for the award of the degree in B. Tech. program

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

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

12. Withdrawal from the Examination

a. A candidate may, for valid reasons, be granted permission by the Principal to withdraw from appearing for the examination in any course or courses of only one semester examination during the entire duration of the Degree Programme. Also, only ONE application for withdrawal is permitted for that semester examination in which withdrawal is sought
b. Withdrawal application shall be valid only if the candidate is otherwise eligible to write the examination and if it is made prior to the commencement of the examination in that course or courses and also recommended by the Head of the Department
c. Such withdrawal from the examination shall be treated as absent for the 1st attempt to the respective examination and will lose the eligibility for First Class with Distinction
d. If any student is intended to drop FSI subsequent to his/her registration followed by allotment, he/she needs to re-register the course

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

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

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

Any canddate who is interested to take admission in NSRIT from a non-autonomous engineering institution affiliated to the parent university either in the semester III or thereafter, shall acquire the credits required for graduation as per the Institute autonomous regulations and the candidature shall be treated under following category

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

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

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

be earned on self study mode to compensate the required number of credits. In case of excess credits, it will be treated as over and above.

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

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

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

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

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

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

17. 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.

18. 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.

Civil Engineering

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

The Curriculum design, delivery, and assessment, the three major pillars of academic system is completely aligned in line with Outcome Based Education (OBE) to assess and evaluate the 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	APSCHE	NSRIT (A)
HS	Humanities and Social Science	12.0	10.5	10.5
BS	Basic Science	25.0	18.0	21.0
ES	Engineering Science	24.0	22.5	21.0
PC	Professional Core	48.0	55.5	54.0
PE	Professional Elective	18.0	15.0	15.0
OE	Open Elective	18.0	12.0	12.0
IN	Internship (s), Project & Seminars	15.0	16.5	16.5
SC	Skill Oriented Courses	-	10.0	10.0
MC	Mandatory Courses	-	-	-
AC	Audit Course	-	-	-
	Total no. of credits	160	160	160

Civil Engineering

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

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

No.	Code	Course	POs	Contact Hours				
				L	T*	P	C	
Semester I								
01	20HSX01	Communicative English	10	3	0	0	3.0	HS
02	20BSX11	Linear Algebra and Differential Equations	1, 12[1]	3	1	0	3.0	BS
03	20BSX21	Engineering Chemistry	1	3	0	0	3.0	BS
04	20ESX01	Engineering Drawing	1, 5, 10	1	0	4	3.0	ES
05	20ESX02	Programming for Problem Solving Using 'C'	1	3	0	0	3.0	ES
06	20HSX02	Communicative English Lab	10	0	0	3	1.5	HS
07	20BSX22	Engineering Chemistry Lab	1, 4	0	0	3	1.5	BS
08	20ESX07	Programming for Problem Solving Using 'C' Lab	1, 4	0	0	3	1.5	ES
			Sub-total	13	01	13	**19.5**	
Semester II								
01	20BSX12	Partial Differential Equations and Vector Calculus	1	3	1	0	3.0	BS
02	20BSX31	Engineering Physics	1	3	0	0	3.0	BS
03	20ESX05	Basic Electrical and Electronics Engineering	1	3	1	0	3.0	ES
04	20ESX04	Engineering Mechanics	1	3	1	0	3.0	ES
05	20CE201	Building Materials and Construction Components	2, 5	3	0	0	3.0	ES
06	20BSX32	Engineering Physics Lab	1, 4	0	0	3	1.5	BS
07	20ESX08	Basic Electrical and Electronics Engineering Lab	1, 4	0	0	3	1.5	ES
08	20ESX06	Engineering Workshop	4	0	0	3	1.5	ES
09	20MCX01	Environmental Science	1	2	0	0	-	MC
			Sub-total	17	03	09	**19.5**	
Semester III								
01	20BSX13	Numerical Methods and Transforms	1	3	1	0	3.0	BS
02	20CE302	Building Planning and Drawing	1, 10, PSO 1	3	0	0	3.0	PC
03	20CE303	Surveying	1	3	1	0	3.0	PC
04	20CE304	Strength of Materials	1, PSO 1	3	1	0	3.0	PC
05	20CE305	Fluid Mechanics	1, 3, PSO 2	3	1	0	3.0	PC
06	20CE306	Surveying Lab	5, 10	0	0	3	1.5	PC
07	20CE307	Strength of Materials Lab	1, 4	0	0	3	1.5	PC
08	20CE308	Fluid Mechanics and Hydraulic Machinery Lab	1, 4	0	0	3	1.5	PC
09	20CES01	Computer Aided Building Drawing	5, 10, PSO 1	1	0	2	2.0	SC
10	20MCX02	Constitution of India	-	2	0	0	-	MC
			Sub-total	18	04	11	**21.5**	

*Suggested hours for tutorial

No.	Code	Course	POs	Contact Hours				
				L	T	P	C	
Semester IV								
01	20HSX03	Managerial Economics and Financial Analysis	11	3	0	0	3.0	HS
02	20CE402	Hydraulics and Hydraulic Machinery	1, 3, PSO 2	3	1	0	3.0	ES
03	20CE403	Concrete Technology	1, 2, 6, 8	3	0	0	3.0	PC
04	20CE404	Soil Mechanics	1, 2, 3, 6, PSO 1	3	0	0	3.0	PC
05	20CE405	Construction Project Management	11	3	0	0	3.0	PC
06	20CS407	Python Programming Lab	1	0	0	3	1.5	ES
07	20CE407	Concrete Technology Lab	1, 2, 4	0	0	3	1.5	PC
08	20CE408	Soil Mechanics Lab	1	0	0	3	1.5	PC
09	20CES02	Building Information Modeling Lab	1, 5, 10	1	0	2	2.0	SC
			Sub-total	16	01	11	**21.5**	
Semester V								
01	20CE501	Structural Analysis	1, PSO 1	3	1	0	3.0	PC
02	20CE502	Design of Reinforced Concrete Elements	1, 3, 8, PSO 1	3	1	0	3.0	PC
03	20CE503	Foundation Engineering	1, 3, 6, PSO 1, 2	3	1	0	3.0	PC
04	-	Professional Elective I	-	3	0	0	3.0	PE
05	-	Open Elective I	-	3	0	0	3.0	OE
06	20CE506	Drawing of Reinforced Concrete Structures	1, 3, PSO 1	0	0	3	1.5	PC
07	20CE507	Irrigation Design and Drawing	5, 10, 6, PSO 1, 2	0	0	3	1.5	PC
08	-	MOOCs	12	0	0	0	2.0	SC
09	20MCX03	Intellectual Property Rights and Patents	-	2	0	0	-	MC
10	-	Summer Internship #1[2]	5, 8, 9, 10, PSO 1	0	0	0	1.5	IN
11	-	Technical Paper Writing	-	0	0	2	-	AC
			Sub-total	17	03	08	**21.5**	
Semester VI								
01	20CE601	Transportation Engineering	PSO 2	3	0	0	3.0	PC
02	20CE602	Design of Steel Structures	3, 10, PSO 1	3	1	0	3.0	PC
03	20CE603	Environmental Engineering	2, 3,6, PSO 2	3	0	0	3.0	PC
04	-	Professional Elective II	-	3	0	0	3.0	PE
05	-	Open Elective II	-	3	0	0	3.0	OE
06	20CE606	Detailing and Drawing of Steel Structures	10, PSO 1	0	0	3	1.5	PC
07	20CE607	Transportation Engineering Lab	4, PSO 2	0	0	3	1.5	PC
08	20CE608	Environmental Engineering Lab	4, PSO 2	0	0	3	1.5	PC
09	20CES04	Estimation and Costing	1,11	0	0	4	2.0	SC
10	20MCX04	Indian Traditional Knowledge	-	2	0	0	-	MC
			Sub-total	17	01	13	**21.5**	
Semester VII								
01	-	Professional Elective III	-	3	0	0	3.0	PE
02	-	Professional Elective IV	-	3	0	0	3.0	PE
03	-	Professional Elective V	12	3	0	0	3.0	PE
04	-	Open Elective III	-	3	0	0	3.0	OE
05	-	Open Elective IV	12	3	0	0	3.0	OE
06	20HSX04	Professional Ethics	8	3	0	0	3.0	HS
07	20CES05	Finishing School for Civil Engineering	9, PSO 1	0	0	4	2.0	SC
08	-	Summer Internship #2[2]	5, 8, 9, 10, PSO 1	0	0	0	3.0	IN
			Sub-total	18	0	04	**23.0**	
Semester VIII								
01	-	Full Semester Internship[3]	5-10, PSO 1, PSO 2	0	0	0	06	IN
02	-	Capstone Project[3]	5-10, PSO 1, PSO 2	0	0	0	06	IN
			Sub-total	0	0	0	**12.0**	
			Total Credits	-	-	-	**160**	

[1]By default all courses are mapped to PO 12 as they are weakly contributing

[2] The work pertaining to Summer Internship #1 and #2 shall be completed at the end of Semesters IV and VI respectively. The assessment shall be carried out during Semesters V and VII

[3] The students opting for FSI in VII Semester should take up the courses of VII Semester in VIII Semester

List of Electives

Professional Elective #1								
1	20CE001	Advanced Concrete Technology	-	3	0	0	3.0	PE
2	20CE002	Environmental Geotechnics	-	3	0	0	3.0	PE
3	20CE003	Transportation Planning and Management	-	3	0	0	3.0	PE
4	20CE004	Water Resources Systems Planning and Management	-	3	0	0	3.0	PE
5	20CE005	Construction Equipment Automation	-	3	0	0	3.0	PE
6	20CE006	Harbor Engineering	-	3	0	0	3.0	PE
Professional Elective #2								
7	20CE007	Pre-Stressed Concrete	-	3	0	0	3.0	PE
8	20CE008	Environmental Impact Assessment	-	3	0	0	3.0	PE
9	20CE009	Pavement Analysis and Design	-	3	0	0	3.0	PE
10	20CE010	Urban Hydrology	-	3	0	0	3.0	PE
11	20CE011	Sustainable Construction Methods	-	3	0	0	3.0	PE
12	20CE012	Advanced Structural Analysis	-	3	0	0	3.0	PE
Professional Elective #3								
13	20CE013	Repair and Rehabilitation of Structures	-	3	0	0	3.0	PE
14	20CE014	Solid Waste Management	-	3	0	0	3.0	PE
15	20CE015	Traffic Engineering	-	3	0	0	3.0	PE
16	20CE016	Hydraulic Structures	-	3	0	0	3.0	PE
17	20CE017	Construction Cost Analysis	-	3	0	0	3.0	PE
18	20CE018	Coastal Zone Management	-	3	0	0	3.0	PE
Professional Elective #4								
19	20CE019	Special Concrete	-	3	0	0	3.0	PE
20	20CE020	Hazardous Waste Management	-	3	0	0	3.0	PE
21	20CE021	Urban Transportation Planning	-	3	0	0	3.0	PE
22	20CE022	Hydro Power Engineering	-	3	0	0	3.0	PE
23	20CE023	Safety Engineering	-	3	0	0	3.0	PE
24	20CE024	Ocean Engineering	-	3	0	0	3.0	PE
Professional Elective #5								
The curriculum provides academic flexibility to choose any of the domain specific courses from MOOCs as approved by the respective Board of Studies and Academic Council. The students can take up this course on self-study mode. The course shall be of 45 – 60 hours duration (4-credits) and the assessment shall be as per the academic regulation 2020.								PE
Open Elective #1								
25	20CEO01	Urban Environmental Service	-	3	0	0	3.0	OE
26	20CSO01	Data Structures and Algorithms	-	3	0	0	3.0	OE
27	20AIO01	Machine Learning for Engineers	-	3	0	0	3.0	OE
28	20DSO01	Introduction to Database Management Systems	-	3	0	0	3.0	OE
29	20ECO01	Architectures and Algorithms of IoT	-	3	0	0	3.0	OE
30	20EEO01	Introduction to Renewable Energy Sources	-	3	0	0	3.0	OE
31	20MEO01	Nano Technology	-	3	0	0	3.0	OE
32	20SHO01	Women and Society	-	3	0	0	3.0	OE
Open Elective #2								
33	20CEO02	Ecology, Environment and Resources	-	3	0	0	3.0	OE
34	20CS004	Internet of Things	-	3	0	0	3.0	OE
35	20AIO02	Fundamentals of Deep Learning	-	3	0	0	3.0	OE
36	20DSO02	Introduction to Data Science	-	3	0	0	3.0	OE
37	20ECO02	IoT for Smart Grids	-	3	0	0	3.0	OE
38	20EEO02	Electrical Safety and Management	-	3	0	0	3.0	OE
39	20MEO02	Fundamentals of Automobile Engineering	-	3	0	0	3.0	OE
Open Elective #3								
40	20CEO03	Disaster, Risk Mitigation and Management	-	3	0	0	3.0	OE
41	20CSO03	Operating Systems	-	3	0	0	3.0	OE
42	20AIO03	Fundamentals of AI	-	3	0	0	3.0	OE
43	20DSO03	Introduction to Big Data	-	3	0	0	3.0	OE
44	20ECO03	Privacy and Security in IoT	-	3	0	0	3.0	OE
45	20EEO03	Low-cost Automation	-	3	0	0	3.0	OE

46	20MEO03	Industrial Automation	-	3	0	0	3.0	OE
47	20SHO02	Design Thinking	-	3	0	0	3.0	OE
Open Elective #4								
The curriculum provides academic flexibility to choose any of the inter-disciplinary courses from MOOCs as approved by the respective Board of Studies and Academic Council. The students can take up this course on self-study mode. The course shall be of 45 – 60 hours duration and the assessment shall be as per the academic regulation 2020.								OE
B. Tech. (Honors)								
Category I								
1	20CEH01	Cognitive Management of IoT for Smart Cities	-	4	0	0	4.0	HO
2	20CEH02	Energy Efficient Buildings	-	4	0	0	4.0	HO
3	20CEH03	Structural Health Monitoring	-	4	0	0	4.0	HO
Category II								
4	20CEH04	Structural Failure Protection using AI	-	4	0	0	4.0	HO
5	20CEH05	Architecture and Town Planning	-	4	0	0	4.0	HO
6	20CEH06	Safety Analysis and Risk Management	-	4	0	0	4.0	HO
Category III								
7	20CEH07	Intelligent Transportation Networks	-	4	0	0	4.0	HO
8	20CEH08	Building Information Modelling	-	4	0	0	4.0	HO
9	20CEH09	Traffic Engineering and Management	-	4	0	0	4.0	HO
Category IV								
10	20CEH10	Structural Health Monitoring using IoT	-	4	0	0	4.0	HO
11	20CEH11	GIS and Remote Sensing	-	4	0	0	4.0	HO
12	20CEH12	Disaster Risk Mitigation	-	4	0	0	4.0	HO
B. Tech. (Minor with Specialization)								
Category I								
1	20CEM01	Air Pollution	-	3	0	0	3.0	MI
2	20CSM01	E-Commerce	-	3	0	0	3.0	MI
3	20MEM01	Biomaterials	-	3	0	0	3.0	MI
4	20EEM01	Basic Control Systems	-	3	0	0	3.0	MI
5	20ECM01	Semiconductor Devices & Circuits	-	3	0	0	3.0	MI
6	20AIM01	Fundamentals of Neural Networks	-	3	0	0	3.0	MI
7	20DSO03	Introduction to R Programming	-	3	0	0	3.0	MI
Category II								
8	20CEM02	Climate Change Mitigation and Adaptation	-	3	0	0	3.0	MI
9	20CSM02	Knowledge Discovery and Databases	-	3	0	0	3.0	MI
10	20MEM02	Micro Electromechanical Systems	-	3	0	0	3.0	MI
11	20EEM02	Basics of Electrical Machines and Drives	-	3	0	0	3.0	MI
12	20ECM02	Digital Electronics	-	3	0	0	3.0	MI
13	20AIM02	Machine Learning with Python	-	3	0	0	3.0	MI
14	20DSM02	Data Management and Analysis	-	3	0	0	3.0	MI
Category IIII								
15	20CEM03	Sustainability and Pollution Prevention Practices	-	3	0	0	3.0	MI
16	20CSM03	Database Security	-	3	0	0	3.0	MI
17	20MEM03	Surface Engineering	-	3	0	0	3.0	MI
18	20EEM03	Electrical Engineering Material Science	-	3	0	0	3.0	MI
19	20ECM03	Analog Electronic Circuits	-	3	0	0	3.0	MI
20	20AIM03	Interpretable Deep Learning	-	3	0	0	3.0	MI
21	20DSM03	Data Governance	-	3	0	0	3.0	MI

List of Honors offered by Civil Engineering Program

1. Applications of IoT in Civil Engineering
2. Smart Cities
3. Structural safety and Risk Management

List of Minor with Specialization offered by Civil Engineering Program

1. Environmental Engineering, Climate Changes and Sustainability

PE 20CE013 Repair and Rehabilitation of Structures 3 0 0 3

Pre-Requisite: The students have to know about basic components of building & their function and basic knowledge of different types of defects in structures.

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

Code	Course Outcomes	Mapping with POs	DoK
20CEO02.1	Identify the causes for deterioration of structures and able to give the preventive measures	-	L1, L2
20CEO02.2	Analyze the maintenance and repair stratagies		L1, L2, L3, L4
20CEO02.3	Explain different types of special materials used for repair techniques		L1, L2
20CEO02.4	Identify different types of strengthening techniques used for existing structures		L1, L2
20CEO02.5	Recognize the mechanisms of deterioration of structures and conduct preliminary forensic assessment of deteriorated concrete structures		L1, L2, L3

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

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Serviceability and Durability of Structure 9 Hours

Effects due to Temperature, climate, Chemicals, Wear and Erosion, Effects of Cover Thickness and Cracking, Design and Construction Errors, Corrosion Mechanism, Methods of Corrosion Protection, Corrosion Inhibitors, Corrosion Resistant Steels, Coatings, Cathodic Protection.

Damage of structures due to fire

Unit II: Maintenance and Repair Strategies 9 Hours

Maintenance, Repair and Rehabilitation - significance of Maintenance - Preventive Measures on Various Aspects Inspection, Evaluation Procedure for Evaluating a Damaged Structure - Causes of Deterioration - Testing methods.

Various damages to masonry structures

Unit III: Repair Materials 9 Hours

Sustainable Development, Fundamentals concerning Environment and Sustainable Development, Economy, Poverty, Human Settlement Issues, Land Resources, Forests, Mountains, Agriculture, Biodiversity, Protection of Oceans, Industry and Business.

Protective coatings for Concrete and Steel

Unit IV: Repair Techniques and Protection Methods 9 Hours

Rust Eliminators and Polymers Coating for Rebar's During Repair Foamed Concrete, mortar and Dry Pack, Vacuum Concrete, Gunite and Shotcrete, Epoxy Injection, Mortar Repair for Cracks, Shoring and Underpinning.

Jacketing and Strengthening

Unit V: Rehabilitation & Retrofitting of Structures 9 Hours

Repairs to overcome low member strength, Deflection, Cracking, Chemical Disruption, Weathering Wear, Fire, Leakage, Marine Exposure. Engineered Demolition Techniques for Dilapidated Structures – Case Studies.

Health Monitoring of Structures, Use of Sensors, Building Instrumentation

Text Books

1. Shetty, M. S., "ConcreteTechnology-Theory and Practice",S.Chandand Company, 6th Edition, 2008
2. Vidivelli, B., "Rehabilitation of Concrete Structures Standard Publishes Distribution",1st Edition, 2009
3. Varghese, P.C., "Maintenance Repair and Rehabilitation and Minor Works of Building", 1st Edition, Prentice Hall India Pvt. Ltd., 2014

Reference Books

1. Dov Kominetzky, M. S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001
2. Ravishankar, K. Krishnamoorthy,T. S.,"Structural Health Monitoring", "Repair and Rehabilitation of Concrete Structures", Allied Publishers, 2004
3. Hand Book on "Seismic Retrofit of Buildings",CPWD and Indian Buildings Congress, Narosa Publishers, 2008
4. Hand Book on "Repair and Rehabilitation of RCC Buildings-Director General Works CPWD", Govt of India, New Delhi, 2002

Web References

1. cpwd.gov.in/Units/handbook.pdf
2. tp://www.alljntuworld.in/wp-content/uploads/2016/01/Rehabilitation-and-RetrofittingofStructuresNotes.pdf
3. http://www.tn.gov.in/tsunami/digitallibrary/ebooksweb/04%20REPAIR_RESTORATION_AND_RET ROFITTIN.pdf
4. https://books.google.co.in/books/about/Case_Studies_of_Rehabilitation_Repair_Re.html?id=zraEplyE pCYC
5. https://books.google.co.in/books/about/Retrofitting_Design_of_Building_Structur.html?id=5XhbZW6 JS4YC&redir_esc=y
6. https://books.google.es/books/about/Concrete_Repair_Rehabilitation_and_Retro.html?hl=es&id=nwb NBQAAQBAJ

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Rehabilitation
2. What do you mean by structural cracks?
3. What are the objectives of maintenance?
4. How deterioration occurs due to corrosion?
5. What are the factors that affect cracking?

L2: Understand

1. Describe the steps in the assessment procedure for evaluate damage in a structure
2. Explain the various causes for deterioration of concrete structure
3. Explain the difference between wear and erosion
4. Discuss the effect of temperature on concrete
5. Explain the various corrosion protection methods

L3: Apply

1. Contrast about cathodic protection
2. Differentiate shoring and underpinning
3. Compare structural cracks and non structural cracks

L4: Analyze

1. Classify cracks based on its thickness
2. Analyze the factors influencing cracks
3. Attribute the nature of cracks

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CE014 Solid Waste Management 3 0 0 3

Pre-Requisite: Environmental Engineering, Environmental Science

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

Code	Course Outcomes	Mapping with POs	DoK
20CE014.1	Understand the basics of solid waste management	----	L1,L2
20CE014.2	Execute the relevant methods of collection ,transportation and storage of waste		L2,L3
20CE014.3	Execute and implement the disposal methods for different types of solid waste		L2,L3
20CE014.4	Understanding and implement the waste management systems		L1, L3
20CE014.5	Implement the rules and laws regarding solid waste management		L2, L3

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

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I: Fundamentals of SWM **9 Hours**

Definition, types of SW, sources and classification of SW, Characteristics of municipal solid waste, impact on environment, management techniques, factors affecting SW generation.

Sources and characteristics of SW

UnitII: Storage,Collection andTransportation of SW **9 Hours**

Storage of SW, Collection, transportation of solid waste,transport vehicles with their capacity working, organization pattern of SW management system, practices according to population of the city or town.

Storage and collection

Unit III: Disposal of Municipal Solid Waste **9 Hours**

Composting – process,principal,methods and factors affecting it. Incineration – Intro, types of incinerators, products of incineration process and their uses, advantages and disadvantages. Land filling and its methods, advantages and disadvantages, Biogas from landfills. Recycling of SW.

Composting, landfills

Unit IV:Waste Management, Health and Public Involvement **9 Hours**

Bio-mediical waste management – Definition,sources,classification,generation,management techniques,health aspects and public involvement. Industrial waste management – types,collection,disposal and recycling. E-Waste management – Definition,types,effects,recycling and disposal.

Waste management techniques

Unit V:Legal Aspects of SWM **9 Hours**

Legal aspects,present scenario,waste managemenr rules 2016 (Bio-MedicalE-waste,plastic waste,solid waste management, construction demolition), role of central pollution control board.

Solid waste management rules

Text Books

1. Ramanathan Jagbir Singh A. L., Solid waste Management: Present and Future Challenges, 1st Edition, Wiley Publications, 2019
2. George Tchobanoglous and Frank Kreith,Handbook of Solid Waste Management, 2ndEdition, McGraw-Hill Book Company,2002
3. Jayarama Reddy P.,MuncipalSolid waste Management,B.S.Publications,2018
4. SwaraBombade, Dhanashri Joshi , Solid Waste Management,Tech-Neo Publications LLP, Pune,2020
5. Rao M. N., Razia Sultana,Solid and Hazardous Waste Management, 2nd Edition, BS Publications, 2020

Reference Books

1. SasiKumar K., Solid Waste Management, PHI Learning, New Delhi, 2009
2. Rao C.S., Environmental Pollution Control Engineering,New Age International,New Delhi,2006
3. Hosetti B.B.,Prospect and Perspectives of solid Waste Management,New Age Iinternational Publishers, New Delhi,2006

Web References

1. https://nptel.ac.in

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Expalin different types of solid wastes
2. Define composting
3. List any four sources of municipal soild waste

L2: Understand

1. What is the process of Land fills and incineration?
2. Discuss briefly about the classification of solid waste
3. Explainabout the characteristics municipal soild waste
4. Discuss in detail about the effects of various solid waste
5. Discuss the factors to be considered while selecting a suitable site for disposal

L3: Apply

1. How can we implement the disposal methods for solid waste?
2. Compile the major features of municipal solid waste rules and regulations
3. Suggest the relavent methods for disposal and recycling of given type of soild waste
4. Suggest the existing legal framework to regulate the given type of solid waste with justification

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CE015Traffic Engineering 3 0 0 3

Pre-Requisite: Transportation Engineering

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

Code	Course Outcomes	Mapping with POs	DoK
20CE015.1	Understand the relationships b/w the traffic parameters and traffic flow mechanics	----	L1, L2
20CE015.2	Understand and apply the knowledge on traffic studies and principles		L1, L2,L3
20CE015.3	Understand and apply the knowledge on parking studies and surveys effectiveness.		L1, L2,L3
20CE015.4	Apply the traffic control regulations and designs		L2,L3
20CE015.5	Understnd the traffic safety principles and measures		L1, L2

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

Unit I: Basic concepts of traffic engineering 9 Hours

Components and charactertics,relationship among traffic parameters and empirical relationship,mecahnics of traffic flow,macro and micro scopic approach and human factors approach.

Traffic parameters and chacterstics

Unit II: Traffic measurement and traffic studies 9 Hours

Traffics volume studies, concept of PCU,data collection and presentation speed studies,origin and destination studies, traffic forecasting priniciples and techniques

PCU studies and origin and destination studies

Unit III: Parking and delay studies 9 Hours

Types of parking facilities,parkinginventaroystudy,parkingsurvey,and delay studies,level of service ,factors effecting los,measure of effectiveness and performance characterstics of highway capacity

Parking survey,delay survey

Unit IV: Traffic signs, road marking and traffic control 9 Hours

Traffic problems,importance of traffic control and regulations,channelization,trafficsignals,signal design by webster method pedistrialrequirements,traffic regulatory measures,types of traffic signs and marking

Traffic control and regulations

Unit V :Design regulations and highway safety 9 Hours

Dimensions and weights of vehicles,road lighting priniciples of road lighting and factors in design of road lighting,problems of highway safety,types of road accidents and measures, priniciples of road safety audit

Road safety and accident studies

Text Books:

T1: LK Kadiyali , Traffic Engineeering and TransporationPlanning,khanna publications,

T2: Fundamentals of transporation engineering -C.S.papacostas, Prentice Hall (india)

References:

R1: Transporation engineering -An introduction C-J-Khisty,prentice Hall

R2: Fundamentals of transporation engineering -C.S.papacostas, Prentice Hall (india)

R3: Highway engineering and traffic analysis -Mannering and Kilareshi ,John Wiley Punlications

R4: Priniciples of transporation engineering -parthachakroborthy ,animas das- prentice Hall of india

Web References: (Provide additional references apart from prescribed text books, if any)

1. **www.nptel.com**
2. **www.iare.ac.in**
3. **https://nacto.org**

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define the term traffic engineering.
2. List out the factors affecting Level of service
3. State the principles of road lighting

L2: Understand

1. Explain the concept of PCU
2. Discuss briefly the rules and regulations of traffExplainthe parking facilities

L3: Apply

1. Out line the webster method of traffic signal design
2. Demonstrate various methods for determining traffic studies

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CE016 Hydraulic Structures 3 0 0 3

Pre-requisites: Nil

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

Code	Course Outcomes	Mapping with POs	DoK
20CEO16.1	Introduce hydrologic cycle and its relevance to Civil engineering	---	L1, L2
20CEO16.2	Make the students understand physical processes of precipitation abstractions from precipitation		L1, L2, L3
20CEO16.3	Be Able To Estimate Irrigation Water Requirements		L1, L2, L3
20CEO16.4	Ability To Design Irrigation Canals And Canal Network		L1, L2, L3
20CEO16.5	Analyse Stability Of Gravity And Earth Dams		L1, L2, L3, L4

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

Unit I: Introduction of Hydrology& Precipitation 9 Hours

Engineering Hydrology, Hydrology applications,Hydrological cycle-forms of Precipitations, Measurement of Precipitations,Rain gauge network of Precipitations,Problems on rain gauge stations

Hydrology,precipitation and rain gauge

Unit II: Abstraction from Precipitation& Hydrograph 9 Hours

Initial abstractions,Evaporation Factors affecting- Evaporation-Measurement- Evapo-transpiration-factors affectingInfiltration, factors affecting Infiltration- Infiltration indices- Problems on Infiltration indices- unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations- principle of superposition and S-hydrograph methods

Losses and evaporation

Unit III: Ground Water&Irrigation 9 Hours

Occurrence, types of aquifers,aquifer parameters, porosity- specific yield, permeability, transmissivity- steady radial flow to wells in confined and steady radial flow to wells in unconfinedIrrigation-Necessity And Importance- Principal Crops and Crop Seasons, Estimation Of Consumptive Use,Duty And Delta,Factors Affecting Duty- Depth And Frequency Of Irrigation,Standards Of Quality For Irrigation Water,Crop Rotation.

Irrigation efficiency

Unit IV: Canals& Canal Structures 9 Hours

Classification,Design of Non-Erodible Canals- Economics of Canal Lining,Methods Of Economic Section and Maximum Permissible Velocity,Design OfErodible Canals- Kennedy's Silt Theory, Lacey's Regime Theory, Balancing Depth Ofcutting.
Falls: Types And Location,Design Principles Of Sarda Type Fall, Regulators: Head Regulators& Cross Regulators, Design Principles,Cross Drainage Works – types, selection -design principles of Aqueduct

Falls: Types And Location

Unit V :Diversion Head Works&Reservoir Planning 9 Hours

Types Of Diversion Head Works,Weirs And Barrages,Causes And Failures Of Weirs On Permeable Foundations
Bligh's Creep Theory,Reservoir Planning - Site Selection, Zones Of Storage- Types Of Dams,Selection Of Site For A Dam-Forces Acting On A Gravity Dam,Causes Of Failure Of A Gravity Dam,Limiting Height Of A Dam,Stability Analysis, Drainage Galleries Grouting earth dams- types, causes of failures, criteria for safe design, seepage,measure for control of seepage filters - spillways -types,design principle ogee spillways, types of spillway thrust gates,energy dissipation below spilllways its appurentances.

Text Books

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., New Delhi, 2013
2. PunmiaB. C. Pande, Lal B. B., Ashok Kumar Jain and Arun Kumar Jain, S.,Irrigation and Water Power Engineering, Lakshmi Publications (P)Ltd.
3. Sharma, S. K.,"Irrigation Engineering", S. Chand Publishers, New Delhi, 2016

Reference Books

4. Engineering Hydrology Subramanya K., Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2013
5. Irrigation Engineering and Hydraulic Structures, Santosh Kumar Garg, Khanna Publishers
6. Chow V.T., Maidment and Mays L.W., "Applied Hydrology", Tata Mc Graw-Hills Education Pvt. Ltd., New Delhi
7. Mays L.W, Wiley India Pvt. Ltd., "Water Resources Engineering" Wiley India Pvt. Ltd., 2013

Web References

1. Introduction to Engineering Hydrology (slideshare.net)
2. Abstraction From Precipitation | Evaporation | Water Vapor (scribd.com)
3. Runoff Hydrograph: Meaning, Components and Factors | Geography (geographynotes.com)
4. Lec.28-30.pdf (uap-bd.edu)
5. Ground Water Hydrology (slideshare.net)

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write a note on scope of Hydrology
2. Write short notes on Infiltration indices
3. Define Instantaneous Unit hydrograph
4. Write a brief note on components of runoff

L2: Understand

1. Describe the method of estimating a T-year flood using Log-Pearson type-III distribution
2. Explain various methods for the control of floods
3. Explain recuperation test and derive the equation used in the test
4. Describe any one hydrological model

L3: Apply

1. Enumerate and briefly discuss the various factors which affect the runoff from a catchment
2. Discuss the various problems encountered during the operation of flood control reservoirs
3. List of various methods of determining runoff from the catchment. Give the various empirical formulae for determining the runoff indicating the area for which each of these formulae is applicable
4. How do you derive Instantaneous Unit Hydrograph from S-curve?

L4: Analyze

1. Discuss in detail the various causes and effects of Floods
2. Discuss the applications of flow mass curve and flow duration curve
3. A well penetrates fully on 10m thick water bearing stratum of medium sand having coefficient of permeability of 0.005m/s. the well radius is 10cm and is to be worked under a drawdown of 4m at the well face. Calculate the discharge from the well. What will be the % increase in the discharge if the radius of the well is doubled?

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CEO17 Construction Cost Analysis 3 0 0 3

Pre-requisites: None
At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE017.1	Understand the Various types of costs related to the construction	----	L1, L2
20CE017.2	Applythetechniques of appraisal for the economy related to the construction		L1, L2,L3
20CE017.3	Understand the performance statement of a construction company		L1, L2
20CE017.4	Apply the techniques for decision making of depreciation &Budget		L1, L2,L3
20CE017.5	Understandthecost control techniques		L1, L2

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

UnitI: Construction Costs9Hours
Make-up of construction costs; Classification of costs, timecost trade-off in construction projects, compression and decompression.

General Costs of project, Direct and in direct costs

Unit II: Project Appraisal9 Hours
Project appraisal, government and private project evaluators, significance of social benefit –national economic profitability, measurement of direct and indirect benefit and costs. Calculation of benefit cost ratio.

Cost analysis,Ccommercial profitability

Unit III: Engineering economics9 Hours
Time value of money, discounted cash flow, decision making among the alternatives, replacement analysis, break even analysis, estimation of minimum capital required, internal rate of return (IRR), estimation of annualized cost.

Cash flow of a project

Unit IV: Depreciationand Budgetery control9 Hours
Importance and advantagesof depreciation, types – straight line method(simple problems).
Elements of ,Budgettypes of budget – 0 base budjet and master budget, preparation ofcashbudjet.(Simple problems)

Overhead cost

Unit V:Cost Control 9 Hours
Cost audit, Advantages of Cost audit, areas and scope of CA, Cost audit in india.

Capital gearing ratio, debentures,

Text Books
1. M Pandey, Financial Management, Vikas Publishing house pvt ltd9th Edition
2. Donald Newnan, Engineering Economics analysis, Oxford University Press.
3. R Panneerselvam, Engineering Economics, PHI Learning Pvt. Ltd.
4. Frank Harris & Ronald Mc CafferModern Construction ManagementBlackwell science4th Edition.

Reference Books
1. 'Roy PilcherPrinciples of Construction Management, Mc Graw Hill London.
2. United Nations Guidelines for Project Evaluation Oxford & IBH Publishing Co. Pvt. Ltd.
3. A.H. Taylor & H Shearing, Financial & Cost Accounting for Management Mac Donald & Evans.

Web References

1. https://www.youtube.com/watch?v=Kjcm_x9BICQ NASA Remote Sensing Tutorial - http://rst.gsfc.nasa.gov/
2. https://dl.icdst.org/pdfs/files4/51e56f03dd861bfbbb5ce45cfabe7eb7.pdf
3. https://www.digimat.in/nptel/courses/video/112107209/L01.html
4. http://www.digimat.in/nptel/courses/video/109107119/L02.html

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What allowances are included?
2. What contingency is included?
3. Illustrate thecontrollable costs?
4. Discribe the uncontrollable costs?

L2: Understand

1. Classify the law of supply and demand with suitable example?
2. Interpreting the goals of economy?
3. Discuss about Economic efficiency?
4. Explain the law of supply and demand?

L3: Apply

1. Determining the factors in fluency demand?
2. Intigrating the economy efficiency?
3. Determining the concept of break-even analysis with clear diagram?

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE **20CE018 Coastal Zone Management** **3 0 0 3**

Pre-requisites: None

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

Code	Course Outcomes	Mapping with POs	DoK
20CE018.1	Understand Coastal and littoral zones, shore zone process, coastal wetlands	----	L1, L2
20CE018.2	Understand coastal hazard and human activity and coastal environment, Provide examples of strategies for managing human activities in the coastal zone		L1, L2
20CE018.3	Apply Remote Sensing application in Coastal Management		L1, L2, L3
20CE018.4	Explain the significance of current research on important concepts in the coastal policy process		L1, L2, L3
20CE018.5	Summarizeimportant measures in coastal zone management		L1, L2,L3

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

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

Unit I:Coastal and Littoral Zones – Coastal Wetlands **9 Hours**

Coastal zone – Coastal zone regulations – Beach profile – Surf zone – Off shore

Shore zone processes – waves, tides and currents, Coastal landforms;River deltas and dynamics of the delta-fringe coasts, coastal classification

Coastal wetlands – Mangrove swamps, marshes, lagoons, tidal channels/creeks and their significance in coastal stability and economic importance

Continental margins – forms and processes; territorial waters and Exclusive Economic Zone

Sea level changes – factors involved; effects of sea level oscillations on coastal zones

Unit II: Coastal Hazard& Human activity and Coastal Environment **9 Hours**

Coastal Hazards:Storm surges and Tsunamis;Origin, propagation and run-up of tsunamis; Tsunami impact – role of coastal topography and vegetation;Global warming and Sea-level rise - impact on coastal zones; coastal vulnerability assessment

Coastal hazard preparedness – coastal protection, education and awareness of coastal communities

Human activity and coastal environment – deforestation, agriculture/aquaculture, pollution and coastal structures, and their effect on coastal zones, Coastal vegetation; shelter belts; coastal aquifers

Unit III: Remote Sensing for Coastal Management **9 Hours**

Data Input, Data Management, Data Quality-Remote Sensing for Coastal Management.

Data quality in remote sensing, Application of remote sensing in CEM, Application of remote sensing in CZM, Role of Remote Sensing to integrated coastal zone management, Data collection and input overview in GIS, Data processing in remote sensing

Unit IV: Environmental Policiesfor Coastal Regulation Zone9Hours

Coastal Regulation Zone (CRZ) Act, Coastal regulation zones for mainland and islands– Environmental policies, planning, administrative and regulations.CRZ: Environmental policies India past and present, Environmental policies India, Fisheries legal regimes

CRZ mapping.

Unit V:Coastal Zone Management – Concepts, Models and Information Systems **9 Hours**

Coastal zone management – concepts, models and information systems

Integrated Coastal Zone Management (ICZM); concept, application and case studies.

Integrated coastal zone management, Coastal zone management in india, CRZ concept, goals, CRZ case study, CRZ Kerala case study

Text Books

1. DavisA.R., “Coastal Sedimentary Environments”, (Jr.), Springer-Verlag, 1985
2. King C.A.M., “Beaches and Coasts” Edward Arnold, 1972
3. King C.A.M., “Introduction to Marine Geology and Geomorphology”, Edward Arnold, 1974

4. Martin K., "Applications in Coastal Zone Research Management", St. (Ed), U.N. Institute for Training and Research, 1993
5. Sain B.C., and Knecht, R. W., "Integrated Ocean and Coastal Management", UNESCO Publication, 1998

Reference Books

1. Sudarshan, "Subtle Issues in Coastal Management", IIRS, Dehradun, 2000
2. SatakeK., "Tsunamis – Case Studies and Recent Developments", Springer, 2005
3. Richard Sylvester, "Coastal Engineering, Volume I and II", Elseiner Scientific Publishing Co., 1999

Web References

1. Video link on Application of Remote Sensing and GIS for Coastal Zone Management
2. Video link on NASA ARSET: Overview of Coastal Ecosystems and Remote Sensing
3. Video link on Data Quality in GIS
4. Video link on Environmental Impact of Tourism
5. Video link on Sustainable use of coastal areas in Zanzibar

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write a note on Coastal zones
2. Write short notes on coastal hazards
3. What is CZM?
4. Write two applications of remote sensing in CZM.

L2: Understand

1. Describe the application of remote sensing for coastal zone management.
2. Differentiate coastal zones, littoral zones and coastal wetland
3. Explain the impact of human activity on coastal environment
4. Describe in detail Coastal zone management in India.

L3: Apply

1. Enumerate and briefly discuss the various factors which affect the sea level changes and also discuss the effects of sea level oscillations on coastal zones
2. Discuss in detail coastal vulnerability assessment.
3. List of various coastal zone management strategies.
4. How do you give awareness to protect coastal zone

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CEO19 Special Concrete 3 0 0 3

Pre-requisite : Concrete structures
At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE017.1	Understand the basic technique of self healing concrete and their types	--	L1, L2
20CE017.2	Understand theapplications and component types of Self healing concrete		L1, L2
20CE017.3	Understand the properties of self healing concrete		L1, L2
20CE017.4	Understand thevarious applications and properties of living building materials		L1, L2
20CE017.5	Understandtheapplications and various case studies of self heaing concrete		L1, L2

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

UnitI: Fundamental aspects of Self Healing Concrete 9Hours

Introduction, Types of Self Healing Concrete, Need of Self healing concrete, Objectives of SHC, Properties, Autogenous healing- Applications, Durability aspects, Physical, Mechanical performance of composites, Process of SHC, BactreriaSelection, Advantages& Disadvantages of SHC

Characteristics of Self healing concrete

Unit II: Stimulated Autogenous Healing 9 Hours

Introduction, Use of mineral additions, Use of crystalline Admixtures, Use of superabsorbent polymers, Applications, Autonomous self healing- Applications, Microencapsulation, Vacular healing, Self healing bio concrete, Applications, uses.

Durability , performance aspects of SHC

Unit III: Self healing Materials 9 Hours

Introduction, Thermal, electrical, Acoustical properties, Role in repair aspects as cementitious materials, Biomimetics, self healing polymers and elastomers- applications, Self healing fibre reinforced polymer composites - Applications, Self healing coatings- Applications,

Common types of Self healing materials, properties

Unit IV: Living Building materials 9 Hours

Introduction, Self replacing concrete- Applications, properties, uses, Calcium carbonate biocement- Applications, uses, Mycelium composites- Properties, Uses, Self healing cementitious materials, Self healing ceramics, Self healing organic dyes, Self healing of ice.

Building insulation materials, Smart building ,matrials

Unit V:Applications and Case study of Self healing concrete 9 Hours

Effieciancy assessment of self healingconcrete,Large size buildings and roads, Structural Crack prevention - highways, Oil and gas industries, Marine structures, Freez and thawing conditions, Irrigation works, Tunnel lining, dams.
Case study: Applications of Microbial self-healing concrete

Applications in Pier crack prevention, side walks

Text Books

1. Self-Healing Concrete (Materials Research Foundations) by david J. fisher
2. Self-Healing Materials From Fundamental Concepts To Advanced Space And Electronics Applications 2019 Edition by BrahimAïssa, Emile Haddad , Institution of Engineering and Technology
3. concrete technology 2E Paperback – 1 April 2018by A.R. Santhakumar (Author)

Reference Books

1. Self-Healing Composite Materials by Khan Anish, Woodhead, Published November 2019
2. Self Healing Materials- An Alternative Approach to 20 Centuries of Materials Science,: Springer Series in Materials Science (SSMATERIALS, volume 100), 2007.

Web References

1. https://pubs.rsc.org/en/content/articlelanding/2015/ra/c5ra20858k
2. https://www.youtube.com/watch?v=He49aLkGi3k
3. https://www.engineeringcivil.com/self-healing-concrete.html
4. https://en.wikipedia.org/wiki/Self-healing_concrete

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is the process of self healing concrete?
2. What are the applicatiions of self healing concrete?
3. Illustrate the functions of SHC?
4. Illustrate the components of SHC?

L2: Understand

1. Discuss objectives of SHC
2. Inferring the prevention for cracks by using SHC
3. Interpret the various functions of SHC
4. Classify the applications of Self healingcincrete

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CE020 Hazardous Waste Management 3 0 0 3

Pre-requisite: Environmental science, Environmental Engineering
At the end of the course, students will be able to

Code	Course Outcomes	Mapping with POs	DoK
20CE020.1	Understand the basics of hazardous waste	----	L1,L2
20CE020.2	Understand the basics of Hazardous waste management		L1,L2
20CE020.3	Execute and implement the Treatment technologies of Bio-medical waste		L2,L3
20CE020.4	Execute and implement the Treatment technologies of E- waste		L2,L3
20CE020.5	Understand and implement the secured landfills		L1,L3
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit 1: Introduction to Hazardous Waste **9 Hours**

Hazardous waste definition – Physical and Health hazards wastes - Handling Rules – Characterization of hazardous wastes – Analytical– Analytical methods –Hazardous waste inventory- Source reduction of hazardous wastes

Source reduction, Waste inventory

Unit2: Hazardous Waste Management **9 Hours**

Handling , storage and transport of Hazardous wastes –Waste Compatability Chart - Manifest system – Transboundary movement of wastes – Basal Convention – Hazardous waste treatment technologies – Physical, chemical and thermal treatment of hazardous waste – Solidification – Chemical fixation – Encapsulation – Incineration

Handling and storage,chemical fixation

Unit 3:Biomedical Waste Management **9 Hours**

Biomedical waste- Regulatory aspects of Biomedical Waste. Sources-Classification-Waste Handling and Collection-Segregation and labeling- Treatment – autoclaving, Incineration

Incineration,Handling and collection

Unit 4:E-Waste Management **9 Hours**

Regulatory aspects of E- Waste management, Waste characteristics- Generation– Collection -Transport- Treatment and disposal. Recycling and Recovery – Intergraded e-waste management

Handling and disposal

Unit 5 :Secure Landfills **9 Hours**

Hazardous waste landfills – Site selections – landfill design and operation – Regulatory aspects - Leachate Collection and Management – Environmental Monitoring System- Landfill Closure and post closure care

Site selection,landfills

Text Books

1. Michael D. LaGrega, Phillip L. Buckingham, Jeffrey C. Evans, Hazardous Waste Management,2nd Edition, Waveland Press,2010
2. Lagrega,Hazardous Waste Management,2nd Edition,Medtech,2015
3. John pichtel, Waste Management Practices: Municipal, Hazardous, and Industrial,CRC Press, 2nd Edition,2014
4. Rao M. N., Razia Sultana,Solid and Hazardous Waste Management, 2nd Edition, BS Publications, 2020

Reference Books

1. Rao C.S., Environmental Pollution Control Engineering,New Age International,New Delhi,2006
2. Rao M. N., Razia Sultana,Solid and Hazardous Waste Management: Science and Engineering, Butterworth-Heinemann, 2016
3. William C. Blackman, Jr., Basic Hazardous Waste Management, 3rd Edition,CRC Press,2016

Web References

1. https://nptel.ac.in

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define hazardous waste
2. Define solidification
3. List any four sources of hazardous waste

L2: Understand

1. What is the process of Land fills and incineration?
2. Discuss briefly about the classification of hazardous waste
3. Explainabout the characteristics hazardous waste
4. Discuss in detail about the effects of varioushazardous waste

L3: Apply

1. How can we implement the disposal and treatment methods?
2. Compile the major features of hazardous waste

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CE021 Urban Transportation And Planning 3 0 0 3

Pre-requisite: Transportation Engineering

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

Code	Course Outcomes	Mapping with POs	DoK
20CEO21.1	Understand issues regarding urban transporation and generate remedies	-----	L1, L2
20CEO21.2	Building data for efficient transportation and planning		L1, L2,L3
20CEO21.3	Understand different stages of transportation and planning		L1, L2,L3
20CEO21.4	Analysing Traffic and transportation problems in India		L1, L2,L3
20CEO21.5	Organising and analysing different surveys		L1, L2,L4
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

UnitI: Issues On Urban Transportation & Solutions 9 Hours

Urban Issues, Travel Characteristics, Supply and Demand,ProblemDefinition, Solution Generation

demand,supply and generation

UnitII:CollectionOf Data &Inventories 9 Hours

Data Collection,Organising and Analysing Surveys,RoadSideInterviews,Home Interview Surveys, Commercial Vehicle Surveys,Economic data – Income – Population – Employment – Vehicle Owner Ship.

Income,population,employment

Unit III:Trip Generation And Trip Distribution 9 Hours

Trip Generation Analysis: Zonal Models, Category Analysis, Household Models, Trip Attraction modelsTrip Distribution: Gravity Model, Growth Factor Methods of Trip Distribution, Uniform Factor Method

Gravity,distribution,growth

Unit IV:TrafficAssignement 9 Hours

Traffic Assignment: Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All-or-Nothing Assignment

coding,network,skimming

Unit V :Case studies 9 Hours

Brief Case studies of Comprehensive Traffic and Transportation problems of Indian towns /cities.

Text Books:

1. Traffic Engineering and Transport Planning - Kadiyali L.R., Khanna Publishers 1 January 1999.
2. Lecture notes on UTP - Prof. S. Raghavachari ,R.E.C.Warangal.
3. C.S. Papacostas and P.D. Prevedouros, Transportation Engineering and Planning, Prentice Hall of India Pvt. Ltd2001.

References:

1. Introduction to Urban System Planning - B.G.Hutchinson; McGraw Hill
2. Metropolitan transportation planning – John W. Dickey, Tata McGraw Hill, New Delhi, 1975.
3. Introduction to Transportation Planning – M.J.Bruton; Hutchinson of London.

Web References: (Provide additional references apart from prescribed text books, if any)

1. https://archive.nptel.ac.in/courses/105/107/105107067/
2. https://supernet.isenberg.umass.edu/courses/FOMGT341-Fall09/lecture1.pdf

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Explain the interrelationship between income population and employment.
2. Explain various urban transportation problems.
3. Write a note on
    i. Road side interviews
    ii. Commercial vehicle survey
    iii. Home interview survey

L2: Understand

1. Explain various factors governing trip generation.
2. What is trip distribution and mention meyhos of trip generation.
3. Define trip assignement and explain various application of trip assignment

L3: Apply

1. Write a note on study area and zoning.List the factors affecting zoning.
2. The following information was obtained from a transportation survey of a town.Develop a linear regression (of type y=a+bx) model for estimating the trips generated from a zone. If the population in particular zone increases to 40,000 predict the expected trip generation from the zone.

Zone no	1	2	3	4	5	6	7	8
Population in zone(thousands)	26	28	31	33	22	30	20	25
Total trip generated (in hundreds)	12	11	17	15	12	15	9	13

L4: Analyze

1. What is trip distribution ? Briefly explain average factor method mention the disadvanatges of this method
2. What are the applications of Traffic assignment ?
3. Write a note on
    i. All or nothing assignment
    ii. Capacity restraint assignment

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CE022 Hydro Power Engineering 3 0 0 3

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs	DoK
20CE022.1	Describe the different concepts relevant to hydropower engineering	---	L1,L2
20CE022.2	Understanding of different types of hydropower schemes and their purposes.		L1,L2
20CE022.3	Design essential elements of hydropower plant		L2,L3
20CE022.4	Concepts and aspects of Location, components Structures involved in a Hydropower plant		L2,L3
20CE022.5	Understanding of various appurtenances used in any Hydro project		L1,L3
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit I: Basic Hydro Power Concepts 9 Hours

Introduction: Prospects of hydropower, sources of energy, hydropower potential, distribution and development, basin-wise development of hydropower, constraints in hydro power development; Stream Flow Data and Hydropower Potential: Flow and load duration curves, estimation of flow duration curve at ungauged site, primary and secondary power, storage and pondage, load factor, capacity factor, utilization factor, diversity factor.

Unit II: Types of Hydro Power Plants & Intake Structures 9 Hours

Types of Hydro Power Plants: Base and peak load Hydro-power plants, run-off river plants, valley dam plants, diversion canal plants, high head diversion plants, pumped-storage power plants; Intake Structures: Functions of intake structures, its location types, trash rack dimensions, design, spacing of bars, methods of cleaning; design of transition.

Unit III: Conveyance System 9 Hours

Conveyance System: Power canal-location, site, surges in canals, penstocks types, design and layout, economical diameter of penstock, hydraulic losses, branches, air vent, forebay.

Unit IV: Hydraulic Transients 9 Hours

Hydraulic Transients: Basic equations of Unsteady flow through conduits, method of characteristics, boundary conditions, single-pipeline applications for various valve opening conditions, functions of surge tank and its location, types and design of surge tank, introduction to transient software's like HAMMER and HYTRAN etc.

Unit V:Hydraulic Turbines 9 Hours

Hydraulic Turbines: Types of turbines, characteristics and efficiency of turbines, selection of turbines, selection of turbines, cavitations, casing, draft tubes, tail trace and their hydraulic design; Small Hydropower Development: Benefits and potential of small hydropower plants, components of small hydropower plants, trench weir, desilting tank, and turbines.

Text Books

1. Nag P.K., "Power Plant Engineering" Tata McGraw Hill, 2nd edition, 4th reprint 2003.
2. Rai-Khanna. G.D., "An introduction to power plant technology" Publishers, Delhi, 2013

Reference Books

1. Barrow, H.K., "Water Power Engineering", Tat McGraw-Hill
2. Varshney, R.S., "Hydro Power Structures", Nem Chand & Bros.
3. Choudhary, M.H., "Applied Hydraulic Transients, Van Nastrand Reinhold
4. Warnick, C.C., "Hydropower Engineering", Prentice-Hall
5. "Hydropower Development", Vol.3,4,5,&6, Norwegian Institute of Technology, Division of Hydraulic Engineering
6. Sharma P.C., Kataria S. K. & Sons, "Power Plant Engineering", 2009

Web References

1. NPTEL Powerplant Engineering (iitr.ac.in)

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What do you mean by run off river plants?
2. Define specific speed.
1. For what purpose relief valve is provided.
2. Write any two advantages of pumped storage plant.

L2: Understand

3. What is the necessity to determine future demand of load? Explain in detail?
4. Describe the general layout of runoff river plants.
5. What is difference between storage and pondage?
6. Describe surge tank and its types. What are the functions of surge types.

L3: Apply

1. What are different types of turbines? Discuss the general criterion for the selection of turbine?
2. Discuss the design theory of daft tubes.
3. For rigid and elastic pipe. derive the expression for water hammer pressure
4. Explain different types of power houses Also describe the function of different componentsbriefly.

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

PE 20CE023Safety Engineering 3 0 0 3

Pre-requisite: Nil

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

Code	Course Outcomes	Mapping with POs	DoK
20CE023.1	To list out and describe the various functions and activities of safety engineering department	---	L1, L2
20CE023.2	To carry out safety audit and prepare a report for the audit		L1, L2,L3
20CE023.3	To prepare an accident investigatin report		L1, L2,L3
20CE023.4	To evaluate the safety performance of an organisation		L1, L2,L3
20CE023.5	To identify various agencies involved in traning		L1,L2

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

Unit I:Concepts and techniques 9 Hours

History of safety movement -Evoluatlion modern safety concept-general concepts of management-line and staff functions for safety-budgeting for safety policy. incident recall technique (IRT),disaster control,job safety analysis,safety survey, survey inspection safety sampling, evaluation of performance of supervisors on safety

Incident recall techinque

Unit II: Safety audit 9 Hours

Components of safety audit,types of audit,audit methodology,non conformity reporting(NCR), audit check list and report -review of inspection , remarks by governing agencies, consults,experts,- perusal of accidents and safety record formats -implementation of audit indication- liaison with departments to ensure co ordination- check list- identification of unsafe acts on workers and un safe conditions in the shop floor -IS 14489 1998 code of practice on occupational safety and health audit

Non conformity reporting

Unit III: Accident investigation and reporting 9 Hours

Concept of an accident, near miss incident,reportable and non reportable accidents-reporting to statutory authorities- priniciples of accident preventation -accident investigation and analysis-records for accidents, departments accidental reports documentation of accidents- unsafe act and condition -domino sequence -supervisory role -role of safety committee -cost of accident

Accident investigation and analysis

Unit IV: Safety performance moinitoring 9 Hours

Recommanded practices for compiling and measuring work injury experience -permenant total disabilities, permenant partial disabilities, temporary total disabilities- calculation of accidents indices, frequency rate, serverity rate frequency serverity incidence ,incident rate ,accident rate safety t score safety activity rate , total injury lines ,incidence rates, lost workday cases incidence rates (LWDI), number of lost working days rate-problems

Calculation od accident indices

Unit V :Safety education and training 9 Hours

Importance of training -identification of training needs-training method- programmes seminars, conferences,competitions-methods of promoting safe practice -motivation -communication-role of government agencies and private consulting agenciesin safety training DGFASLI,NSC,ASSE,HSE,OSHA,NEBOSH- creating awreness,awardcelebrastions, safety displays, safety pledge safety incentive scheme,safety campaign

Tranining methods and traning needs

Text books:

1. Ray Asfan C indusrial safety and health mgmt -pearson prentice hall 2003
2. Blakke R.B Industrial safety . prentice halliinc new jersey 1973

References :

1. Heinrich H.W. industrial accident preventation McGraw-Hill company, New york 1980
2. Krishnan N.V. safety management inindustryjaico publishing house ,bombay 1997.

Web References: (Provide additional references apart from prescribed text books, if any)

1. https://mrcet.com
2. https://www.studocu.com

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define safety sampling
2. List the techniques of safety managemt.

L2: Understand

1. Explain the concept of accident invetigation.
2. Discuss the recommended practices for compliing and measuring work injury
3. Decribe about emergency planning during accidents

L3: Apply

1. How the equipment life circle is useful for deciding maintaince activities
2. What are the principles of accident prevention?

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

PE 20CE024Ocean Engineering 3 0 0 3

Pre-requisite: NIL

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

Code	Course Outcomes	Mapping with POs				DoK
		PO2	PO3	PO4	PO5	
20CE024.1	Understand ocean environment and ocean flow characteristics	3	3	3	3	L1,L2
20CE024.2	Describe the spatial and temporal variability of physical properties of the ocean.	3	3	3	2	L1,L2
20CE024.3	Explain conservation equations and transport processes	2	3	3	2	L2,L3
20CE024.4	Classify different water masses of world oceans using T-S diagrams.	3	3	3	3	L2,L3
20CE024.5	Classify different types of ocean structures and system	2	3	3	2	L1,L3
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos						
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge						

Unit I: Introduction to Ocean Environment 9 Hours

Brief introduction to ocean environment and ocean floor characteristics, waves, tides, currents, seawater properties; Waves and Tides: General aspects of ocean waves, wave characteristics, sea and swell, deep and shallow water waves, storm surges and tsunamis- Tides and tide generating forces; their causes, variation and types, Tidal currents.

Unit II: Introduction to Oceanography 9 Hours

General introduction, major expeditions-Dimensions of the ocean, Geographical features of ocean - Physical properties of sea water- distribution of temperature, salinity, density and oxygen in space and time, mixed layer and barrier layer, Acoustic properties of sea water- sound velocity profile- SOFAR channel and shadow zone- Optical characteristics of sea water – Color of the sea. Different materials for marine applications - metals, concrete, geo- synthetic products and other materials for marine environment; Marine corrosion and control; Introduction to physical modelling of coastal and offshore and harbour engineering problems.

Unit III: Ocean circulation 9 Hours

Ocean circulation – Conservation equations and transport processes, momentum balances, geostrophic, large scale circulation, wind-driven circulation, abyssal ocean circulation, boundary currents, friction and Ekman layers; Waves – Origin and evolution, characteristics, classification, Tsunami, Tides – Origin, characteristics, tidal generation forces, equilibrium tide, tidal analysis and prediction.

Unit IV:Circulation and Water masses 9 Hours

Circulation and Water masses: General circulation of the atmosphere – wind driven currents in the world ocean – Equatorial current systems – Wyrtki Jet Under currents- Circulation in the Arabian Sea and Bay of Bengal- Somali current – wind stress Ekman spiral– Upwelling – Indian Ocean Dipole (IOD)- El Nino and La Nina. Formation and classification of water masses- T-S diagram- water masses of the world ocean – thermohaline circulation - Identification of water masses.

Unit V:Ocean Structures & System 9 Hours

Different types of ocean structures and systems (fixed, floating, semi-submersibles, submersibles, pipelines, etc.) for exploitation and production of oil and gas, minerals and energy. Brief outline of planning, design and construction.Towing, launching and installation.

Text Books

1. Reddy M. P. M., “Descriptive Physical Oceanography”, Oxford & IBH, New Delhi,2000
2. Stewart R. H.,“Introduction to Physical Oceanography”, E - Book, 2005
3. Sverdrup H.U.,“The Oceans, their Physics, Chemistry and General Biology”, Prentice Hall, 1969
4. JohnA.K., and Newell G.,“IntroductiontoPhysicalOceanography”,3rdEdition,Waveland Press, Inc., 2017

Reference Books

1. Sussman, J.M.,Pickard G.L., EmeryW.J, “Perspectives Descriptive Physical Oceanography: An Introduction, 1992
2. McLellan, Hugh J., “Elements of Physical Oceanography”, Pergamon Press (New York), 1965
3. Steele, John H, “Elements of Physical Oceanography: A Derivative of the Encyclopedia of Ocean Sciences”, Academic Press, 2010.

Web References

1. http://nptel.iitm.ac.in
2. Ocean Structures and Materials by Dr. Srinivasan Chandrasekaran, Department of Ocean Engineering, IIT Madras. For more details on NPTEL visit http://nptel.iitm.ac.in

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write a any two wave characteristics.
2. What is SOFAR channel?
3. Define El Nino and La Nina.
4. Write a short note on floating structures.

L2: Understand

5. Describe the Conservation equations and transport processes.
6. Explain wind driven currents in the world ocean
7. Explain wind stress Ekman spiral.
8. Describe fixed, semi-submersibles system.

L3: Apply

9. Enumerate and briefly discuss the various types of ocean structures and systems. for exploitation and production of oil and gas,
10. Discuss the Equatorial current systems.
11. List different materials for marine applications. Explain them in detail.
12. How do you design and construct floating structures.

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

OE 20CEO03 Disaster Risk Mitigation and Management 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20CEO03.1	Identifyvarioustypesofdisasters,theircauses,effects&mitigationmeasures	-	L1,L2
20CEO03.2	Understand various phases of disaster management cycle and createvulnerabilityandriskmaps		L1, L2
20CEO03.3	Understand the approaches of risk and vulnerability		L1, L2
20CEO03.4	Explain the concept of disaster management and emerging approaches		L1, L2
20CEO03.5	Understandthemitigation measures		L1, L2
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

UNIT I:Natural Disasters 9 Hours

Natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.
Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation.

Ozone Depletion

UnitII:Disaster Management Principles 9 Hours

Evolution of disaster risk management concept Disaster management cycle – Prevention, Preparedness, Mitigation, Rescue and Recovery Integrated and Comprehensive disaster risk reduction approach,Strategies and Policies.

Disaster management cycle

UnitIII: Risk and vulnerability 9 Hours

Hazard, risk and vulnerability: Physical, social and economic dimensions, Vulnerability in changing climate, Climate change and Disasters, Risk Analysis Techniques, Risk: Identification, reduction and transfer, Approaches to mapping social vulnerability, Participatory disaster risk assessment, Action plans, Strategy for survival.

Vulnerability in changing climate

UNIT IV: Disaster Management 9 Hours

Preparedness through (IEC) Information, education & communication,pre-disasterstage(mitigation),Effecttomitigatenaturaldisasteratnationalandgloballevels. International strategy for disaster reduction.
Emerging approaches in Disaster Management-Concept of disaster management, national disaster management framework, financialarrangements, role of NGOs, community –based organizations and media.

National disastermanagement framework

UNIT-V:Risk Mitigation 9 Hours

Definition, Concept, Importance, Guiding Principles, Tools, Approaches, StrategiesSustainable Development, Sustainable Land Use Planning, Technology and the Environment. Emerging Technologies in Disaster Mitigation, Remote Sensing, GIS, Disaster Mapping, Aerial Photography, Land Use Zoning

Emerging technologies in disaster mitigation

TextBooks

1. Khanna,B.K.,"Disasters: Allyouwantedtoknowabout",NewIndiaPublishingAgency,New Delhi, 2005
2. Edwards,B.," NaturalHazards",Cambridge UniversityPress,U.K., 2005
3. Chakraborty,S.C.,"NaturalHazardsandDisasterManagement",PargatishilProkashak,Kolkata, 2007

Reference Books

1. Sahni,P., "DisasterMitigationExperiencesandReflections",PrenticeHallofIndia,NewDelhi, 2002
2. Prashant K. Srivastava, Sudhir Kumar Singh, Mohanty, U. C., Tad Murty, "Techniques for Disaster Risk Management and Mitigation", 2020

Web References

1. https://books.google.com
2. http://cbseacademic.nic.in

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define climatic change
2. List any four effects of natural disasters
3. Define disaster Management

L2: Understand

1. Explain about risk assessment
2. Outline the principles of disaster management
3. Differentiate between hazard, risk and vulnerability

CONTROL COPY ATTESTED

Chairman
Board of Studies

OE 20CS404 Operating Systems 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20CS404.1	Describe the structure, components and functionalities of operating system	-	L1, L2
20CS404.2	Describe the process management activities of operating system		L1, L2
20CS404.3	Illustrate the use of process synchronization tools		L1, L2
20CS404.4	Describe the various memory management and allocation techniques		L1, L2
20CS404.5	Demonstrate different secondary storage management strategies and file system		L1, L2
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit I: Introduction to Operating System Concepts 9 Hours

What Operating System Do, OperatingSystem Operations, Process Management, Memory Management, Storage Management, Protection and Security, Computing Environments, OperatingSystems Services, System Call, Types of System Call, OperatingSystem Generation, System Boot

The Shell, Mobile Operating System, Choice of Interface

Unit II: Process Management 9 Hours

Process Concept:The Process, Process State, Process Control Block, Threads, Process Scheduling: Scheduling Queues, Schedulers, Context Switch, Operations on Processes, Inter Process Communication, Multithread Programming: Overview, Benefits, Multithreading Models, Process Scheduling:Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

Process Termination, Multiprocess Architecture

Unit III: Synchronization 9 Hours

Background, The Critical-section problem, Peterson's Solution, Synchronization hardware, Semaphores, Classic Problems of Synchronization, Monitors, Deadlocks:System Model, Deadlock Characterization, Methods for Handling Deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

Transactional Memory, Two Phase Locking

Unit IV: Memory Management 9 Hours

Background, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table, Virtual Memory Management:Background, Demand paging, Page replacement, Thrashing, Mass-Storage Structure: Overview of Mass-Storage Structure, Harddisk Drives, Volatile Memory, HDD Scheduling-FCFS Scheduling, SCAN Scheduling of a Disk-Scheduling Algorithm.

Buddy System, Prepaging

Unit V: File system Interface 9 Hours

File Concept, Access Methods, Directory and Disk Structure, File System Mounting, File Sharing, Protection, ImplementingFile Systems:File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Consistency Checking, Malware, Denial of service

Text Books

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", TenthEdition,John Wiley and Sons Inc., 2018
2. William Stallings,"Operating Systems - Internals and Design Principles", Ninth Edition, Pearson, 2018

Reference Books

1. Andrew S. Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson, 2015
2. Charles Crowley,"Operating Systems: A Design-Oriented Approach",First Edition, Tata McGrawHill Education,

2001
3. Dhananjay M. Dhamdhere,"Operating Systems: A Concept-Based Approach", Third Edition, McGrawHill Higher Education, 2017

Web Resources

1. http://nptel.ac.in/downloads/106108101/
2. https://www.coursera.org/learn/iot/lecture/MrgxS/lecture-3-1-operating-systems
3. https://www.geeksforgeeks.org/operating-system-introduction-operating-system-set-1/
4. https://www.unf.edu/public/cop4610/ree/Notes/PPT/PPT8E/CH12-OS8e.pdf
5. https://in.udacity.com/auth?next=/course/introduction-to-operating-systems--ud923

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	50	40
L2	50	60
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Operating System
2. What are operating system services?
3. List any four types of system calls
4. What is a process? List any four fields of process control block
5. What are the necessary conditions for a deadlock?
6. Differentiate between binary and counting semaphore.
7. What are the various attributes that are associated with an opened file?

L2: Understand

1. Discuss the essential properties of operating systems -Batch, Interactive, Timesharing Real time and Distributive
2. Explain how multiprogramming increases the utilization of CPU
3. Why system calls are needed in operating system?
4. Distinguish between logical address and physical address
5. What is the difference between a process and thread?
6. How does the system detect thrashing? What can the system do to eliminate this problem?
7. Consider the following four processes represented as (Process, Arrival Time,Burst Time) with the length of CPU burst in milliseconds.
   { (P1, 0, 10), (P2, 1, 7), (P3, 2, 13), (P4, 3, 11) }. Using preemptive SJFscheduling: (i) Draw Gantt chart
   (ii) Calculate average waiting time.
8. Why semaphores are important? Suggest the solution for bounded bufferproblem with semaphores
9. Explain the steps involved in handling a page fault with aneat sketch

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

OE 20AIO03 Fundamentals of AI 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20AIO03.1	Describe the foundational principles of artificial intelligence		L1, L2
20AIO03.2	Formalise the given problem using different AI methods		L1, L2
20AIO03.3	Explain different concepts of logic		L1, L2
20AIO03.4	Describe the different methods of knowledge representation		L1, L2
20AIO03.5	Explain the principles and applications of expert systems		L1, L2
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit 1: Introduction to Artificial Intelligence 9 Hours

Introduction – History - Intelligent systems - Foundations of AI – Applications – Tic-Tac-Tie game playing - Development of AI languages - Current trends in AI

Unit II: Problem Solving 9 Hours

Problem solving: State-Space search and Control strategies:Introduction - General problem solving - Characteristics of problem - Exhaustive searches - Heuristic search techniques - IterativedeepeningA* - Constraint satisfaction - Problem reduction and game playing: Introduction - Problem reduction - Game playing - Alphabeta pruning - Two-player perfect information games

Unit III: Logic concepts 9 Hours

Introduction -Propositional calculus - Proportional logic - Natural deduction system - Axiomatic system - Semantic tableau system in proportional logic - Resolution refutation in proportional logic

Unit IV: Knowledge Representation 9 Hours

Introduction - Approaches to knowledge representation - Knowledge representation using semantic network - Extended semantic networks for KR - Knowledge representation using frames - Advanced knowledge representation techniques: Introduction - Conceptual dependency theory - Script structure - Cyctheory - Case grammars

Unit V: Expert Systems 9 Hours

Expert system and applications: Introduction - Phases in building expert systems - Expert system versus traditional systems - Rule-based expert systems - Blackboard systems - Truth maintenance systems - Application of expert systems

Text Books

1. Stuart Russel and Peter Norvig, “Artificial Intelligence: A Modern Approach”, Fourth Edition, Pearson Education, 2020
2. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education, 2007

Reference Books

1. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
2. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
3. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013

Web Resources

1. https://nptel.ac.in

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. State the tasks which are associated with A.I.
2. Give an example of script-arithmetic problem.
3. Define Script
4. Recall Intelligence

L2: Understand

1. Explain Turing Test.
2. Explain the characteristics of production system.
3. Write A* algorithm in detail and explain its functionality to solve 8-puzzle problem.
4. Explain the semantic analysis phase done through case grammars in Natural Language understanding

CONTROL COPY ATTESTED
Chairman
Board of Studies CSE (AI&ML)

OE 20DSO03 Introduction to Big Data 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20DSO03.1	Identify the Knowledge of Big Data	-	L1, L2
20DSO03.2	Demonstrate Hadoop Framework for handling Big Data		L1, L2
20DSO03.3	Illustrate the Architectural Concepts of HDFS in Hadoop Ecosystem		L1, L2
20DSO03.4	Illustrate MapReduce Framework		L1, L2
20DSO03.5	Explain Spark & RDD		L1, L2
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit I: Introduction to Big Data 9 Hours

What is Big Data, Evolution of Big Data, Types of Big Data, Sources of Big Data,5Vs of Big Data, Big Data Analytics, Big Data Applications, Google File System

Uses of Big Data in Retail Industry

Unit II: Introduction to Hadoop 9 Hours

Introducing Hadoop, Hadoop History, Hadoop-definition,Comparing SQL Databases and Hadoop, Hadoop Cluster, Hadoop Modes, Hadoop Features, The building blocks of Hadoop, NameNode, DataNode, Secondary NameNode, JobTracker, Task Tracker

Hadoop Cluster

Unit III: Hadoop Ecosystem &HDFS 9 Hours

Hadoop and its Ecosystem, Hadoop Ecosystem Components, Hadoop Ecosystems Tools, Hadoop Distributed File System, Concept of Block in HDFS Architecture, Features of HDFS, HDFS Read and Write Mechanism, Rack awareness in HDFS, Introducing HBase, Hive, Pig

HDFS Read/Write

Unit IV: Introduction to MapReduce 9 Hours

Hadoop MapReduce Framework, Architecure, Phases, Mapreduce Job Types, Uses of MapReduce, Techniques to Optimize MapReduce Jobs, Limitations of MapReduce.

MapReduce Phases

Unit V: Introduction to Spark and RDD 9 Hours

Introduction to Spark, Dataframes - Dataframes role in Spark, Introduction to RDD, RDD operations, Creating RDDs, RDD Operations, Working with Key/Value Pairs.

Dataframes

Text Books

1. DT Editorial Services, “Big Data – Hadoop2, MapReduce, Hive, YARN, Pig, R and Data Visualization”, Black Book, DreamTech Press, 2019.
2. Sridhar Alla, “Big Data Analytics with Hadoop 3” - Packt Publications, 2018.
3. Holden Karau, Andy Konwinski, Patrick Wendell &MateiZaharia, “Learning Spark” O’reilly Publications,2015.

Reference Books

1. Chuck Lam, “Hadoop in Action”, 1st Edition, MANNING Publications, 2016.
2. Balamurugan Balusamy, Nandhini Abirami R, SeifedineKadry, Amir H. Gandomi, “Big Data: Concepts, Technology, and Architecture” 1st Edition, Wiley Publications, 2021.
3. Thomas Erl, Wajid Khattak, Paul Buhler, “Big Data Fundamentals: Concepts, Drivers &Techniques”, 1st Edition,Pearson Publications, 2016.

Web Resources

1. https://hadoop.apache.org/
2. https://spark.apache.org/

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Big Data.
2. List the characteristics of Big Data.
3. Define Hadoop.
4. What are Hadoop components?
5. What are RDD operations?

L2: Understand

1. Explain HDFS Read & Write mechanism.
2. Explain Rack awareness in HDFS.
3. Explain MapReduce workflow in detail.
4. Describe the working with Key/value pairs in RDDs.

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE-DS)

OE 20ECO03 Privacy and Security in IoT 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20ECO03.1	Understand the basic knowledge of cryptography, networking and web security	-	L1, L2, L3
20ECO03.2	Explain Architecture of IoT and its Applicaations		L1, L2, L3
20ECO03.3	Understand the Attacks against IoT system		L1, L2, L3
20ECO03.4	Explain Secure Bootstrapping for IoT Sytem		L1, L2, L3
20ECO03.5	Understand the IoT system security and Trust zone		L1, L2, L3

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

UnitI: Introduction to Cryptography and Network Securitys **9 Hours**

Cryptography , networking,Web Security: Secure socket layer and transport layer security, System Security: Intruders , Viruses and related threads, trusted systems.

Secure Shell (SSH)

Unit II: Introduction to IoT **9 Hours**

Internet of Things (IoT) ,Need of IoT,Applications,Architecture,Enabling technologies, IoT security and privacy.

IoT protocols

Unit III: Attacks against IoT **9 Hours**

Attacks against IoT system (hardware + software) ,Aattacks against IoT network protocols ,Attacks against industry IoT

Attacks against Web systems

Unit IV: Secure Bootstrapping for secure IoT system **9 Hours**

Ttrustedboot,Secureboot,TPM and its usages,Remote attestation ,tamper resistant-proof-response hardware and its usage

Bootatraping for IoT

Unit V: IoT System Security and TrustZone **9 Hours**

System security ,TrustZone hardware architecture,TrustZone software architectures.

Web security

Text Books

1. Syed Rameem Zahra, Mohammad Ahsan Chishti ,"Security and Privacy in the Internet of Things " 1stEdtion ,Chapman & Hall, 2020
2. Fei Hu ,"Security and Privacy in Internet of Things (IoTs) Models, Algorithms, and Implementations",1st Edition CRC Press

Reference Books

1. Ravi Ramakrishnan, Loveleen Gaur "Internet of Things Approach and Applicability in Manufacturing" ,1stEdtion ,Chapman & Hall, 2019
2. Vijay Madisetti, ArshdeepBahga, Internet of Things, "A Hands on Approach", UniversityPress,2015

Web Resources

1. https://lss.at.ufl.edu/help.shtml
2. http://cms.uflib.ufl.edu/ask

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What iscryptography ?
2. List the applications of IoT
3. What is Attacks against IoT system?

L2: Understand

1. Explain about networking
2. Explain Enabling technologies of IoT
3. Explain Aattacks against IoT network protocols

L3: Apply

1. Discus about web security
2. Write about Architecture of IoT
3. Explain Attacks against industry IoT

CONTROL COPY ATTESTED

Chairman
Board of Studies(ECE)

OE 20EEO03 Low Cost Automation 3 0 0 3

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

Code	Course Outcomes	Mapping with PO's	DoK
20EEO03.1	Understanding automation of assembly lines	-	L2
20EEO03.2	Automation Using Hydraulic Systems		L2
20EEO03.3	Describe Automation Using Pneumatic Systems		L2
20EEO03.4	Explain Automation Using Electronic Systems		L2
20EEO03.5	Explain Assembly Automation		L2
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge			

UNIT I :Automation Of Assembly Lines **9 Hours**

Concept of automation-mechanization and automation - Concept of automation in industry - mechanization and automation - classification, balancing of assembly line using available algorithms -Transfer line-monitoring system (TLMS) using Line Status - Line efficiency - Buffer stock Simulation in assembly line

Transfer line-monitoring system (TLMS) using Line Status ,Line efficiency

UNIT II: Automation Using Hydraulic Systems **9 Hours**

Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. - Selection of hydraulic fluid, practical case studied on hydraulic circuit design and performance analysis - Servo valves, electro hydraulic valves, proportional valves and their applications.

Servo valves, electro hydraulic valves, proportional valves and their applications.

UNIT-III: Automation Using Pneumatic Systems **9 Hours**

Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods – step counter method - compound circuit design - combination circuit design. Pneumatic equipments - selection of components - design calculations -application - fault finding – hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

Low cost automation - Robotic circuits.

UNIT-IV :Automation Using Electronic Systems **9 Hours**

Introduction - various sensors – transducers - signal processing - servo systems - programming of microprocessors using 8085 instruction - programmable logic controllers

programming of microprocessors using 8085 instruction - programmable logic controllers

UNIT-V:Assembly Automation **9 Hours**

Types and configurations - Parts delivery at workstations - Various vibratory and non vibratory devices for feeding - hopper feeders, rotary disc feeder, centrifugal and orientation - Product design for automated assembly.

Product design for automated assembly.

Text Books

1. Anthony Esposito, "Fluid Power with applications", Prentice Hall international, 2009.
2. Mikell P Groover-"Automation, Production System and Computer IntegratedManufacturing", Prentice Hall

Publications, 2007.

Reference Books

1. Kuo .B.C, “Automatic control systems”, Prentice Hall India, New Delhi, 2007.
2. Peter Rohner, “Industrial hydraulic control”, Wiley Edition, 1995.
3. Mujumdar.S.R, “Pneumatic System”, Tata McGraw Hill 2006.

Web References

1. https://nptel.ac.in/courses/19102011

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is automation?
2. What isPneumatic fundamentals?
3. What istransducers?
4. What is switching circuits?
5. What is Buffer stock Simulation?

L2: Understand

1. Explain Line efficiency.
2. Explain Selection of hydraulic fluid.
3. Explain Pneumatic equipments
4. Explain programmable logic controllers.
5. Explain Parts delivery at workstations.

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

OE 20MEO03 Industrial Automation 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20MEO03.1	Identify various concepts of automation and work part transport mechanisms.	-	L2
20MEO03.2	Illustrate the assembly systems and their applications.	-	L3
20MEO03.3	Describe the importance of handling systems and identification systems.	-	L3
20MEO03.4	Apply the concepts of part families and machine cells into various production systems	-	L2
20MEO03.5	Recognize the importance of automated inspection and to distinguish the various control systems	-	L2

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

Unit I: Manufacturing and Automation-Over View 9 Hours

Production systems, Automation in production systems, Automation principles and strategies, Reasons for Automation, Manufacturing operations, Functions in Manufacturing, Information processing in Manufacturing plant layout, production facilities. Basic elements of an automated system, levels of automation; Hardware components for automation and process control, programmable logic controllers and personal computers. Automation for machining operations.

Unit II: Assembly Systems and Line Balancing 9 Hours

Process-Assembly lines-manual single stations assembly, Manual assembly line, automated assembly system-Line balancing. Automated Assembly Systems – Design for automated assembly-Types of automated assembly systems-Parts feeding devices

Unit III: Automated Material Handling Systems 9 Hours

Automated Material Handling and storage system: Material Handling and Identification Technologies: Material handling, equipment, Storage systems, performance and location strategies, Automated storage systems, AS/RS, types. Functions, material handling equipment-Conveyors, AGVS, Industrial Robots-Anatomy, Robot configurations, work volume-AS/RS. Automatic identification methods, Barcode technology, RFID

Unit IV: Manufacturing Cells 9 Hours

Manufacturing Systems and Automated Production Lines: Manufacturing systems: components of a manufacturing system, Single station manufacturing cells, Automated production lines, Applications, Transfer lines

Unit V: Control Systems 9 Hours

Control Systems-Process Industries Versus Discrete Manufacturing Industries, Continuous Versus Discrete Control: Continuous Control Systems, Discrete Control Systems, Computer Process Control: Control Requirements, Capabilities of Computer Control.

.

Text Books

1. Milkell P. Groover, Automation, Production Systems and Computer Integrated Manufacturing, Kindle Edition, Prentice Hall of India, 2016.

Reference Books

1. C. Roy, “Robots and Manufacturing Automation”, Asfahl John Wiley Sons Krishna Kant, “Computer Based Industrial Control”, EEE-PHI, 2nd Edition, 2010

Web References

1. www.nptel.iitm.ac.in
2. www.btechguru.com

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What is industrial automation?
2. What are the different costs included in industry in designing the particular product ?
3. What is production volume?
4. List the categorization of production system.
5. What are the types of automation?
6. What are the features of Flexible Automation?
7. What is factory type of Integral automation?
8. Define process.
9. What are process variables?
10. What is meant by control system in automation?

L2: Understand

1. Explain Automation principles and strategies
2. Compare Manual assembly line, automated assembly system
3. Illustrate Material handling, equipment, Storage systems, performance and location strategies
4. Demonstrate components of a manufacturing system
5. Compare Continuous Control Systems, Discrete Control Systems

L3: Apply

1. Apply the basic elements of an automated system for industrial automation
2. Apply different types of automated assembly systems for moderate plants
3. Apply the Barcode technology, RFID for industrial automation
4. Discuss Automated production lines, Applications, Transfer lines
5. Design the capabilities of computer control systems

CONTROLCOPYATTESTED

Chairman

Board of Studies (ME)

OE 20SHO02 Design Thinking 3 0 0 3

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

Code	Course Outcomes	Mapping with Pos	DoK
20ME021.1	Explain the fundamentals of Design Thinking and innovation	-	L2
20ME021.2	Empathize and analyse model action plan		L2
20ME021.3	Describe the principles of innovation and idea generation for product design		L2
20ME021.4	Apply design thinking techniques for given tasks		L2
20ME021.5	Apply the design thinking techniques for solving problems in various sectors		L3
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK: Depth of Knowledge			

Unit I: Introduction to Design Thinking 9 Hours

Introduction to elements and principles of Design, basics of design-dot, line, shape, form as fundamental design components. Principles of design. Introduction to design thinking, history of Design Thinking, New materials in Industry

Unit II: Design Thinking 9 Hours

Design thinking process (empathize, analyze, idea & prototype), implementing the process in driving inventions, design thinking in social innovations. Tools of design thinking - person, costumer, journey map, brain storming, product development

Unit III: Innovation 9 Hours

Art of innovation, Difference between innovation and creativity, role of creativity and innovation in organizations. Creativity to Innovation. Teams for innovation, Measuring the impact and value of creativity. Product Design: problem formation, introduction to product design, Product strategies, Product value, Product planning, product specifications

Unit IV: Design Thinking for Strategic Innovation 9 Hours

An exercise in design thinking – implementing design thinking for better process. Implement design thinking process in various Industries. Design thinking for Start-ups

Unit V: Design thinking in Various Sectors 9 Hours

Case studies in Information Technology, Finance, Education, Management and Retail sector. Analyze and Prototyping, Usability testing, Organizing and interpreting results

Case study learning outcomes:

1. Make use of practical design thinking methods in every stage of problem with the help of method templates
2. Apply design thinking to a problem in order to generate innovative and user-centric solutions
3. Empathize with end user and initiate a new working culture based on user-centric approach
4. Prototype and run usability tests for unbiased examination of the product in order to identify problem

Text Books

1. Tim Brown, Harper Bollins, Change by Design, 2009
2. David Lee, Design Thinking in the Class Room, Ulysses Press

Reference Books

1. Design the Future, Shrrutin N Shetty, Norton Press
2. William Lidwell, Kritina Holden, Jill Butter, Universal Principles of Design

3. Chesbrough H., The Era of Open Innovation
4. Chitale A. K. and Gupta R. C., Product Design and Manufacturing, Prentice Hall

Web References

1. https://nptel.ac.in/courses/110106124
2. https://onlinecourses.nptel.ac.in/noc19_mg60/preview
3. www.tutor2u.net/business/presentations/. /productlifecycle/default.html
4. https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
5. www.bizfilings.com › Home › Marketing › Product Development
6. https://www.mindtools.com/brainstm.html
7. https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit
8. www.vertabelo.com/blog/documentation/reverse-engineering https://support.microsoft.com/en-us/kb/273814
9. https://support.google.com/docs/answer/179740?hl=en
10. https://www.youtube.com/watch?v=2mjSDIBaUIM
11. thevirtualinstructor.com/foreshortening.html
12. https://dschool.stanford.edu/.../designresources/.../ModeGuideBOOTCAMP2010L.pdf
13. https://dschool.stanford.edu/use-our-methods/ 6.
14. https://www.interactiondesign.org/literature/article/5-stages-in-the-design-thinking-process 7.
15. https://www.nngroup.com/articles/design-thinking/ 9.
16. https://designthinkingforeducators.com/design-thinking/ 10.
17. www.designthinkingformobility.org/wp-content/.../10/NapkinPitch_Worksheet.pdf

Activity Based Learning (Suggested Activities in Class) / Practical Based learning

http://dschool.stanford.edu/dgift/

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. What do you mean by design thinking?
2. How design thinking works within a product development process

L2: Understand

1. Explain the elements and principles of design
2. Differentiate between creativity and innovation

L3: Apply

1. How design thinking helped financial sector to gain the consumer 'trust'?

CONTROL COPY ATTESTED

Chairman
Board of Studies(BS & H)

HS 20HSX04 Professional Ethics 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20HSX04.1	Understand the ethics and apply ethics in society	-	L1, L2, L3
20HSX04.2	Discuss the ethical issues related to engineering and realize the responsibilities and rights in the society		L1, L2, L3
20HSX04.3	Know the code of ethics and industrial standards		L1, L2, L3
20HSX04.4	Understand the rights and responsibilities of an employee at workplace		L1, L2, L3
20HSX04.5	Understand environmental ethics and CSR of companies		L1, L2, L3
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit I: Introduction to Ethics 9 Hours

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

Unit II: Engineering Ethics 9 Hours

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

Unit III: Engineering as Social Experimentation 9 Hours

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

Unit IV: Safety, Responsibilities and Rights 9 Hours

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

UnitV: Global Issues 9 Hours

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

Text Books

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

Reference Books

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

Web References

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

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

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

L2: Understand

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

CONTROL COPY ATTESTED

Chairman
Board of Studies(BS & H)

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

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

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

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

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

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

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

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

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

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

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

Unit V : Report Writing **9 Hours**

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

Text Books

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

Reference Books

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

Web References

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

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

HO 20CEH04Structural failure Protection Using AI 4 0 0 4

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

Code	Course Outcomes
20CEH02.1	Diagnose the distress in the structure understanding the causes andfactors
20CEH02.2	Assess the health of structure using static fieldmethods
20CEH02.3	Assess the health of structure using dynamic fieldtests
20CEH02.4	Explore the Neural Networks and its functioning
20CEH02.5	Develop the algorithm and the applications of neural networks to structural behaviour.

Unit I: Structural Health **9 Hours**

Factors affecting Health of Structures, Causes of Distress, Regular Maintenance

Unit II: Structural Health Monitoring and Structural Audit **9 Hours**

Concepts, Various Measures, Structural Safety in Alteration. Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Unit III: Static Field Testing& Dynamic Field Testing **9 Hours**

Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement. Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

Unit IV: Artificial Neural Networks **9 Hours**

Introduction to ANN- Inspiration and representation for Neural Network -feed forward and feedback networks-Introduction to the Activation Function- activation networks.

Unit V :Counterpropagation and Back Propagation Neural Networks **9 Hours**

Introduction- Algorithm writing-Kohonen layers- Outstar& Instar- hidden layer – Applications of Neural Networks to Structural Behavior.

Text Books

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, “Structural Health Monitoring”, Wiley-ISTE; 1st Edition, 2006

Reference Books

1. Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes,“Structural Health Monitoring”, John Wiley and Sons,2006
2. Ou, J. P., Li, H., Duan, Z. D. and Taylor and Francis Group,“Structural Health Monitoring and Intelligent Infrastructure”, Volume 1, London, UK,2006
3. Victor Giurglutiu,“Structural Health Monitoring with Wafer Active Sensors”, Academic Press Inc.,2007

Web References

1. https://www.javatpoint.com/artificial-neural-network
2. https://towardsdatascience.com/simply-deep-learning-an-effortless-introduction-45591a1c4abb
3. https://www.slideshare.net/mentelibre/counterpropagation-network

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

HO 20CEH05 Architecture and Town Planning 4 0 0 4

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

Code	Course Outcomes
20CEH05.1	Gain knowledgeofdesignelementsofarchitecture
20CEH05.2	Reviewtheindustrial revolution
20CEH05.3	Understandtheconceptsof townplanning
20CEH05.4	Applythegeneral principlesandtechniquesoftownplanning
20CEH05.5	Understand the town planning standards and technique

UnitI:Elements and Principles 12 Hours

ElementsofDesign: Linedirection.Shape,size,texture,valueandcolour,balance,scaleandproportion.
Principles of Design: Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 Dcompositions.

Unit II: The Industrial Revolution 12 Hours

The Industrial Revolution: The age of revivals, the emergence of engineer, new materials andtechniquesand theevolution of balloonframe and steel frame.
Origin of Modern Architecture: definition and concept of modern architecture, various pioneers ofmodernarchitecture.

Unit III: TownPlanning 12 Hours

Definitionandmeaning,ageof planning,scopeandmotivesofplanning,briefhistoryof town planning, its origin and growth, historically development of town planning in ancient valleycivilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planningNew Concepts: Garden city movement, Linear city and concentric city concepts, Neighbourhood andRadburm,La-cite industrille, Radiantcityto presentdayplanning.

Unit IV: Planning Principles 12 Hours

Types of town and their functions, types of town planning – Grid Iron, Radial,Spiderwebs, Irregular andMixed, theiradvantages and disadvantages.

Unit V: Planning Practice and Techniques 12 Hours

Zoning – its definition, procedure and districts, height and bulkzoning, F. A. R., Master Plan – Meaning, preparation and realization, the scope of city planning – cityrehabilitationand slumclearance.

Text Books

1. Hiraskar, G. K., “The great ages of World Architecture”, Dhanpat Rai Publishing Co. Pvt. Ltd., 2018
2. Sane, Y. S.,“Planning and Design of Buildings by Section of Architecture”
3. Krishnamurthy, G. K. and Ravindra,S. V., “Professional Practice”, PHI Learning, New Delhi, 2020

Reference Books

1. Cherry and Gordon,”UrbanPlanningProblems”BoardHill,London,1974
2. Sundaram,K. V.,”Urban and Regional Planning in India”, Vikas Publishing HousePvt. Ltd.,NewDelhi,2000
3. Gallion,A.B. and Eisner, S.,“TheUrbanPattern”VanNostrandreinhold,NewYork,1993

Web References

1. NPTEL :: Architecture - NOC:Introduction to Urban Planning
2. NPTEL :: Architecture - NOC:Housing Policy & Planning
3. Architecture and Town Planning lectures - Bing

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

HO 20CEH06 Safety Analysis and Risk Management 4 0 0 4

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

Code	Course Outcomes
20CEH02.1	Gain knowledge in devising safety policy and procedures to be adopted to implement total safety in a plant
20CEH02.2	Become a skilled person in hazopardhazarel analysis and able to find out the root cause of an accident
20CEH02.3	Illustrate how to handle the risk and analyzing the consequences.
20CEH02.4	Analyze the consequence of risk.
20CEH02.5	Manage the safety activities in the construction Industry with various case studies.

Unit I: Concepts of safety **12 Hours**

Hazard classification chemical, physical, mechanical, ergonomics, biological and noise hazards – Hazards from utilities like air, water, steam.

Unit II: Hazard identification **12 Hours**

Safety Audits – Checklists – What if Analysis – HAZAN – HAZOP – Vulnerability models – Event tree and Fault tree Analysis – Past accident analysis – Flix borough – Mexico – Bhopal – Madras – Vizag accident analysis.

Unit III: Hazard and operability Analysis **12 Hours**

Principles – Risk ranking – Guide word – Parameter – Deviation – Causes – Consequences – Recommendation – Coarse HAZOP study – Case studies – Pumping system – Reactor System – Mass transfer system.

Unit IV: Introduction to Consequence Analysis **12 Hours**

Fire and Explosion models: Radiation – Tank on fire – Flame length –Risk analysis- Radiation intensity calculation and its effect to plant, people & property, UCVCE -Explosion due to – Deflatration – Detonation – TNT, TNO & DSM model – Over pressure. Methods for determining consequences effects: Effect of fire- Effects of explosion – Risk contour – Flash fire – Jet fire – Pool fire – BLEVE – Fire ball

Unit V : Safety Management **12 Hours**

Safety management function, line versus staff authority, safety responsibility and accountability in construction industry.Case based reasoning, case indexing, retrieval, accident prevention and forecasting.

Text Books

1. Blake, R.P., “Industrial Safety”, Prentice Hall, 1953.
2. Lees, F.P., “Loss Prevention in Process Industries”, 2nd Edition, Butterworth Heinemann, 1996.
3. K. V. Raghavan and A A. Khan, “Methodologies in Hazard Identification and Risk Assessment”, Manual by CLRI, 1990.
4. V. C. Marshal, “Major Chemical Hazards”, Ellis Horwood Ltd., Chichester, United Kingdom. 1987.

Reference Books

1. Geoff Wells, “Hazard Identification and Risk Assessment”, I.ChE.,John Ridley and John Channing, “Safety at Work”, 6th Edition. Butterworth-Heinemann, 2003.
2. “A Guide to Hazard Operability Studies”, Chemical Industry Safety and Health Council, 1977.
3. Safety Management by John V. Grimaldi, (1996). AITBS Publishers & Distributors, New Delhi, India.
4. Construction Project Administration by A.A.Kwakye, (1997), Adisson Wesley Longman, London.

Web References

1. https://www.britsafe.org/training-and-learning/find-the-right-course-for-you/informational-resources/risk-assessment/
2. https://www.ready.gov/risk-assessment
3. https://www.youtube.com/results?search_query=safety+management+and+risk+analysis

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

HO **20CEH07 Intelligent Transportation Networks** **4 0 0 4**

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

Code	Course Outcomes
20CEH07.1	Understand ITS, AVL& GIS
20CEH07.2	Understand ITS Systems and TMC
20CEH07.3	UnderstandATMS,ATIS and CVO New technologies AVCS,APTS and ARTS
20CEH07.4	Explain the Advanced Transportation Management System
20CEH07.5	Summarize ITS issues in terms of various factors and emerging issues

UnitI:Introduction to Intelligent Transportation Systems (ITS) **12 Hours**

Definition of ITS and Identificationof ITS Objectives, Historical Background, Benefits of ITS -ITS Data collection techniques – Detectors,AutomaticVehicleLocation(AVL),AutomaticVehicleIdentification(AVI),GeographicInformationSystems(GIS), video data collection.

Unit II:Telecommunications in ITS **12 Hours**

ImportanceoftelecommunicationsintheITSsystem,InformationManagement,TrafficManagementCentres(TMC).Vehicle–Roadsidecommunication– Vehicle Positioning System.

Unit III: ITS functional areas **12 Hours**

Advanced Traffic Management Systems (ATMS), Advanced TravelerInformation Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced VehicleControl Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced RuralTransportationSystems (ARTS).

Unit IV: ITS User Needs and Services **12 Hours**

ITSUserNeedsandServices–TravelandTrafficmanagement,PublicTransportationManagement,ElectronicPayment,CommercialVehicleOperations,EmergencyManagement,AdvancedVehiclesafetysystems,InformationManagement.

Unit V: ITS Applications **12 Hours**

Automated Highway Systems - Vehicles in Platoons – Integration of Automated HighwaySystems.ITSProgramsintheWorld–OverviewofITSimplementationsindevelopedcountries,ITSin developing countries

Text Books

1. KanPaulChen,JohnMiles, “ITSHandBook2000:RecommendationsforWorldRoadAssociation(PIARC)”
2. Sussman,J.M.,“PerspectiveonITS,ArtechHousePublishers”,2005
3. USDepartmentofTransportation,“NationalITSArchitectureDocumentation”,(CD-ROM),2007

Reference Books

1. Sussman, J.M.,“Perspectives on Intelligent Transportation Systems”, Springer, Berlin, 2010

Web References

1. NPTEL :: Civil Engineering - Traffic Engineering & Management
2. Intelligent Transportation System - II (iitb.ac.in)
3. Intelligent Transportation System - I (iitb.ac.in)

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

HO 20CEH08Building Information Modeling 4 0 0 4

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

Code	Course Outcomes
20CEH03.1	Specify the components and systems, by design process to the engineers and contractors
20CEH03.2	Make use of BIM tools for analyzing
20CEH03.3	Be able to plan the use of BIM in building projects and provide the right level of detail.
20CEH03.4	Be able to comply legal and project collaboration requirements
20CEH03.5	Provide the total analysis in a report manner

Unit I: Introduction **12 Hours**

Review of Buildings & Systems Building components and systems (architectural, MEP, structural) - Building vocabulary-Building drawings, specifications-Building design process and roles of owners, managers, designers, engineers and contractors/subcontractors.

Unit II: BIM in Design Coordination **12 Hours**

Develop an advanced understanding of BIM approaches for retrieving, analysing and integrating information to aid decision-making, and using appropriate BIM tools.

Unit III: BIM in Construction Operations **12 Hours**

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

Unit IV: Miscellaneous **12 Hours**

Miscellaneous Applications of BIM Cost Estimating- Energy Modelling- Conflicts/Interference checking- Future of BIM

Unit V : Report Writing **12 Hours**

Submission of the output compiled by the Software

Text Books

1. Dr.dv.HarshulSavla,Dr.Chandrahauns ChavanBuilding Information Modeling: Global & Indian Perspective, NotinPress; 2021

Reference Books

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

Web References

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

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

HO 20CEH09 Traffic Engineering and Management 4 0 0 4

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

Code	Course Outcomes
20CEH09.1	Carry out trafficsurveys
20CEH09.2	Implement traffic systemmanagement
20CEH09.3	Carry out intersection design forsafety
20CEH09.4	Record and analyse accident data and suggestcountermeasures
20CEH09.5	Carry out road safetyaudit

UnitI: Traffic Stream Characteristics 12 Hours

Road user, vehicle and highway characteristics, Fundamental parameters and relations of traffic flow, Traffic stream models. Speed data collection and analysis, Density and travel time measurement and analysis, Moving Observer Method, Automated Traffic Measurements - Traffic forecasting and growth studies. Capacity and level of services of roads. Pedestrian studies – flow characteristics - Design principles of pedestrian facilities.

Unit II: Traffic Management 12 Hours

Parking studies – parking statistics, parking surveys, parking requirements - on street and off street parking. Lay-byes and bus stops. Principles of Traffic Control: Basics of traffic management. Traffic Signs, Road Markings. Traffic System Management – speed, vehicle, parking, enforcement regulations. Mixed traffic regulations – one way, tidal flow, turning restrictions etc.

Unit III: Design of Intersections for Safety 12 Hours

Uncontrolled intersection, Conflicts at intersection, Channelization, Traffic islands, Design of median islands, turning vehicle templates. Traffic intersection control: Traffic Rotaries – design of traffic rotaries. Traffic signal design - Design Principles of Traffic Signal, Coordinated Traffic Signal, Vehicle Actuated Signals and Area Traffic Control. Design of Grade Separated Intersection - trumpet, diamond, cloverleaf and flyovers.

Unit IV: Accident Investigation and Prevention 12 Hours

Characteristics of road accidents, causes of accidents: road – driver – vehicle - environment, Significance of accident data, Accident recording and analysis - Crash reporting and collision diagrams - Statistical Interpretation and Analysis of Crash Data. Identification of potential sites for treatment - Safety countermeasures. Monitoring and evaluation. Roadwaylighting.

Unit V: Road Safety Audit 12 Hours

Overview, stages of road safety audit, audit process, checklists, and elements of good road safety audit. Highway safety improvement program - Safety Education, Traffic Law Enforcement. Road Safety Management System. Case studies.

Text Books

1. Kadiyali L. K., “Traffic Engineering and TransportationPlanning”, 3rd Edition, Khanna Publishers, 2004
2. Mannering and Kilareski, “Highway Engineering and TrafficAnalysis”, 3rd Edition, John Wiley Publications, 2007
3. Roger P. Roess, Elena S.Prassas, William R.McShane, “TrafficEngineering”, 3rd Edition, Prentice Hall, 2004

Reference Books

1. Khanna, S. K., Justo, C. E. G. and Veeraragavan A., Highway Engineering, Nem Chand and Bros, Roorkee,2014
2. Kadiyali, L. R., and Lal, N. B., Principles and Practices of Highway Engineering, Khanna Publishers,2008
3. IRC SP: 88 – 2010
4. Rune Elvik, Alena hoye, TrulsVaa and Michael Sorensen, “The Handbook of Road Safety Measures”, Emerald Group Publishing Limited,2009
5. ITE, Highway Safety Manual, ITE,2010

Web References

1. https://nptel.ac.in/courses/105/101/105101008/
2. https://www.youtube.com/watch?v=5zKC_aq4ypM&list=PLI_6Sjd3m1Meef4k2EpO7q2K-bsTWGa1M

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

HO 20CEH10 Structural Health Monitoring 4 0 0 4

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

Code	Course Outcomes
20CEH04.1	Diagnose the distress in the structure understanding the causes andfactors
20CEH04.2	Assess the health of structure using static fieldmethods
20CEH04.3	Assess the health of structure using dynamic fieldtests
20CEH04.4	Suggest repairs and rehabilitation measures of thestructure
20CEH04.5	Understand the concepts of Internet of Things and to Know basic communication protocols in IoT

Unit I: Structural Health **12 Hours**

Factors affecting Health of Structures, Causes of Distress, Regular Maintenance

Unit II: Structural Health Monitoring and Structural Audit **12 Hours**

Concepts, Various Measures, Structural Safety in Alteration. Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

Unit III: Static Field Testing **12 Hours**

Types of Static Tests, Simulation and Loading Methods, sensor systems and hardware requirements, Static Response Measurement.

Unit IV: Dynamic Field Testing **12 Hours**

Types of Dynamic Field Test, Stress History Data, Dynamic Response Methods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.

Unit V : Internet of Things **12 Hours**

Introduction: Internet of Things Vision, Emerging Trends, Economic Significance, Technical Building Blocks, Physical design of IoT, Things of IoT, IoT Protocols, Logical design of IoT,IoT functional blocks, IoT communication models, IoT Communication APIs, IoT enabling technologies, IoT levels and deployment templates, IoT Issues and Challenges,Applications.

Text Books

1. Daniel Balageas, Claus-Peter Fritzen, Alfredo Güemes, “Structural Health Monitoring”, Wiley-ISTE; 1st Edition, 2006

Reference Books

1. Daniel Balageas, Claus_Peter Fritzen, Alfredo Güemes,“Structural Health Monitoring”, John Wiley and Sons,2006
2. Ou, J. P., Li, H., Duan, Z. D. and Taylor and Francis Group,“Structural Health Monitoring and Intelligent Infrastructure”, Volume 1, London, UK,2006
3. Victor Giurglutiu,“Structural Health Monitoring with Wafer Active Sensors”, Academic Press Inc.,2007

Web References

1. https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-oe05/
2. https://www.youtube.com/watch?v=IHKoohRHRII
3. https://www.iitk.ac.in/ce/test/MoHUPA%20Presentation_Dr.K%20Roy%20_%20Dr.S.Mukhopadhya.pdf

CONTROL COPY ATTESTED

Chairman
Board of Studies

HO 20CEH11GIS and Remote Sensing 4 0 0 4

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

Code	Course Outcomes	Mapping with POs			DoK
		PO1	PO2	PO4	
20CEH11.1	Understand the basic principles of Remote Sensing and GIS techniques	3	2	3	L1, L2
20CEH11.2	Understand the types of sensors and platforms	3	2	2	L1, L2
20CEH11.3	Understand the concepts of visual and digital image analyses	3	2	3	L1, L2
20CEH11.4	Understand the principles of spatial analysis	3	2	2	L1, L2
20CEH11.5	Understandtheapplication of RS and GIS to Civil Engineering	3	2	3	L1, L2

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

UnitI: Fundamental Of Remote Sensing 12 Hours

Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces,Active and Passive Remote Sensing, types of resolutions - advantages & limitations, Types of sensors, image data characteristics, digital image data formats

Advantages and disadvantages of Remotes sensing system

Unit II: Image Analysis 12 Hours

Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification. : Overlay function-vector overlay operations; raster overlay operations, network analysis.

Display of digital image, Keys

Unit III: GIS and Data entry Process 12 Hours

Basic Principles, components, application areas of GIS, map projections, spatial data structures, raster and vector data formats, data inputs, data manipulation, data retrieval, data analysis and data display.

Geo referenced Data, Fundamentals of data quality management

Unit IV: Gis Software 12 Hours

GIS and Image interpretation Software – Salient features – Capabilitiesand Limitations. Data management in public domain GIS software- Attribute DataManagement.

GIS applications, advantages

Unit V: Applications of RS and GIS 12Hours

Land cover and land use, agriculture, forestry, geology, geomorphology, urban & transportation applications,Flood zoning and mapping, groundwater prospects, groundwater quality monitoring and potential recharge zones, watershed management.

GIS case studies, Usefulness in Civil engineering

Text Books

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press.
2. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi.
3. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
4. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
5. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt. Ltd, 2013.

Reference Books

1. 'Remote Sensing and its Applications' by Narayan LRA, Universities Press, 2012.
2. 'Concepts and Techniques of Geographical Information System' by Chor Pang Lo and A K W Yeung, Prentice Hall (India), 2006.

Web References

1. CCRS Canada Centre for Remote Sensing -http://landmap.mimas.ac.uk/ipc/ccrs/fundam_e.html
2. NASA Remote Sensing Tutorial - http://rst.gsfc.nasa.gov/
3. TELSAT, Belgium - http://eoedu.belspo.be/en/guide/index.htm
4. http://www.landsat.org/ (Free)
5. Commercial ERDAS Imagine http://gi.leica-geosystems.com/LGISub1x33x0.aspx

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

HO 20CEH12 Disaster Risk Mitigation **4 0 0 4**

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

Code	Course Outcomes	Mapping with POs				DoK
		PO3	PO6	PO7	PO12	
20CEH12.1	Identifyvarioustypesofnatural disasters,theircauses,effects&mitigationmeasures	2	3	3	1	L1,L2
20CEH12.2	Identify various types of man made disasters, their causes,effects	3	3	3	1	L1, L2
20CEH12.3	Demonstrate the understanding of various phases of disaster management cycle and createvulnerabilityandriskmaps.	2	3	3	1	L2,L3
20CEH12.4	Understandtheuseofemergencymanagement systemtotacklettheproblems	3	3	3	1	L2, L3
20CEH12.5	Tobeinapositiontoprovidethefirstlineresponseintimesofdisaster.	2	3	3	1	L2, L3

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

L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge

UNIT I: Natural Disasters 12 **Hours**

Meaning and nature of natural disasters, their types and effects. Floods, drought,cyclone,earthquakes,landslides,avalanches,Volcaniceruptions,Heatandcoldwaves,Climaticchange:global warming, Sea levelrise, ozonedepletion

UNIT II: **12 Hours**

Man Made Disasters - Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire,forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, roadaccidents,railaccidents, airaccidents,seaaccidents.

UNIT III: **12 Hours**

Disaster Management - Preparedness through (IEC) Information, education & Communication Pre-disasterstage(mitigation),Effecttomitigatenaturaldisasteratnationalandgloballevels.Internationalstrategyfor disasterreduction.

UNIT IV: **12 Hours**

Emerging approaches in Disaster Management-Concept of disaster management, national disastermanagement framework; financial arrangements; role of NGOs, community –based organizations andmedia.

Technology, Definition, Brief History, Technological Society, Technology and the Environment, Emerging Technologies in Disaster Mitigation, Remote Sensing, GIS, Disaster Mapping, Aerial Photography, Land Use Zoning, Emergency Communication, Wireless and Radio, HAM Radio, Worst Scenario Analysis, Emergency Operations Centre, Cost Benefit Analysis, Environment Impact Assessment

UNIT V: **12 Hours**

Central,state,districtandlocaladministration,Armedforcesindisasterresponse;Disasterresponse;Policeand otherorganizations

TextBooks

1. Khanna,B.K.,2005.Disasters: Allyouwantedtoknowabout,NewIndiaPublishingAgency,New Delhi.
2. Edwards,B.,2005.NaturalHazards,Cambridge UniversityPress,U.K.
3. Chakraborty,S.C.,2007.NaturalHazardsandDisasterManagement,PargatishilProkashak,Kolkata.

Reference books

1. Sahni,P.,2002.DisasterMitigationExperiencesandReflections,PrenticeHallofIndia,NewDelhi.
2. Prashant K. Srivastava, Sudhir Kumar Singh, U. C. Mohanty, Tad Murty,2020, Techniques for Disaster Risk Management and Mitigation

Webreferences

https://books.google.com
http://cbseacademic.nic.in

CONTROL COPY ATTESTED
Chairman Board of Studies(CE)

MI 20CEM01 Air Pollution 3 0 0 3

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

Code	Course Outcomes
20CEM01.1	Identify different types of pollution and their sources
20CEM01.2	Identify the meteorological components
20CEM01.3	Outline the impact on local and global effects of air pollution on human, materials, properties and vegetation
20CEM01.4	Explain various types of air pollution control equipment and their working principles
20CEM01.5	Understand sampling methods and monitoring of air pollution

Unit I: Introduction **9 Hours**

Definition of air pollution, Sources and causes of air pollution, Types and classification of air pollution - Natural contaminants, Particulate, Gases and Vapors, Primary and secondary air pollutants

Unit II: Meteorology **9 Hours**

General atmospheric circulation, Atmospheric stability, Effect of meteorology on Plume dispersion, Inversion, Wind profiles and stack plume patterns

Unit III: Effects of Air Pollution **9 Hours**

Effects of air pollution on human beings, plants and animals and properties. Global effects-Green house effect, Ozone depletion, heat island, dust storms, Automobile pollution sources and control, Photochemical smog

Unit IV: Air Pollution Control **9 Hours**

Particulate matter and gaseous pollutants - Settling chambers, Cyclone separators, Scrubbers, Filters & Electrostatic precipitator

Unit V: Air Quality Sampling and Monitoring **9 Hours**

Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants

Text Books

1. Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, “Environmental Engineering”, Mc Graw Hill, International Edition, 2017
2. Rao M. N., Rao H. V. N., “Air Pollution”, 1st Edition, Mc Graw Hill, 2004

Reference Books

1. Martin, Crawford, “Air Pollution Control Theory”, Tata McGraw Hill, New Delhi, 1986
2. Bulkeley, H., “Cities and Climate Change”, Routledge, London, 2013
3. Rao C. S., “Environmental Pollution Control Engineering,” Wiley Eastern Limited, New Delhi, 1992
4. Gurjar, B. R., Molina, L., Ojha, C. S. P., “Air Pollution: Health and Environmental Impacts”, CRC Press, 2010

Web References

1. http://www.epa.gov
2. http://www.indiaenvironmentportal.org.in
3. http://nptel.iitm.ac.in
4. http://www.filtersource.com
5. https://dgserver.dgsnd.gov

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

MI 20CSM01 E-Commerce 3 0 0 3.0

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

Code	Course Outcomes	Mapping withPOs	DoK
20CSM01.1	Explain the role of new internet economy in E-Commerce	-	L1,L2
20CSM01.2	Explain the architecture of World Wide Web		L1,L2
20CSM01.3	Describe the E-Commerce process models and E-Payment System		L1,L2
20CSM01.4	Illustrate the network models in customization and internal commerce		L1,L2
20CSM01.5	Explain the E-commerce models in advertising and marketing of business		L1,L2
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit I:Introduction **9 hours**

Electronic Commerce- Architectural Frame work, anatomy of E-commerce applications, E-Commerce consumer applications, E-commerce organization applications

E-Commerce and media convergence

Unit II: World Wide Web & Network security **9 hours**

Client-Server Network security, World Wide Web(WWW) as the architecture, Web background: Hypertext Publishing, Technologybehind the web, Security and the web

Emerging Client-Server Security Threats

Unit III: E-Payment Systems **9 hours**

Consumer Oriented Electronic Commerce- Mercantile Process models, E-Payment systems- Digital Token-Based, smart cards, credit cards, risk and E-Payment systems.

Designing E-Payment Systems

Unit IV:EDI Implementation and Intraorganizational E-Commerce **9 hours**

Standardization and EDI, EDI Software implementation, Value added networks, Intra organizational E-Commerce- Workflow Automation and Coordination, Customization and Internal Commerce, Supply chain management (SCM).

EDI Envelope for Message Transport

Unit V: Advertising and Marketing on the Internet **9 hours**

Corporate Digital Library- Document Library, digital document types, corporate data warehouses, Advertising and marketing-Information based marketing, Advertising on Internet, online marketing process, market research.

Charting the Online Marketing Process

Text Books

1. Ravi Kalakota and Andrew B. Whinston., "Frontiers of electronic commerce", First Edition, Pearson Education ,2011
2. Jaiswal S.," E-Commerce", Second Edition,Galgotia,2010

Reference Books

1. Dave Chaffey., "E-business & E- commerece management- strategy, implementation and Practice", Fifth edition, Pearson Education, 2015.
2. Kenneth C, "E-Commerce: Business.Technology.Society", First Edition, Pearson Education, 2008

Web References

1. https://www.techopedia.com/definition/18226/corporate-data-warehouse-cdw
2. http://ecmrce.blogspot.com
3. http://data.conferenceworld.in

Internal Assessment Pattern

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

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

1. Write any four important E-Commerce organization Applications
2. Write about any four requirements of EDI
3. Write short notes on Risks in E-Payment systems
4. Write short notes on Market research
5. What are the factors for design of electronic payment system?

L2: Understand

1. How enterprise resource planning and supply chain management software differs in their goals and implementations
2. How product or service customization is adopted in intraorganizational commerce?
3. Explain Merchantile's model from the Merchant's perceptive
4. Explain in detail about E-Payment systems
5. Discuss about mercantile transaction using credit cards

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

MI 20MEM01 Biomaterials **3 0 0 3**

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

Code	Course Outcomes	Mapping withPOs	DoK
20MEM01.1	Classify various biomaterials	-	L1,L2
20MEM01.2	Identify the Metallic implant materials		L1,L2, L3
20MEM01.3	Describe the failure modes of implant materials		L1,L2
20MEM01.4	Apply Ceramic implant materials		L1,L2, L3
20MEM01.5	Develop the Biocompatibility & Toxicological properties in of biomaterials		L1,L2, L3

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

Unit I: Introduction **09 Hours**

Definition of biomaterials, requirements & classification of biomaterials, Comparison of properties of some common biomaterials. Effects of physiological fluid on the properties of biomaterials. Biological responses (extra and intra- vascular system). Surface properties of materials.

physical properties of materials, mechanical properties.

Unit II: Metallic implant materials **09 Hours**

Stainless steel, Co-based alloys, Ti and Ti-based alloys. Importance of stress-corrosion cracking. Host tissue reaction with bio metal, corrosion behavior and the importance of passive films for tissue adhesion. Hard tissue replacement implant: Orthopedic implants, Dental implants. Soft tissue replacement implants: Percutaneous and skin implants.

Vascular implants, Heart valve implants-Tailor made composite in medium.

Unit III: Polymeric implant materials **09 Hours**

Polyolefin's, polyamides, acrylic polymers, fluorocarbon polymers, silicon rubbers, acetyls. (Classification according to thermo sets, thermoplastics and elastomers).Viscoelastic behavior: creep-recovery, stress-relaxation, strain rate sensitivity. Importance of molecular structure, hydrophilic and hydrophobic surface properties, migration of additives (processing aids), aging and environmental stress cracking. Physiochemical characteristics of biopolymers. Biodegradable polymers for medical purposes, Biopolymers in controlled release systems.

Synthetic polymeric membranes and their biological applications.

Unit IV: Ceramic implant materials **09 Hours**

Definition of bio ceramics. Common types of bio-ceramics: Aluminum oxides, Glass ceramics, Carbons. Bio resorbable and bioactive ceramics. Importance of wear resistance and low fracture toughness. Host tissue reactions: importance of interfacial tissue reaction (e.g. ceramic/bone tissue reaction).

Composite implant materials: Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement (short and long fibers, fibers pull out).

Polymers filled with osteogenic fillers (e.g. hydroxyapatite). Host tissue reactions.

Unit V: Biocompatibility & Toxicological screening of biomaterials **09 Hours**

Definition of biocompatibility, blood compatibility and tissue compatibility. Toxicity tests: acute and chronic toxicity studies (in situimplantation, tissue culture, haemolysis, thrombogenic potential test, systemic toxicity, intracutaneous irritation test), sensitization.

carcinogenicity, mutagenicity and special tests.

Text Books

1. Biomaterials Science: An Introduction to Materials in Medicine, By Buddy D. Ratner, et. al. AcademicPress, San Diego, 1996.
2. Sujata V. Bhat, Biomaterials, Narosa Publishing House, 2002.
3. J B Park, Biomaterials – Science and Engineering, Plenum Press, 1984.
4. Comprehensive structural interity, Vol.9: Bioengineering Editors: Mithe, Ritchie and Karihalo, ElsevierAcademic Press, 2003.

Reference Text books

1. Biomaterials Science: An introduction to Materials in Medicine, Edited by Ratner, Hoffman, Schoet and Lemons, Second Edition: Elsevier Academic Press, 2004.

Web References

1. https://nptel.ac.in/content/syllabus_pdf/113104009.pdf
2. RBM603 BIOMATERIALS Syllabus free download
3. UP Technical University BE BM Syllabus
4. RBM603 Syllabus, BM Unit-wise Syllabus – BE 6th Semester

Internal Assessment Pattern

CognitiveLevel	InternalAssessment#1(%)	InternalAssessment#2(%)
L1	10	10
L2	30	30
L3	60	60
Total(%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Write about classification of biomaterials?
2. State the applications of biomaterials?
3. List the advantages and disadvantages biomaterials?
4. Write about Effects of physiological fluid on the properties of biomaterials?
5. Define Importance of stress-corrosion cracking?

L2: Understand

1. Surface properties of materials
2. Comparison of properties of some common biomaterials
3. Corrosion behavior and the importance of passive films for tissue adhesion
4. Visco elastic behavior: creep-recovery, stress-relaxation, strain rate sensitivity

L3: Apply

1. Mechanics of improvement of properties by incorporating different elements. Composite theory of fiber reinforcement (short and long fibers, fibers pull out). Polymers filled with osteogenic fillers (e.g. hydroxyapatite). Host tissue reactions

CONTROLCOPYATTESTED

Chairman

Board of Studies(ME)

MI **20EEM01 Basic Control Systems** **3 0 0 3**

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

Code	Course Outcomes	Mapping with PO's	DoK
20EEM01.1	Determine time response specifications of second order systems		L1-L2
20EEM01.2	Determine error Constants for different types of input signals		L1-L2
20EEM01.3	Understand various levels of illuminosity produced by differentilluminating sources.		L1-L3
20EEM01.4	Design different lighting systems by taking inputs and constraints in view for different layouts.		L1-L3
20EEM01.5	Understand the speed/time characteristics of different types oftraction motors.		L1-L3
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create, DoK:Depth of Knowledge			

Unit I: Introduction to Control Systems **09 Hours**

Classification of control systems, open loop and closed loop control systems and their differences, Feedback characteristics, transfer function of linear system, differential equations of electrical networks, translational and rotational mechanical systems

Differences between Closed loop and Open Loop Control Systems

Unit II: Time Response Analysis **09 Hours**

Standard test signals time response of first and second order systems time domain specifications, steady state errors and error constants

Definitions of Time domain Specifications

Unit III: Stability **09 Hours**

The concept of stability, Routh's stability criteria – Limitations of Routh's stability, effect of addition of poles and zeros, introduction to root locus.

Basics of Routh's Criteria

Unit IV: Frequency response **09 Hours**

Introduction to frequency domain specifications, basics of bode plot, Phase margin, Gain Margin. Introduction to Polar plots, its phase margin and gain margin. Introduction to Nyquist stability criteria

Definitions of Frequency domain Specifications

Unit V: State Space Analysis **09 Hours**

Concepts of state, state variables and state model, state space representation of transfer function, diagonalization, solving the time invariant state equations, State Transition Matrix and its Properties, concepts of controllability and observability.

Basics of Matrix operations

Text Books

1. I.J.Nagarath and M.Gopal, "Control Systems Engineering", Newage International Publications, 5th Edition, 2014.
2. Kotsuhiko Ogata, Modern Control Engineering, Prentice Hall of India, 5th edition, 2014

Reference Books

1. S.Palani, "Control Systems Engineering", Tata Mc Graw Hill Publications, 3rd Edition, 2012.

Web References

1. https://nptel.ac.in/courses/107/106/107106081/
2. https://www.tutorialspoint.com/control_systems/control_systems_introduction.htm

Internal Assessment Pattern

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

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

1. What are the various standard test signals?
2. Define concept of observability.
3. What is state transition matrix? Write its properties.

L2: Understand

1. Explain how Routh Hurwitz criterion can be used to determine the absolute stability of a system
2. Explain about feedback characteristics.
3. Describe the effect of addition of poles and zeros.

L3: Apply

1. The characteristic polynomial of a system is.$s^5+2s^6+3s^5+s^4+5s^3+2s^2+s+7=0$. Determine the the stability of thesystem using Routh's stability criteria.
2. Determine range of K for stability of unit feedback system whose open loop transfer function is G(s) = K/s(s+1)(s+2).
3. For a system having G(s) = 25/s(s+10) and units negative feedback, find its time response specifications.

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

MI **20ECM01 Semiconductor Devices and Circuits** **3 0 0 3**

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

Code	Course Outcomes	Mapping with POs	DoK
20ECM01.1	Classify different types of semiconductors with energy band diagrams	-	L1, L2
20ECM01.2	Explain the operation and characteristics of PN junction diode and special diodes		L1, L2
20ECM01.3	Classify and Analyze different types of rectifiers		L1, L2, L3
20ECM01.4	Demonstrate the flow of current in different configurations of the transistor & the concept of DC biasing and transistor stabilization		L1, L2, L3
20ECM01.5	Analyze and Design the small signal low frequency amplifiers		L1, L2, L3

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

Unit I: Semiconductor Physics **09 Hours**

Atomic structure, Neil Bohr's atomic theory, definition of conductors, insulators and semiconductors, energy level diagrams. Semiconductors: Classification and types, intrinsic and extrinsic, P-type and N-type semiconductors, majority and minority carriers, recombination, effect of temperature.

Fermi Level, Charge Densities in Semiconductors

Unit II: Semiconductor Diodes and Special Diodes **09 Hours**

Formation of depletion region, barrier potential, reverse breakdowns, PN junction as diode, symbol, biasing modes, V-I characteristics, diode current equation, effect of temperature on diode current, ideal diode. Special Diodes: Zener diode, Photo Diode, LED - Working, characteristics and applications.

Diode Switching times, Varactor diode, Tunnel Diode

Unit III: Rectifiers and Filters **09 Hours**

Half wave Rectifier, Full wave rectifier, Bridge Rectifier - Operation, Input and output wave forms. Filters: Inductor filter, Capacitor filter, π filter, Comparison of various filter circuits in terms of ripple factors.

LC filter, Multi section π filter

Unit IV: Transistors and Biasing Techniques **09 Hours**

Junction transistor, Transistor current components, Transistor configurations, Transistor as an amplifier, characteristics of transistor in CB and CE configurations. Need for biasing, operating point, Load line analysis, fixed bias and self bias, Stabilization against variations in VBE, Ic, and β, Stability factor, Thermistor and Sensistor bias compensation techniques, Thermal runaway.

Ebers-Moll model of a transistor, Punch through/reach through, Thermal stability

Unit V: Small Signal Low Frequency Transistor Amplifier Models **09 Hours**

BJT: Two port network, Transistor hybrid model, Determination of h-parameters, Generalized analysis of transistor amplifier model using h-parameters, Exact and approximate analysis of CB and CE amplifiers, Comparison of transistor amplifiers.

Effects of emitter bypass capacitor (C_e) on low frequency response

Textbooks

1. Lal Kishore K., "Electronic Devices and Circuits", 4th Edition, Bright Sky Publications, 2016
2. Millman J. and Christos C. Halkias, "Electronic Devices and Circuits", 4th Edition, Tata Mc-Graw Hill, 2010
3. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2009
4. Boylestad R. L. and Louis Nashelsky, "Electronic Devices and Circuits", 10th Edition, Pearson Publications,2009

Reference Books

1. Salivahanan S., Suresh Kumar and Vallavaraj N. A., "Electronic Devices and Circuits", 2nd Edition, Tata Mc-Graw Hill, 2012
2. Donald A. Neamen, "Electronic Circuit Analysis and Design", 3rd Edition, Tata McGraw Hill, 2010
3. Millman J. and Halkias C., "Integrated Electronics", 2nd Edition, Tata Mc-Graw Hill, 2009
4. Singh B. P. and Rekha, "Electronic Devices and Integrated Circuits", 3rd Edition, Pearson publications, 2009
5. Mittal G. K., "Electronic Devices and Circuits", 3rd Edition, Khannan Publishers, 2008

Web Resources

1. www.elprocus.com/p-n-junction-diode-theory-and-working/
2. http://fourier.eng.hmc.edu/e84/lectures/ch4/node3.html
3. http://nptel.ac.in/courses/117103063/11

Internal Assessment Pattern

Cognitive Level	Internal Assessment #1 (%)	Internal Assessment #2 (%)
L1	40	35
L2	40	35
L3	20	30
Total (%)	100	100

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

1. Define Semiconductor
2. What is ideal diode?
3. List any three applications of Zener diode
4. What is rectifier?
5. Define ripple factor
6. What is BJT?
7. What is thermal runaway?
8. Define stability

L2: Understand

1. Describe the formation of P type semiconductor
2. Draw and explain V-I characteristics of PN junction diode
3. Describe the construction and operation of Photo diode
4. With neat circuit diagram describe the operation of bridge rectifier
5. Explain, why Zener diode is used in reverse bias with the help of characteristics
6. Draw and explain the input and output Characteristics of Common base configuration
7. With neat sketches explain the V-I characteristics of NPN transistor in common emitter configuration
8. Write a short note on Thermal Runaway
9. Explain thermister compensation technique

L3: Apply

1. Show that the efficiency of half wave rectifier is 40.6%
2. Show that the efficiency of full wave rectifier is 81.2%
3. Obtain an expression of stability factor for fixed bias
4. With suitable expressions explain self bias of BJT
5. Obtain the expressions for voltage gain and current gain of small signal low frequency common emitter amplifier

CONTROL COPY ATTESTED

Chairman
Board of Studies (ECE)

MI 20AIM01 Fundamentals of Neural Networks 3 0 0 3

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

Code	Course Outcomes	Mapping with POs	DoK
20AIM01.1	Describe the concepts of artificial neural networks	-	L1, L2
20AIM01.2	Compare functions of biological and artificial neural networks		L1, L2
20AIM01.3	Explain the architecture and functioning of Single Layer feed forward networks		L1, L2
20AIM01.4	Describe architecture and functioning of Multi-layer networks		L1, L2
20AIM01.5	Explain associative memory networks		L1, L2
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create. DoK: Depth of Knowledge			

Unit 1: Introduction to Neural Networks **9 hours**

Introduction - Humans and Computers - Organization of the Brain – Biological Neuron - Biological and Artificial Neuron Models - Characteristics of ANN - McCulloch-Pitts Model - Historical Developments - Potential Applications of ANN

Unit 2: Essentials of ANN **9 hours**

Artificial Neuron Model - Operations of Artificial Neuron - Types of Neuron Activation Function - ANN Architectures - Classification Taxonomy of ANN – Connectivity - Learning Strategy (Supervised, Unsupervised, Reinforcement) - Learning Rules

Unit 3: Single Layer Feedforward Networks **9 hours**

Introduction - Perceptron Models: Discrete - Continuous and Multi-Category - Training Algorithms: Discrete and ContinuousPerceptron Networks – Limitations of the Perceptron Model

Unit 4: Multi - Layer Feedforward Networks **9 hours**

Generalized Delta Rule - Derivation of Backpropagation (BP) Training - Summary of Backpropagation Algorithm - Kolmogorov Theorem, Learning Difficulties and Improvements

Unit 5: Associative Memory Networks **9 hours**

Paradigms of Associative Memory - Pattern Mathematics - Hebbian Learning - General Concepts of Associative Memory - Bidirectional Associative Memory (BAM) Architecture - BAM Training Algorithms: Storage and Recall Algorithm - BAM Energy Function

Text Books

1. S. N. Sivanandam, S. Sumathi, S. N. Deepa, “Introduction to Neural Networks Using MATLAB 6.0”, Tata McGraw-HillCompanies, 2006
2. Simon Haykin, “Neural Networks: A Comprehensive Foundation”, Second Edition, Pearson Education, Asia
3. James A. Freeman, David M. Skapura, “Neural Networks: Algorithms, Applications, and Programming Techniques”, Addison-Wesley Publishing Company

Reference Books

1. B. YagnaNarayana, “Artificial Neural Networks”, Prentice Hall India, 2013
2. Satish Kumar, “Neural Networks: A classroom approach”, Tata McGraw Hill, 2004.
3. Laurene Fausett, “Fundamentals of Neural Networks”, Pearson Education

Web Resources

1. https://www.tutorialspoint.com/artificial_neural_network/index.html

Internal Assessment Pattern

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

Sample Short and Long Answer Questions of Various Cognitive Levels

L1: Remember

5. Define Neural Computing
6. Define ANN and Neural Computing
7. List any 4 design parameters in the design of Artificial Neural Network
8. What kinds of transfer functions can be used in each layer?
9. Define Pattern Association
10. What is Adaline Model?
11. What are the types of Learning?
12. What is simple artificial neuron?
13. List any 4 applications of Artificial Neural Network
14. Define Delta Learning rule

L2: Understand

4. Describe on the process of assigning and updating weights in a artificial neural network
5. What are the design steps to be followed for using ANN for your problem?
6. Describe least square algorithm with example
7. Why XOR Problem cannot be solved by a single layer perceptron? Write an alternative solution for it
8. Explain Back Propagation Network with necessary diagrams and equations
9. Write the differences between Hetero Associative Memories and Interpolative Associative Memories

CONTROL COPY ATTESTED
Chairman
Board of Studies (CSE)

MI **20DSO03 Introduction to R Programming** **3 0 0 3.0**

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

Code	Course Outcomes	Mapping withPOs	DoK
20DSO03.1	Understand the basic concepts of R programming	-	L1, L2
20DSO03.2	Understand about Scalars and Vectors		L1, L2,
20DSO03.3	Implement Lists and data Frames		L1, L2, L3
20DSO03.4	Implement Tables and Statistical Distributions		L1, L2 , L3
20DSO03.5	Implement Functions in R programming		L1, L2
1. Weakly Contributing | 2. Moderately Contributing | 3. Strongly Contributing, for the attainment of respective Pos			
L1: Remember | L2: Understand | L3: Apply | L4: Analyze | L5: Evaluate | L6: Create DoK: Depth of Knowledge			

Unit I: Introduction **9 Hours**

Overview of R, R data types and objects, reading and writing data, sub setting R Objects, Essentials of the R Language, Installing R, Running R, Packages in R, Calculations, Complex numbers in R, Rounding, Arithmetic, Modulo and integer quotients, Variable names and assignment, Operators, Integers, Factors, Logical operations

Variable Scope & Default Arguments

Unit II: Control Structures And Vectors **9 Hours**

Control structures, functions, scoping rules, dates and times, Introduction to Functions, preview of Some Important R Data Structures, Vectors, Character Strings, Matrices, Lists, Data Frames, Classes

Vectors: Generating sequences, Vectors and subscripts, Extracting elements of a vector using subscripts, Working with logical subscripts, Scalars, Vectors, Arrays, and Matrices, Adding and Deleting Vector Elements, Obtaining the Length of a Vector, Matrices and Arrays as Vectors Vector Arithmetic and Logical Operations, Vector Indexing, Common Vector Operations

Higher-Dimensional Arrays

Unit III: Lists **9 Hours**

Lists: Creating Lists, General List Operations, List Indexing Adding and Deleting List Elements, Getting the Size of a List, Extended Example: Text Concordance Accessing List Components and Values Applying Functions to Lists, Data Frames, Creating Data Frames, Accessing Data Frames, Other Matrix-Like Operations

Merging Data Frames

Unit IV: Factors and Tables **9 Hours**

Factors and Levels, Common Functions Used with Factors, Working with Tables, Matrix/Array-Like Operations on Tables

, Extracting a Sub table, Finding the Largest Cells in a Table, Math Functions, Calculating a Probability, Cumulative Sums and Products, Minima and Maxima, Calculus, Functions for Statistical Distributions

Aaggregate () Function, Set Operations

Unit V: Functions **9 Hours**

Scripts to Functions, Making the Script, Transforming the Script, Using the Function, Reduce the number of Lines, Adding more Arguments, Dots, Using Functions as Arguments, Crossing the Boarders, Choices with If-Else Statements, vectorizing Choices, Looping Through Values

Coping and Scoping of Functions

Text Books

1. Norman Matloff, " The Art of R Programming- A Tour of Statistical Software Design ", 2011
2. Roger D. Peng, " R Programming for Data Science " , 2012

Reference Books

1. Garrett Grolemund, Hadley Wickham, "Hands-On Programming with R: Write Your Own Functions andSimulations", 1st Edition, 2014
2. Andrie de Vries, Joris Meys, "R For Dummies", 2nd Edition, 2015

Web References

1. https://swayam.gov.in/nd1_noc19_ma33/preview
2. https://data-flair.training/blogs/object-oriented-programming-in-r/
3. http://www.r-tutor.com/elementary-statistics
4. https://www.tutorialspoint.com/r/

Internal Assessment Pattern

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

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

1. Write about vectors in R
2. Write any three type conversions in R
3. What is a data structure in R?
4. Write any two Boolean operators in R
5. Write any two linear vector algebra operations

L2: Understand

1. Explain the importance of data frame
2. How to apply same functions to all rows and columns of a matrix? Explain with example
3. Explain about Finding Stationary Distributions of Markov Chains
4. Describe R functions for Reading a Matrix or Data Frame from a File
5. Explain different matrix operation function in R

L3: Apply

1. Implement binary search tree with R
2. Write R script to create a line graph
3. Create a R language code to generate first n terms of a Fibonacci series
4. Apply R program to implement quicksort
5. Apply R code to the function by using if else commandf(x) = x if
   x<1/2
   = (1-x) if 1/2<x<1
   = 0 otherwise

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

MI 20SHM01 Psychology 3 0 0 3

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

Code	Course Outcomes
20SHM01.1	Focuses on classical/operant conditioning, reinforcement schedules, and observational learning to help students obtain an understanding of learning and conditioning
20SHM01.2	Understand the properties of Senses
20SHM01.3	Understand the state of Consciouness, Sleep & Dreams
20SHM01.4	Understand the importance of learning
20SHM01.5	Understanding the components of memory, language, cognition, problem solving, and the many forms of memory will be the focus of this course

Unit I: Introduction 9 Hours

Definition of Psychology, Psychology as a Science: Methods of psychology, Different schools of Psychology and modern perspectives of psychology - Scope and branches of psychology

Unit II: Sensation and Perception 9 Hours

General Properties of Senses, subliminal stimuli, Selective Attention, Physiological correlates of Attention, Internal influences on Perception - Learning, Set, Motivation and Emotion, External influences on perception - Figure Ground separation, Movement, organization, illusions, Perceptual constancies, Depth perception, Binocular and Monocular Depth, Perception; Perceptual defense and perceptual vigilance, sensory deprivation, sensory bombardment

Unit III: Consciousness 9 Hours

Fundamental Process, Active and passive roles of consciousness, Sleep and Dreams, Meditation, Hypnosis, Psi Phenomena, Alternate states of consciousness, Natural and Drug induced

Unit IV: Learning 9 Hours

Definition of learning, Theories of learning, Classical conditioning, Operant conditioning, Cognitive Learning, Social Learning

Unit V: Memory 9 Hours

Meaning and nature of memory, Theories of memory: Information processing theories - sensory register, short term memory, rehearsal; Levels of processing theories, Long term memory - organizations, TOT, semantic and episodic memory, encoding and storing long term memories, role of organization, role of imagery, role of constructive processes; Retrieval from long term memory, Forgetting- Motivated forgetting, Interference, Decay through disuse, Techniques of improving memory

Text Books

1. Morgan C. T., King, R. A., Weisz, J. R. and Schopler J., Introduction to Psychology, 7th Edition, Singapore: Mcgraw - Hill, 2007
2. Myers D. G., Psychology, 5th Edition, Worth Publishers: New York, 2004
3. Kalat J., Introduction to Psychology, 8th Edition, Wordsworth Pub. Co., 2007

Reference Books

1. Feldman R. S., Understanding Psychology, 6th Edition, Tata McGraw - Hill, New Delhi, 2006
2. Kosslyn S. M. and Rosenberg R. S., Psychology in Context, 3rd Edition, Pearson Education Ltd., 2006

Web References

1. https://www.all-about-psychology.com/learn-psychology.html
2. https://study-uk.britishcouncil.org/plan-studies/choosing-course/subjects/psychology
3. https://www.youtube.com/watch?v=k-P1BEk6hhE

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20SHM02 Statistical Methods 3 0 0 3

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

Code	Course Outcomes
20SHM02.1	Demonstrate statistical techniques in real life problems
20SHM02.2	Gain statistical knowledge on measures of central tendency and variation
20SHM02.3	compute sample space, event, relative frequency, probability, conditional probability, independence
20SHM02.4	familiar with some standard discrete and continuous probability distributions
20SHM02.5	Understand the theory of sampling techniques and their practical applications

Unit I: Introduction 9 Hours

Definition and classification of statistics, Stages in statistical investigation, Definition of some basic terms, Applications, uses and limitations of statistics, Scales of measurement, methods of data collection and presentation, Diagrammatic and graphical presentation of data

Unit II: Treatment of Data 9 Hours

Frequency distributions, stem-leaf displays, measures of central tendency (mean,median,mode,quantiles), measures of variation (range, quartile deviation, mean deviation, standard deviation), standard scores, moments (about origin and mean) skewness and kurtosis

Unit III: Elementary Probability 9 Hours

Introduction, definitions of random experiment, samplespace, events, types of events, countingrules, permutation and combinations rule, definition of probability in several approaches, some probability rules, conditional probability and independence, bayes theorem

Unit IV: Probability Distributions 9 Hours

Definition of random variables and probability distributions, Introduction to expectation: mean and variance of a random variable, Common discrete probability distributions: Binomial and Poisson, Common continuous probability distributions: normal, t and chi-square distributions

Unit V: Sampling Techniques 9 Hours

Basic concepts: population, sample, parameter, statistic, sampling frame, sampling units , Reasons for sampling, Sampling and non sampling errors, probability sampling techniques (simple, stratified, systematic), Non probability sampling methods

Text Books

1. Bluman A. G., Elementary Statistics: A Step by Step Approach, 2nd Edition, Wm. C. Brown Communications, Inc., 1995
2. Spiegel M. R. and Stephens L. J., Schaum's Outline of Statistics, Schaum's Outline Series , 4th Edition, 2007
3. Gupta C.B. and Gupta, V., An Introduction to Statistical Methods, Vikas Publishing House, Pvt. Ltd., India, 2004

Reference Books

1. Richard A., Gupta C. B.", Probability and Statistics for Engineers", Miller & Fruend ,Pearson's Edition, 2010
2. Freund, J. E. and Simon G. A., Modern Elementary Statistics, 9th Edition, 1998
3. Snedecor G.W. and Cochran W. G.,Statistical Methods, 7th Edition, 1980
4. David S. M., McCabe P. and Craig B., Introduction to the Practice of Statistics, 6th Edition, W. H. Freeman, 2008

Web References

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://archive.nptel.ac.in/courses/111/105/111105077/
3. http://www.nitttrc.edu.in/nptel/courses/video/111105077/L10.html

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20MBM01 General Management 3 0 0 3

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

Code	Course Outcomes
20MBM01.1	Understand basic functions of management
20MBM01.2	Understand the planning process and strategic formulation
20MBM01.3	Know the nature of the organization process
20MBM01.4	Understand the staffing objectives and functions
20MBM01.5	Understand the directing process and controlling methods

Unit I: Management Introduction 10 Hours

Concept, Nature, Process and Significance of Management, Managerial Roles (Mintzberg), An Overview of Functional areas of Management - Marketing, Finance, Production, HRM, IT,R & D, Development of Management Thought - Classical, Neo – classical

Unit II: Planning 10 Hours

Process and Types, Decision - making concept and process, Bounded rationality, Management by objectives, Corporate Planning - Environment analysis and Diagnosis, Strategy Formulations

Unit III: Organizing 10 Hours

Concept, Nature, Process and Significance, Authority and Responsibility relationships - Delegation, Decentralisation, Departmentation basis and formats (Project and Matrix), Formal and Informal Organisation, Changing patterns in organisation structures in the knowledge economy

Unit IV: Staffing 10 Hours

Human Resource Planning, Objectives, Factors influencing Human Resource Planning, HR Planning Process, Job Analysis, Recruitment, Process and Sources of Recruitment, Selection, Process of selection and Techniques, Errors in selection Retention of employees

Unit V: Directing and Control 10 Hours

Motivating and Leading People at work - basic concepts, Communication - nature, process, networks and barriers, Effective Communication Managerial Control - Concept and process, Designing an Effective Control System, Techniques –Traditional and Modern (PERT and CPM)

Note: Discuss case studies from every unit

Text Books

1. Singh B. P. and Chhabra T. N., Management Concepts and Practices, Dhanpat Rai, New Delhi
2. Singh B. P. and Singh A. K., Essentials of Management, Excel Books, New Delhi
3. Dwivedi R. S. Management – An Integrated Approach, National Publishing House

Reference Books

1. Weihrich, Heing and Harold Koontz, Management a Global Perspective, Mc - Graw Hill, New Delhi
2. Stoner, James A. F., Freeman A. E. and Gilbert D. A., (Jr.), Management, Prentice Hall of India Pvt. Ltd.
3. Ivancevich, John M., Donnelly J. H. and Gibson J. L., Management: Principles and Functions, AITBS, New Delhi
4. Luthans, Fred, Introduction to Management, Mc - Graw Hill
5. Jones, Gareth R and Jennifer M., George, Contemporary Management, Tata Mc-Graw Hill

Web References

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

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20MBM02 Human Resource Planning 3 0 0 3

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

Code	Course Outcomes
20MBM02.1	Understand staffing concept Write sound job descriptions, job specifications
20MBM02.2	Develop a structured, job - related interview for talent acquisition across all the verticals
20MBM02.3	Know the training and development strategies of a firm
20MBM02.4	Understand compensation management and performance management process
20MBM02.5	Understand the role of trade unions in a firm

Unit I: Introduction 10 Hours

Human resource planning concepts, Concept of Staffing, Factors affecting Staffing, Staffing Process.
Job Analysis -- Concept, Job - Specifications, Job - Description, Process and Methods, Advantages of Job Analysis.
Job Designing: Introduction, Definition, Modern Techniques, Factors affecting Job Design

Unit II: Talent Acquisition 10 Hours

Recruitment and Selection: Needs-recruitment process - alternative to recruitment, Concept of Selection, Criteria for Selection, Process. Screening – Pre and Post Criteria for Selection, Interviewing – Types and Guidelines for Interviewer & Interviewee, Types of Selection Tests, Selection Hurdles and Ways to Overcome Them, Current trends in Recruitment and Selection

Unit III: Training & Development 10 Hours

Induction – Concept, Types - Formal/Informal Induction, Advantages of Induction, Training Vs Development, Need, Process of Training, Methods of Training, Development techniques, need for development, Career Planning, training and development policies, linking training and development to company's strategy

Unit IV: Compensation and Performance Management 10 Hours

Compensation management process, Forms of pay, Financial and non – financial compensation - Factors influencing Wage fixation, Performance Appraisal System, Methods of Performance Appraisal, Performance management process

Unit V: Managing Industrial relations 10 Hours

Managing Industrial Relations – Components of IR - Trade Unions, Functions of Trade Union – Employee Participation – Importance and Schemes, Collective Bargaining – Grievance Redressal, Industrial Dispute – Settlement mechanism

Note: Discuss case studies from every unit

Text Books

1. Subba Rao P., Human Resource Management, Himalaya, Mumbai
2. Aswathappa K., Human Resources and Personnel Management, Tata McGraw-Hill
3. Armstrong M., Performance Management: Key Strategies and practical Guidelines, Kogan Page, London

Reference Books

1. Gary Dessler, Human Resources Management. Pearson Publication
2. Mammoria C. B., Personnel Management
3. Recruitment and Selection: Theories and Practices, Dipak Kumar Bhattacharyya, Cengage, India

Web References

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

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20CEM02 Climate Change Mitigation and Adaptation 3 0 0 3

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

Code	Course Outcomes
20CEM02.1	Understand the concept of climate change scenarios
20CEM02.2	Outline the causes for the changes in the climate
20CEM02.3	Identify the impacts of climate change on various sectors
20CEM02.4	Adopt the methodologies in finding the changes in climate
20CEM02.5	Demonstrate the climate change adaptation and mitigation options forsecuring sustainable development

UnitI: Fundamentals of Climate Change **9 Hours**

Greenhouse gases, radiative forcing potential, carbon dioxide equivalency, natural climate forcing factors, emissions sources and sinks

Unit II: Observed Changes and its Causes **9 Hours**

Observation of Climate Change – Changes in patterns of temperature, precipitation and sea level rise – Observed effects of Climate Changes – Patterns of Large Scale Variability – Drivers of Climate Change –-Evidences of Changes in Climate and Environment – on a Global Scale and in India.

Unit III: Impacts of Climate Change **9 Hours**

Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios -Projected Impacts for Different Regions- Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

Unit IV: Clean Technology and Energy **9 Hours**

Clean Development Mechanism -Carbon Trading- examples of future Clean Technology -Biodiesel – Natural Compost – Eco-Friendly Plastic – Alternate Energy – Hydrogen – Biofuels -Solar Energy – Wind – Hydroelectric Power.

Unit V: Adaptation and Mitigation Responses **9 Hours**

Policy, Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC, Concept framework of urban adaptation to climate change**,** Mitigation Efforts in India and Adaptation funding.

Text Books

1. Jan C. Van Dam, “Impacts of Climate Change and Climate Variability on Hydrological Regimes”, Cambridge University Press, 2003
2. Dash Sushil Kumar, “Climate Change – An Indian Perspective”, Cambridge University Press India Pvt. Ltd, 2007

Reference Books

1. Pielke, R., “Lifting the taboo on adaptation”, Nature 445 (7128), 597-598, 2007
2. Bulkeley, H., “Cities and Climate Change”, Routledge, London, 2013

Web References

1. IPCC Fourth Assessment Report – The AR4 Synthesis Report
2. https://www.coursera.org/learn/climate-change-mitigation
3. https://www.usc.edu.au/study/courses-and-programs/courses/course-library/ens/ens204-climate-change-mitigation-and-adaptation

CONTROL COPY ATTESTED

Chairman
Board of Studies(CE)

MI **20CSM02 Knowledge Discovery and Databases** **3 0 0 3**

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

Code	Course Outcomes
20CSM02.1	Illustrates the basic concepts of database management system
20CSM02.2	Able to summarize mining and preprocessing of data
20CSM02.3	Outline the functionalities of data mining(characterization)
20CSM02.4	Able to explain the processes of association analysis
20CSM02.5	Illustrate the features of various clustering techniques

Unit I: Introduction to Database and Data Warehouse **9 Hours**

Overview of Data, What is Database and What is Database Management Base System, Meaning of Entity, Relation, Database Design and ER diagrams, Attributes, DMBS Software's available in Market, Structured Query Language (SQL)
What is Data Warehouse, Types of Data Warehouse, On-Line Analytical Processing (OLAP)

Unit II: Data Mining Introduction **9 Hours**

Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, Data Objects and Attribute Types, Statistical Description of Data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and Discretization, Data Visualization

Unit III: Classification **9 Hours**

Introduction and Basic Concepts of Classification, What is Training Data, Supervisory Learning and Unsupervisory Learning. Decision Tree Induction, Working of Decision Tree and Building a Decision Tree, Bayes' Theorem, Classification by Back Propagation

Unit IV: Association **9 Hours**

What is Association Analysis, Frequent Item Set Generation, Association Rule Generation using Apriori Algorithm.

Unit V: Clustering and Outlier Analysis **9 Hours**

What is Cluster Analysis, Different Types of Clusters, Partition Method – K-Means Algorithm, Hierarchical Methods – Hierarchical Cluster Algorithm, Density Based Method- DBSCAN and Outlier Analysis, What is Outlier Analysis?

Practicing Tool: SQL, Weka, Python and R

Text Books

1. Raghurama Krishnan, Johannes Gehrke, "Data base Management Systems", Third Edition, TATA McGraw Hill, 2008.
2. Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
3. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Pearson, 2016

Reference Books

1. Alex Berson, Stephen J.Smith, —"Data Warehousing, Data Mining & OLAPII", Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, ShyamDiwakar and V. Ajay, — "Insight into Data Mining Theory and PracticeII", Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten, Eibe Frank, — "Data Mining: Practical Machine Learning Tools and Techniques", Second Edition, Elsevier.

Web Resources

1. https://www.tutorialspoint.com/
2. https://www.coursera.org/learn/

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

MI 20MEM02 Micro Electromechanical Systems 3 0 0 3

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

Code	Course Outcomes
20MEM02.1	Acquire the operation of micro devices, micro systems and their applications
20MEM02.2	Ability to design the micro devices, micro systems using the MEMS fabrication process.
20MEM02.3	Acquire basic approaches for various sensor design
20MEM02.4	Acquire basic approaches for various actuator design
20MEM02.5	Gain the technical knowledge required for computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale devices.

Unit I: Basic Concepts 9 Hours

Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA. MECHANICAL SENSORS AND ACTUATORS: Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology

Unit II: Thermal Sensors and Actuators 9 Hours

Thermal energy basics and heat transfer processes, thermisters, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

Unit III: Micro-Opto-Electro Mechanical Systems 9 Hours

Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement, MAGNETIC SENSORS AND ACTUATORS: Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators, by directional micro actuator, feedback circuit integrated magnetic actuator, large force reluctance actuator, magnetic probe-based storage device

Unit IV: Micro Fluidic Systems 9 Hours

Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemo resistors, chemo capacitors chemotransistors, electronic nose (E-nose), mass sensitive chemosensors, fluorescence detection, calorimetric spectroscopy

Text Books

1. Nitaigour Premchand Mahalik, “MEMS” TMH Publishing co.

Reference Books

1. Chang Liu,” Foundation of MEMS”, Prentice Hall Ltd.
2. Sergey EdwrdLyshevski, “MEMS and NEMS”, CRC Press, Indian Edition.
3. Tai-Ran Hsu, “MEMS and Micro Systems: Design and Manufacture”, TMH Publishers.
4. Thomas M Adams, “Richard A Layton Introductory MEMS”, Springer International Publishers.

Web References

1. https://nptel.ac.in/courses/117/105/117105082/

CONTROL COPY ATTESTED

Chairman
Board of Studies (ME)

MI 20EEM02 Basics of Electrical Machines and Drives 3 0 0 3

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

Code	Course Outcomes
20EEM02.1	Understand the basic concepts of different types of electrical drives
20EEM02.2	Able to explain the performance characteristics of electrical drives
20EEM02.3	Study the different methods of starting D.C motors and induction motors
20EEM02.4	Study the conventional and solid-state D.C. drives
20EEM02.5	Study the conventional and solid-state A.C. drives

Unit I: Introduction **9 Hours**

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

Unit II: Drive Motor Characteristics **9 Hours**

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound – single phase and three phase induction motors

Unit III: Starting Methods **9 Hours**

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors

Unit IV: Conventional and Solid-State Speed Control of D.C. Drives **9 Hours**

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system – Using controlled rectifiers and DC choppers –applications.

Unit V: Conventional and Solid-State Speed Control of A.C. Drives **9 Hours**

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme Using inverters and AC voltage regulators – applications

Textbooks

1. Nagrath I.J. & Kothari D.P, “Electrical Machines”, Tata McGraw-Hill, 2006
2. Vedam Subrahmaniam, “Electric Drives (Concepts and Applications)”, Tata McGraw-Hill, 2010

Reference Books

1. Partab. H., “Art and Science and Utilisation of Electrical Energy”, Dhanpat Rai and Sons, 2017
2. Pillai.S.K “A First Course on Electric Drives”, Wiley Eastern Limited, 209
3. Singh. M.D., K.B.Khanchandani, “Power Electronics”, Tata McGraw-Hill, 2006.

Web References

1. https://link.springer.com/book/10.1007/978-3-319-72730-1
2. https://www.routledge.com/Electrical-Machine-Drives-Fundamental-Basics-and Practice/Franchi/p/book/9781138099395

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

MI **20ECM02 Digital Electronics** **3 0 0 3**

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

Code	Course Outcomes
20ECM02.1	Utilize theory of Boolean algebra & the underlying features of various number systems
20ECM02.2	Choose the concepts of Boolean algebra for the minimization of switchingfunctions
20ECM02.3	Design of various combinational logic circuits using basic gates
20ECM02.4	Design various simple programmable logic devices to complexprogrammable logic devices & arrays
20ECM02.5	Develop of various sequential logic circuits

Unit I: Introduction to Boolean Algebra and Switching Functions **9 Hours**

Conversion from One Radix to Another Radix, r - 1 and r's complement, 4 Bit Codes: BCD, Excess - 3, 2421, 84 – 2 – 1, 9's Compliment Code, Gary Code etc. Realization of logic operations for Basic and Universal gates

Unit II: Boolean Minimization **9 Hours**

Minimization of Logic Functions using Boolean Theorems, Minimization of Switching Functions using K-Map Up to 6 Variables, Quine - McCluskey Method, Standard SOP And POS forms

Unit III: Finite State Machines and Bipolar Logic Families **9 Hours**

Design of synchronous FSMs, Asynchronous FSMs. Bipolar Logic Families (ECL), MOS logic families (NMOS and CMOS) and their electrical behaviour

Unit IV: Memory Elements **9 Hours**

Basic structures and realization of Boolean functions using PROM, PAL, PLA, PLD, CPLD, FPGA, Buffers. Logic Implementation using Programmable Devices (ROM, PLA, FPGA)

Unit V: Elementary Combinational and Sequential Digital Circuits **9 Hours**

Adders, Subtractors, Multiplexer, Demultiplexer, Encoder, Decoder, Comparators, Latches, Flip-flops, Shift registers, Counters

Text Books

1. Taub, H. and Schilling, D., "Digital Integrated Electronics", McGraw Hill, 1977
2. Hodges, D.A. and Jackson, H.G., "Analysis and Design of Digital Integrated Circuits", International Student Edition, McGraw Hill, 1983
3. Hill, F.J. and Peterson, G.L., "Switching Theory and Logic Design", John Wiley, 1981
4. Anand Kumar, A., "Switching Theory and Logic Design", 3rd Edition, Prentice Hall International Learning, 2016

Reference Books

1. Kohavi, Z., "Switching and Finite Automata Theory", McGraw Hill,1970
2. Jain, R.P., "Modern Digital Electronics", 3rdEdition, Tata McGraw Hill, 2003
3. Charles Roth, H. and Larry Kinney, L.Jr., "Fundamentals of Logic Design", 7th Edition, Cengage Learning, 2014

Web Resources

1. https://onlinecourses.nptel.ac.in/noc19_ee51/preview
2. https://nptel.ac.in/courses/117/105/117105080/
3. https://gate.iitkgp.ac.in/gate_syllabus.html
4. https://www.ee.iitb.ac.in/web/academics/courses/EE221

CONTROL COPY ATTESTED

Chairman
Board of Studies (ECE)

MI **20AIM02 Machine Learning with Python** **3 0 0 3**

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

Code	Course Outcomes
20AIM02.1	Solve simple computational problems with python
20AIM02.2	Identify and use appropriate functions to handle data in python code
20AIM02.3	Describe the foundational concepts and terminologies of machine learning
20AIM02.4	Explain various unsupervised learning algorithms
20AIM02.5	Evaluate the performance of the machine learning algorithm

Unit 1: Basics of Python Programming **9 Hours**

Introduction to Python: evolution, features – Python IDE installation – Syntax –Comments – Variables – Data types – Numbers – Strings – Booleans – Operators – Control statements – Data structures: lists, dictionary, tuples, sets, arrays – Functions

Unit 2: Python modules for ML **9 Hours**

NumPy – Pandas – SciPy – Matplotlib

Unit 3: Introduction to Machine Learning **9 Hours**

Machine Learning essentials: data set, mean, median, mode, standard deviation, percentile, data distribution, normal distribution – Types of learning: supervised, unsupervised – Supervised learning: classification and regression – Classification algorithms: KNN, Naïve Bayes classifier, Decision trees, Linear models, SVM

Unit 4: Unsupervised Learning and Pre-processing **9 Hours**

Types of unsupervised learning – Challenges in unsupervised learning – Pre-processing and Scaling – Dimensionality reduction: Principal Component Analysis – Clustering: k-means, agglomerative, DBSCAN

Unit 5: Data Representation and Model Evaluation **9 Hours**

Categorical variables: one-hot encoding – Binning – Discretization – Automatic feature selection – Model evaluation: cross-validation –Grid search – Evaluation metrics and scoring

Text Books

1. Andreas C. Miller and Sarah Guido, "Introduction to Machine Learning with Python – A guide for Data Scientist", O.Reilly Publisher, 1st edition, 2016
2. Peter Flach, "Machine Learning – The art and science of algorithms that make sense of data", Cambridge Press, 2012
3. Tom Michell, "Machine Learning", McGraw Hill, 2014

Reference Books

1. Peter Harington, "Machine Learning in Action", Cengage Publications, 2012
2. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar "Foundations of Machine Learning", MIT Press, 2012

Web Resources

1. https://www.tutorialspoint.com/python
2. https://www.w3schools/python

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE(AI/ML)

MI 20DSM02 Data Management and Analysis 3 0 0 3

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

Code	Course Outcomes
20DSM02.1	Understand database and be familiar with relational database concepts
20DSM02.2	Demonstrate knowledge of terms, methods of ER Modelling
20DSM02.3	Demonstrate knowledge of trends in data management in Entity Clustering
20DSM02.4	Demonstrate how to acquire, transform, analyse in SQL
20DSM02.5	Demonstrate how to solve problems in accounting using Transactions

Unit I: Database Concepts and Design Concepts 9 Hours

Why Databases? Data Versus Information, Why Database Design is Important? Evolution of File System Data Processing, Problems with File System Data Processing, Database Systems, Relational Database Model- A Logical View of Data, Keys, Integrity Rules, Relational Algebra, Relationships within the Relational Database, Data Redundancy

Unit II: Entity Relationship (ER) Modeling 9 Hours

Entities, Attributes, Relationships, Connectivity and Cardinality, Existence Dependence, Relationship Strength, Weak Entities, Relationship Participation, Relationship Degree, Recursive Relationships, Associative Entities, Developing an ER diagram

Unit III: Entity Clustering 9 Hours

Entity Integrity: Selecting Primary Keys, Natural Keys and Primary Keys, Primary Key guidelines, when to use Composite Primary Keys, when to use Surrogate Primary Keys, Design Cases: Learning Flexible Database Design

Unit IV: Introduction to SQL 9 Hours

Data Definition Commands, Data Manipulation Commands, SELECT Queries, Additional Data Definition Commands, Additional SELECT Query Keywords, Creating VIEW, Joining Database Tables

Unit V: Transaction Management and Concurrency Control 9 Hours

What is Transaction? Concurrency Control, Concurrency Control with Locking Methods, Concurrency Control with Time Stamping Methods, Concurrency Control with Optimistic Methods

Text Books

1. Carlos Coronel and Steven Morris," Database systems: Design, Implementation, & Management", 13th Edition. Cengage Learning. ISBN-13: 978-1337627900, 2019
2. Sholom M. Weiss, Nitin Indurkhya, Tong Zhang, and Fred Damerau, "Text Mining: Predictive Methods for Analyzing Unstructured Information", First Edition. Springer, 2020

Reference Books

1. Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom, "Database Systems: The Complete Book". 2nd Edition. Pearson, 2001
2. Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques". 3rd Edition. Elsevier. 2006

Web Resources

1. https://www.niti.gov.in/verticals/data-management-and-analysis
2. https://searchdatamanagement.techtarget.com/definition/data-management
3. https://nptel.ac.in/courses/110/104/110104094/

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE(DS)

MI **20SHM03 English for the Media** **3 0 0 3**

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

Code	Course Outcomes
20SHM03.1	Understand what media literacy is and its importance
20SHM03.2	Introduce the essential requirements of writing for the media
20SHM03.3	Familiarise the learners with the process of writing for the media
20SHM03.4	Make them familiar with the specific use of english in the field of media
20SHM03.5	Generate interest in various aspects of media and thereby equip them with the basic writing skills required for the same

Unit I: Introduction to Media Literacy **9 Hours**

Understand what media literacy is and its importance, analyze and interpret media messages through guided questions, Practice reading strategies to preview a text & skimming and scanning when you read
Practice reading for the main idea, Define and accurately use content - related vocabulary in course activities and games, Apply comprehension strategies as you read, watch, and listen to a variety of texts and multimedia sources Demonstrate your understanding of these texts and key course ideas through comprehension check quizzes and a discussion board response

Unit II: Writing for the Print Media **9 Hours**

Newspaper: Writing headlines – Analysing newspaper articles- Practising interview skills – Planning and writing a newspaper article
Magazine: Composing magazine covers – Planning the contents of a magazine – Giving instructions for a photo shoot – Planning and writing a true life story

Unit III: Writing for Radio, Television and Film **9 Hours**

Radio: Understanding the language of radio presenters – Understanding the production process – Planning a newslist – Giving post production feedback.
Television: Understanding the pre-production process – Organising a filming schedule – Filming on location – Editing a TV documentary
Film: Writing a screenplay – Pitching successfully – Organizing a shoot – Writing a film review

Unit IV: Writing for Advertisements **9 Hours**

Advertisement : Creating a print advert –Creating a screen advert –Presenting a finished advert- Analysing market trends – Setting up a marketing communication strategy – Organising the relaunch of a product – Evaluating the success of a Relaunch

Unit V: Writing for the New Media **9 Hours**

New Media: Briefing a website designer – Analysing problems and providing solutions – Planning and writing a blog – Creating a podcast- Vlogs – Graphic novel [It is suggested for students to follow the different styles of reporting in various media and to familiarize themselves with the emerging trends in the new media]
Core Reading: Ceramella, Nick and Elizabeth Lee. Cambridge English for the Media. CUP, 2008

Text Books

1. Ryan, Michael and James W Tankard, Writing for Print and Digital Media, McGraw-Hill, 2005
2. Allen, Victoria, Karl Davis et. al., Cambridge Technicals Level 3 Digital Media, Hodder, 2016
3. Hayward, Susan. Cinema studies: The Key Concepts, Routledge, 1996

Reference Books

4. Parthasarathy, Rangaswami, Here is the News! Reporting for the Media.Sterling Publications, 1998
5. Axford, Barrie and Richard Huggins. New Media and Politics, Sage, 2001

Web References

1. https://www.google.co.in/books/edition/Designing_New_Media/
2. https://www.google.co.in/books/edition/AS_Media_Studies
3. https://www.google.co.in/books/edition/Social_Media_and_Democracy

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI **20SHM04 Statistical Inference** **3 0 0 3**

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

Code	Course Outcomes
20SHM04.1	Understand the concept of sampling distribution for large and small samples
20SHM04.2	Calculate the estimator of a parameter using point estimation and bias
20SHM04.3	Compare means and variances of two independent or paired samples using interval estimation
20SHM04.4	Understand the framework of hypothesis testing for carrying out statistical inference
20SHM04.5	Carry out the NP tests with due regard to the assumptions underlying these procedures

Unit I: Sampling Distribution **9 Hours**

Population, Samples, Parameter and statistics, Standard error, Sampling distribution of a statistic, Sampling distribution of mean (known and unknown variance) for large and small samples, Sampling distribution of difference of means, Central limit theorem

Unit II: Point Estimation **9 Hours**

Definition of point estimator, General properties of estimators, Uniformly minimum variance unbiased estimators, Sufficient statistics, Factorization theorem, CR Rao inequality, Cramer - Rao lower bound and UMVUE, Methods of finding point estimators by MLestimation, Method of moments

Unit III: Interval Estimation **9 Hours**

Notion of interval estimation, Review of sampling distributions, Confidence Intervals, Confidence interval for the mean (population variance is known and unknown), Confidence interval for the variance (population mean is known and unknown), Confidence interval for the difference between two means

Unit IV: Testing of Hypothesis **9 Hours**

Statistical hypothesis, null and alternative hypothesis, Simple and composite hypotheses,Test of hypothesis, critical region, type I and type II errors and their probabilities, Simple null hypothesis versus simple alternative, Neyman - Pearson lemma, Examples from the normal population, Tests on the mean, Tests on the variance

Unit V: Non-Parametric Methods **9 Hours**

Introduction, assumptions of Npmethods, Advantages and disadvantages,Testing a hypothesis about median, Test for randomness, sign test, Wilcoxon signed rank test

Text Books

1. Gupta Kapoor V. K., " Fundamentals of Mathematical Statistics", Sultan Chand Publications, New Delhi
2. Rao C. R., Linear Statistical Inference and its Applications, Wiley Eastren Publications

Reference Books

6. Richard A.,Gupta C. B. ", Probability and Statistics for Engineers", Miller & Fruend, Pearson's Edition, 2010
7. Rohatgi V. ,K. Statistical Inference, Dover Publications, 2003
8. Iyengar T. K. V., Krishna Gandhi B., Prasad M. V. S. S. N., "Probability and Statistics", Revised Edition, 2012
9. Wasserman L., "A Concise Course in Statistical Inference", Springer Publications, 2004

Web References

5. https://archive.nptel.ac.in/courses/111/105/111105043/
6. https://onlinecourses.nptel.ac.in/noc20_ma19/preview
7. https://onlinecourses.swayam2.ac.in/cec20_ma01/preview

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20MBM03 Organizational Behaviour 3 0 0 3

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

Code	Course Outcomes
20MBM03.1	Understand basic concepts of organizational behavior and its nature
20MBM03.2	Understand the basic concepts personality, values and motivation
20MBM03.3	Understand inter personal behavior and its significance
20MBM03.4	Know the group behavior and its dynamics
20MBM03.5	Know about organizational climate, culture and organizational change

Unit I: Introduction 9 Hours

Organisational Behaviour - Concept and Emergence of OB Concept, Nature and Theoretical frameworks, Disciplines contributing to the field of OB, Historical Background - Hawthorne Studies, Psychological foundations

Unit II: Individual Behaviour 9 Hours

Personality, Learning, Values and Attitudes, Perception, Learning-Behaviourist, cognitive and social learning; Stress at work. Motivation -Maslow's Need Hierarchy, Herzberg's Two Factors Theory

Unit III: Inter - Personal Behaviour 9 Hours

Interpersonal communication and Feedback, Transactional Analysis (TA), Johari Window. Managingmis() behaviour at work, Substance abuse, cyber slacking, Aggression, and Violence

Unit IV: Group Behaviour 9 Hours

Group Dynamics, Cohesiveness and Productivity, Management of Dysfunctional groups, Group Decision Making, Organisational Politics.

Leadership- Concept and Styles, Fielder's Contingency Model, House's Path - Goal Theory, Leadership Effectiveness

Unit V: Organizational Process 9 Hours

Organizational Climate: Concept, Determinants, Organization Culture - Concept, Forming, Sustaining, and Changing a Culture, Organizational effectiveness - concept and measurement, Organizational change - resistance and management.

Note: Discuss case studies from every unit

Text Books

1. Singh B. P. and Chhabra T. N., Management Concepts and Practices, Dhanpat Rai, New Delhi
2. Singh B. P. and Singh A. K., Essentials of Management, Excel Books, New Delhi
3. Dwivedi R. S. Management – An Integrated Approach, National Publishing House

Reference Books

1. Udai Pareek, Organizational Behavior, 3rd Edition, Oxford University Press, 2011
2. Subba Rao P., "Management and Organizational Behavior", 3rd Edition, Himalaya Publishing House, 2017
3. Ghuman, K. and Aswathappa K., Management: Concepts, Practice and Cases, Tata Mc - Graw Hill

Web References

8. https://nptel.ac.in/courses/105/102/105102012/
9. https://onlinecourses.swayam2.ac.in/nou20_cs14/

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20MBM04 Compensation Management & Employee Welfare Laws 3 0 0 3

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

Code	Course Outcomes
20MBM04.1	Understand different pay structures and pay levels
20MBM04.2	Know about wage act 1936 and its implications
20MBM04.3	Understand the factors influence the wage fixation
20MBM04.4	Understand the components of bonus act 1965
20MBM04.5	Understand various incentive plans and international compensation concept

Unit I: Compensation Management 9 Hours

Compensation management process, forms of pay, financial and non - financial compensation. Compensation Strategies, Assessing job values, pay structures, designing pay levels, construction of optimal pay structure. Paying for performance, skills and competence. International pay systems: comparing costs and systems

Unit II: The Payment of Wages Act, 1936 9 Hours

Objects, Application, Responsibility for payment of wages, Fixation of wage periods, time - limits, Deduction from wages, Remedies available to worker, Powers of authorities, Penalty for offences

Unit III: The Minimum Wages Act, 1948 9 Hours

Objects, application, minimum fair and living wages, determination of minimum wage, taxation of minimum wage, advisory board, remedy to worker for non - payment of minimum wages

Unit IV: The Payment of Bonus Act, 1965 9 Hours

Objects, Scope and Application, Definitions, Calculation ofamount payable as Bonus, Eligibility and Disqualifications for Bonus, Minimum & maximum Bonus, Application of Act in Establishment in Public Sector, Bonus linked with Production or Productivity

Unit V: Incentives Incentive Plan 9 Hours

Individual incentives, pay for performance, compensation of special group Benefits, legally required benefits: Retirement, medical and other benefits, Employee profit sharing, employee stock option, gain sharing International Compensation: Recognizing variation, the social contract, Culture and pay, Preliminary considerations of international compensation

Text Books

1. Belchor, David W., “Compensation Administration”, Prentice Hall, Englewood Cliffs. NT.
2. Henderson R. I., Compensation Management in a Knowledge Based World, New Delhi: Pearson Education
3. Milkovich G., Newman J. and Ratnam C. S. V., Compensation, Tata Mc – Graw Hill, Special Indian Edition

Reference Books

1. Armstrong M.& Murlis H., Reward Management: A Hand book of Salary administration, London: Kegan Paul
2. Sharma J. P., An Easy approach to Company and Compensation Laws, New Delhi: Ane Books Pvt. Ltd.
3. Malik P. L., Hand book of Labourer and Industrial Law, Eastern Book Company
4. Government of India Report of the National Commission on Labour Ministry of Labour and Employment, New Delhi. (latest)

Web References

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

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20CEM03 Sustainability and Pollution Prevention Practices 3 0 0 3

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

Code	Course Outcomes
20CEM03.1	Concept of sustainability and its goals
20CEM03.2	Sources and effects of environmental pollution
20CEM03.3	Identify the prevention measures for environmental protection
20CEM03.4	Approach for analysis and assessment of developmental activities and their impacts on environment
20CEM03.5	Objectives and components of environmental management

Unit I: Concept of Sustainability and Development 9 Hours

Sustainability and its goals, Growth and development, Development and environment, Causes for industrialization, Changing life styles, Regulatory aspects of industrialization, Overall impact of industrialization and Urbanization on quality of human life, Global environmental issues

Unit II: Pollution, Monitoring and Control 9 Hours

Definition, types and sources of pollution, Quality standards for air, water, soil; types of pollutants; Methods of monitoring and control of air, water, soil Pollution (Physicochemical and bacteriological sampling and analysis); effects of pollution on plants, animals and Human beings.

Unit III: Measures for Environmental Protection 9 Hours

Formal and informal environmental education, awareness for nature conservation and protection, environmental ethics and morality, conservation of natural habitats, National parks and wild life sanctuaries, role of youth and women, role of NGO's, urban planning and land-use pattern

Unit IV: Environmental Impact Assessment 9 Hours

Definition, significance and scope of impact assessment, Need & objective, types of environmental impacts, methods of environmental impacts, major steps in impact assessment procedure, generalised approach to impact analysis

Unit V : Environmental Management 9 Hours

Objectives and components of environmental management need for training, Environmental Impact Statement and Environment Managemental Plan, Role of remote sensing in environmental management, Sustainable use of natural resources, management of soil, wildlife and its methods, agriculture management, Public participation in resource management

Text Books

1. Lars F. Niklasson, "Improving the Sustainable Development Goals: Strategies and the Governance Challenge", 2009
2. Herman Koren, "Best Practices for Environmental Health: Environmental Pollution, Protection, Quality and Sustainability", 21 April, 2017
3. McCully, P, "Rivers no more: the environmental effects of dams (pp. 29-64)", Zed Books, 1996
4. McNeill, John R, "Something New Under the Sun: An Environmental History of the Twentieth Century", 2000

Reference Books

1. Environmental Chemistry - A.K. De, New Age Int. Pub. Co., New Delhi, 1990
2. Lave, L.B and Upton, "Toxic Chemicals, Health and the Environment", The Hopkins Press Ltd., London, 1987
3. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. "Environmental and Pollution Science. Academic Press", 2011

Web References

1. http://mcic.ca
2. https://www.drishtiias.com
3. https://www.jica.go.jp

CONTROL COPY ATTESTED

Chairman
Board of Studies (CE)

MI 20CSM03 Database Security 3 0 0 3

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

Code	Course Outcomes
20CSM03.1	Explain the Cossets DBMS
20CSM03.2	Explain the Constrains in Database
20CSM03.3	Describe different Database Schemas
20CSM03.4	Illustrate Desecrate Data Models and Water Marking Processes
20CSM03.5	Explains Geospatial Data Models and Access Methods

Unit I: Database Introduction **9 Hours**

Introduction to Database – Relational Database & Management System, Data Abstraction (Physical Level, Logical Level & View Level) - Multi-level Database, Distributed Database, Database Architecture.

Unit II: Database Securities **9 Hours**

Security issues in Database – Integrity constraints, Access Control (Grant & Revoke Privileges) - Statistical Database, Differential Privacy. Distributed Database Security.

Unit III: Schema Models **9 Hours**

Security in Data Warehouse & OLAP – Introduction, Fact table, Dimensions, Star Schema, Snowflake Schema, Multi-Dimension Range Query, Data Cubes.

Unit IV: Data Mining Introduction **9 Hours**

Data Mining – Introduction - Randomization methods, Data Swapping, Database Watermarking – Basic Watermarking Process - Discrete Data, Multimedia, and Relational Data, Different Data Migration Techniques.

Unit V: Geospatial Database **9 Hours**

Geospatial Database Security – Geospatial data models – Geospatial Authorization, Access Control Models: Geo-RBAC, Geo- LBAC

Text Books

1. Michael Gertz, Sushil Jajodia, “Handbook of Database Security: Applications and Trends”, ISBN-10: 0387485325, Springer, 2007
2. Osama S. Faragallah, El-Sayed M. El-Rabaie, Fathi E. Abd El-Samie, Ahmed I. Sallam, and Hala S. El-Sayed, “Multilevel Security for Relational Databases”, ISBN 978-1-4822- 0539-8, CRC Press, 2014.

Reference Books

1. Bhavani Thuraisingham, “Database and Applications Security: Integrating Information Security and Data Management”, CRC Press, Taylor & Francis Group, 2005.
2. Elmasri navrate, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2016.
3. Peter Rob & Carlos Coronel, “Database Systems Design, Implementation and Management,” Tenth Edition, Pearson Education, 2013

Web Resources

1. http://www.nptelvideos.in/2012/11/database-managementsystem.html
2. https://www.ibm.com/in-en/cloud/learn/database-security
3. http://data.conferenceworld.in

CONTROL COPY ATTESTED

Chairman
Board of Studies (CSE)

MI 20MEM03 Surface Engineering 3 0 0 3

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

Code	Course Outcomes
20MEM03.1	Decide the surface preparation methods suitable for different substrate materials.
20MEM03.2	Apply knowledge on properties offered by different Coatings based on the application requirement.
20MEM03.3	Interpret the testing &evaluation of metallic coatings.
20MEM03.4	Explain the effect of process parameters on the properties & microstructure of the surface coating processes.
20MEM03.5	Explain the importance & role of surface modifications to achieve several technological properties.

Unit I: Fundamentals of Surface Engineering **9 Hours**

Introduction to surface engineering, Scope of surface engineering for different engineering materials, Surface Preparation methods such as Chemical, Electrochemical, Mechanical: Sand Blasting, Shot peening, Shot blasting, Hydro-blasting, Vapor Phase Degreasing etc.,
Coatings: Classification, Properties and applications of Various Coatings

Unit II: Chemical Conversion Coating **9 Hours**

Chromating, Phosphating, and Anodizing, Thermochemical processes: Methodology used, mechanisms, important reactions involved, Process parameters and applications.

Unit III: Coating from Vapor Phase **9 Hours**

PVD, and CVD: Various Methods used, mechanisms, important reactions involved, Process parameters and applications.

Unit IV: Metallic coating **9 Hours**

Hot Dipping, Galvanizing, Electrolytic and Electro less plating: Methodology used, mechanisms, important reactions involved, Process parameters and applications. Testing/ evaluation of metallic coatings.

Unit V: Thermal spray coatings **9 Hours**

Processes, Types of spray guns, Comparison of typical thermal spray processes, Surface Preparation, Finishing Treatment, Coating Structures and Properties, Applications.

Text Books

1. J. R. Davis, "Surface Engineering for Corrosion and Wear Resistance", 1st Edtion, 1997.
2. George J, "Rudzki -Surface Finishing Systems metal and non-metal finishing handbook-guide", 1st Edition, Metals Park: ASM, 1983.
3. James A. Murphy, "Surface Preparation and Finishes for Metal, McGraw-Hill", New York 1971.
4. P. G. Sheasby and R. Pinner, "Surface treatment and finishing of Aluminium and its alloy", 1st Edition, ASM, Metals Park, 1987.

Reference Books

1. Friction Stir Welding and Processing, Rajiv Sharan Mishra, Partha Sarathi De, Nilesh Kumar, International 2006.
2. Friction Stir Welding and Processing, R.S. Mishra and M.W. Mahoney, ASM International, 2007.
3. Advances in Friction-Stir Welding and Processing, M-K Besharati-Givi and P. Asadi, ASM International 2008.

Web References

1. www.nptel.iitm.ac.in
2. www.btechguru.com
3. www.ocw.mit.edu
4. www.corrosion-doctors.org

CONTROL COPY ATTESTED

Chairman
Board of Studies (ME)

MI 20EEM03 Electrical Engineering Material Science 3 0 0 3

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

Code	Course Outcomes
20EEM03.1	Understand the phenomena of metal conductivity
20EEM03.2	Explain the properties of di-electric properties
20EEM03.3	Understand the magnetic properties of materials
20EEM03.4	Explain the types of semi-conductors
20EEM03.5	Understand the modern techniques used for studying the material science

Unit I: Conductivity of Metal **9 Hours**

Introduction, factors affecting the resistivity of electrical materials, motion of an electron in an electric field, Equation of motion of an electron, current carried by electrons, mobility, energy levels of a molecule, emission of electrons from metals, thermionic emission, photo electric emission, field emission, effect of temperature on electrical conductivity of metals, electrical conducting materials

Unit II: Dielectric Properties **9 Hours**

Introduction, effect of a dielectric on the behavior of a capacitor, polarization, the dielectric constant of monatomic gases, frequency dependence of permittivity, dielectric losses, significance of the loss tangent, dipolar relaxation, frequency and temperature dependence of the dielectric constant, dielectric properties of polymeric system,

Unit III: Magnetic Properties of Materials **9 Hours**

Introduction, Classification of magnetic materials, diamagnetism, paramagnetism, ferromagnetism, the hysteresis loop, factors affecting permeability and hysteresis loss, common magnetic materials

Unit IV: Semiconductors **9 Hours**

Energy band in solids, conductors, semiconductors and insulators, types of semiconductors, Intrinsic semiconductors, impurity type semiconductor, diffusion, thermal conductivity of semiconductors, electrical conductivity of doped materials

Unit V: Modern Techniques for Materials Studies **9 Hours**

Optical microscopy – Electron microscopy – Photo electron spectroscopy – Atomic absorption spectroscopy – Introduction to Biomaterials and Nanomaterials

Text Books

1. Joseph Le Roy Hayde Proteus Steinmetz, “Radiation, Light and Illumination: A Series of Engineering Lectures Delivered at Union College”, BiblioLife, 2019
2. Jack L. Lindsey, “Applied Illumination Engineering”, 4th Edition, PHI, 2011
3. John Matthews, “Introduction to the Design and Analysis of Building Electrical Systems”, 2nd Edition, Springer, 2013.

Reference Books

1. M.A. Cayless, “Lamps and Lighting”, 5th Edition, Routledge, 2016.
2. Leopold Bloch, “Science of Illumination: An Outline Of The Principles Of Artificial Lighting”, Kessinger Pub, 2018.

Web References

1. https://nptel.ac.in/courses/108/105/108105060/

CONTROL COPY ATTESTED

Chairman
Board of Studies (EEE)

MI 20ECM03 Analog Electronic Circuits 3 0 0 3

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

Code	Course Outcomes
20ECM03.1	Demonstrate the concept of DC biasing and transistor stabilization leading to the design of amplifiers
20ECM03.2	Classify, analyze types of multistage amplifiers
20ECM03.3	Classify, analyze and design different types of feedback amplifiers and Oscillators
20ECM03.4	Analyze the response of different signals for linear and Nonlinear wave shaping circuits
20ECM03.5	Understand the internal operation of Op-Amp and its Applications

Unit I: Transistor Biasing **9 Hours**

Need for biasing, operating point, BJT biasing methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S, S', S'').

Unit II: BJT and Multistage Amplifiers **9 Hours**

BJT: Transistor at high frequencies, Hybrid- π common emitter transistor model, Hybrid π conductance, Hybrid π capacitances, Multistage Amplifiers: Classification of amplifiers, methods of coupling, cascaded transistor amplifier.

Unit III: Feedback Amplifiers and Oscillators **9 Hours**

Feedback Amplifiers: Feedback principle and concept, types of feedback, classification of feedback amplifiers. Oscillators: Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wien bridge oscillators with BJT, generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators using BJT.

Unit IV: Linear Wave Shaping **9 Hours**

Linear wave shaping: High pass, low pass RC circuits, response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; Attenuators, Diode clippers.

Unit V: Linear Applications of Op-Amp **9 Hours**

Internal Block Diagram of various stages of Op-Amp and Roll of each Stage, Characteristics of Op-Amp, Ideal and Practical Op-Amp specifications, Inverting and Non-inverting amplifier, Integrator and differentiator, Difference amplifier, Instrumentation amplifier.

Text Books

1. Robert, L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits Theory", 10th Edition, Prentice Hall of India, 2009.
2. Millman, J, TaubH, Mothiki Surya Prakash Rao and Millman's, "Pulse Digital and Switching Waveforms", 2nd Edition, Tata McGraw-Hill, 2008.
3. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", Prentices Hall of India, 1987.

Reference Books

1. Donald A. Neaman, "Electronic Circuit Analysis and Design", 3rd Edition, Tata Mc Graw-Hill, 2010
2. Paul Gray, Hurst, Lewis and Meyer, "Analysis and Design of Analog Integrated Circuits", 4th Edition, John Willey &Sons, 2005
3. Anand Kumar, A., "Pulse and Digital Circuits", 2nd Edition, Prentice Hall of India, 2005
4. Sanjay Sharma, "Operational Amplifiers & Linear Integrated Circuits", 2nd Edition, S. K. Kataria & Sons, 2010.

Web Resource

1. https://nptel.ac.in/courses/108102112
2. https://www.udemy.com/course/analog-electronics-basic-concepts/

CONTROL COPY ATTESTED

Chairman
Board of Studies (ECE)

MI 20AIM03 Interpretable Machine Learning 3 0 0 3

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

Code	Course Outcomes
20AIM03.1	Introduction to interpretability
20AIM03.2	Different interpretable models
20AIM03.3	Explain the software's for interpretable models.
20AIM03.4	Illustrate plotting of prediction changes.
20AIM03.5	Explains individual predictions of any black box classification model.

Unit I: Introduction **9 Hours**

Importance of Interpretability, Taxonomy of Interpretability Methods, Scope and evaluation of Interpretability, Properties of Explanations, Human-friendly Explanations

Unit II: Interpretable Models-I **9 Hours**

Data Sets-Regression, Text Classification. Interpretable Models -Linear Regression, Logistic Regression, Decision Tree, Decision Rules, Decision Rule Fit

Unit III: Interpretable Models-II **9 Hours**

Generalized Linear Models (GLM) - Non-Gaussian Outcomes, Advantages; Generalized Additive Models (GAM) - Nonlinear Effects, Advantages and software; Other interpretable Models: Naive Bayes Classifier, K-Nearest Neighbors

Unit IV: Model Agnostic Methods **9 Hours**

Partial Dependence Plot (PDP), Accumulated Local Effects (ALE) Plot, Feature Interaction, Functional Decomposition, Permutation Feature Importance, Global Surrogate.

Unit V: Local Model Agnostic Methods **9 Hours**

Individual Conditional Expectation (ICE), Local Surrogate (LIME), Counterfactual Explanations, Scoped Rules (Anchors), Shapley Values.

Text Books

1. "Interpretable Machine Learning, A Guide for Making Black Box Models Explainable", By Christoph Molnar · 2020
2. "Interpretable Machine Learning with Python, Learn to Build Interpretable High-performance Models with Hands-on Real-world", By Serg Masís · 2021

Reference Books

1. "Explainable AI: Interpreting, Explaining and Visualizing Deep Learning", By Andrea Vedaldi, Grégoire Montavon, Klaus-Robert Müller, Lars Kai Hansen, Wojciech Samek,2019.
2. "Interpreting Machine Learning Models, Learn Model Interpretability and Explainability Methods", By Anirban Nandi, Aditya Kumar Pal · 2021

Web References

1. https://christophm.github.io/interpretable-ml-book/index.html
2. https://ai.googleblog.com/2021/12/interpretable-deep-learning-for-time.html
3. https://arxiv.org/abs/2103.10689

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE(AI/ML)

MI 20DSM03 Data Governance 3 0 0 3

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

Code	Course Outcomes
20DSM03.1	Understanding of the role computation can play in solving problems and optimization techniques
20DSM03.2	Understanding the usage of computational techniques.
20DSM03.3	Understanding Stochastic programming and statistical thinking
20DSM03.4	Identify the problem using Monte Carlo simulations
20DSM03.5	Plotting with the pylab package

Unit I: Introduction, Data Literacy and Concepts **9 Hours**

Data is an asset, Data governance and governance, Data management, The governance "V", Solutions Other terms, Some final core concepts

Unit II: Overview: A Day in the life of a Data Governance Program and its Capabilities **9 Hours**

What does it look like? - The scope of data governance and data management, Business model, Content, Development methods -Federation, Elements of data governance programs, Principles, Policies, Metrics, The critical success factors for data governance

Unit III: The Data Governance Business Case **9 Hours**

The business case, Objectives of the business case for data governance, Components of the business case - The big picture (vision), Program risks, Business alignment, Costs of data quality issues, Costs of missed opportunities, Data debt, Obstacles, impacts, and changes, Presentation of the case. The process to build the business case - Fully understand business direction, identify possible opportunities, identify usage opportunities, define business benefits, confirm business benefits, quantify costs, Prepare the business case documentation, Approach considerations

Unit IV: Overview of Data Governance Development and Deployment **9 Hours**

Types of approaches, The data governance delivery framework, Process overview, Engagement, Strategy, Architecture and design, Implementation, Operation, and changes

Unit V: Engagement **9 Hours**

Initiation- Obtain program approval, Develop DG rollout team structure. Definition- Define DG for your organization, identify business units (subject to DG), Identify business capabilities that need data governance (and don't have it). Scope- Define scope and constraints with the initial plan for DG, Approve scope and constraints. Assessment- Information maturity, Change capacity, Data environment

Text Books

1. John Ladley, "Data Governance", Academic Press, Second Edition, 2012.

Reference Books

1. Evren Eryuek, Uri Gilad, "Data Governance: The Definitive Guide", O'Reilly Media, Inc., 2021.

Web Resources

1. https://nptel.ac.in/courses/110/106/110106072/
2. https://nptel.ac.in/courses/110/104/110104094/

CONTROL COPY ATTESTED

Chairman
Board of Studies CSE(DS)

MI 20SHM06 Journalism 3 0 0 3

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

Code	Course Outcomes
20SHM01.1	Understand the concepts of mass communication in general and journalism in particular
20SHM01.2	Impact fundamentals of journalism, evolutionary process, basics concepts, practices and recent trends
20SHM01.3	Get exposed to different faces of journalism
20SHM01.4	Get trained to develop inquisitive and analytical skills to be successful in media
20SHM01.5	Prepare the report for the representation

Unit I: Introduction **9 Hours**

Journalism: Meaning, Definition Nature, Scope, Functions; Truth,Objectivity, verification. independent monitor, forum for criticism and comment, watch dog role of press and democracy principles of journalism will stop types of journalism: print, broadcast and online

Unit II: Process Control and Capability Analysis **9 Hours**

Mass Media And Development - Early Journalism in the world, India and Karnataka global context Colin rise of advocacy journalism, professionalism, modern journalism and mobile journal journalism. Community journalism, rural journalism, yellow journalism, penny press, tabloid press, and citizen journalism

Unit III: Process-monitoring and Control Techniques **9 Hours**

Journalism as a profession, responsibilities and criticism, do you know any his interest understanding the public taste, press as a tool in social service relationship between press and other mass media

Unit IV: Acceptance Sampling **9 Hours**

Normative theories of press enter relevance to the present day; wire services- Indian and international news agencies

Unit V: Reliability and Life Testing **9 Hours**

Photojournalism- caption writing, photo feature, visual composition- case studies Danish Siddiq, Jimmy Nelson, Margaret Brooke-white, Philip JonesGriffits, Rathika Ramaswami Raghu Rai exercise assignments analysis of daily newspaper in the classroom practice of writing new stories on various topics writing reports on civic problems incorporating information from civil organization based on interviews prepare questions for a specific interview rewriting news stories from newspapers for magazine filing report of more press conferences filing report for an actual press conference practice of writing to wall journal twice a week

Text Books

1. Keval J. Kumar (2001), Mass Communication in India, Jaico Publication, New Delhi
2. Seema Hasan (2010), Mass Communication – Principles and Concepts, CBS Publishers and distributors, New Delhi
3. V S Gupta & Vir Bala Aggarwal (2001), Handbook of Journalism and Mass Communication, Concept Publishing Company, New Delhi

Web References

3. http://wikipedia.org//wiki//media_of_india#cite
4. http://wikipedia.org//wiki//mass%2520_media__of_india#cite
5. http://wikipedia.org//wiki//mass_media_of_india#cite-buzzle

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20SHM07 Statistical Quality Control 3 0 0 3

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

Code	Course Outcomes
20SHM08.1	Identify application of various Statistical quality tools
20SHM08.2	Use control chart techniques for quality improvement
20SHM08.3	planning, establishing, and operating SQC procedures
20SHM08.4	Design a procedure testing incoming batches
20SHM08.5	Carry out reliability testsand perform statistical analysis

Unit I: Introduction **9 Hours**

Quality Improvement in the Modern Business Environment, Modeling Process Quality, Methods and Philosophy of Statistical Process Control

Unit II: Process Control and Capability Analysis **9 Hours**

Control Charts for Variables, Control Charts for Attributes, Process and Measurement System Capability Analysis

Unit III: Process-monitoring and Control Techniques **9 Hours**

Cumulative Sum and Exponentially Weighted Moving Average Control Charts, Univariate Statistical Process Monitoring and Control Techniques

Unit IV: Acceptance Sampling **9 Hours**

Concepts of acceptance sampling, Lot-by-lot acceptance sampling for attributes, Other acceptance sampling techniques

Unit V: Reliability and Life Testing **9 Hours**

Common models and distributions, Estimation of mean life with complete samples, Reliability Estimation, Types of reliability tests

Text Books

1. Montogomery D. C, Introduction to Statistical Quality Control (5th Edition) Wiley eastrenLtd, 2005
2. Gupta.V,Kapoor,V.K Fundamentals of Applied Statistics Sultan Chand Publications, New Delhi

Reference Books

1. Chang D. and Macmillan S. (1992). Statistical Quality Design and Control. Contemporary Concepts and Methods
2. Mahajan M. Statistical Quality Control, Danpatrai & Co Delhi
3. Gupta R.C Statistical quality Control and Quality management,10th Edition, Kanna Publishers, New Delhi

Web References

6. https://www.digimat.in/nptel/courses/video/112107259/L01.html
7. https://freevideolectures.com/course/4539/nptel-operations-management/49
8. https://freevideolectures.com/course/4384/nptel-engineering-metrology/48

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20MBM05 Entrepreneurship and Business Venture Planning 3 0 0 3

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

Code	Course Outcomes
20MBM05.1	Know the role of entrepreneurship development in economy
20MBM05.2	Understand the entrepreneurship and creativity
20MBM05.3	Understand the concept of project planning
20MBM05.4	Understand the sources of financing to ventures
20MBM05.5	Know the methods of entrepreneurship training

Unit I: Introduction 9 Hours

Concept of Entrepreneurship, Role of entrepreneurship in economic Development; factors impacting emergence of entrepreneurship, types of entrepreneurs. Characteristic of successful entrepreneurs; Women Entrepreneurs, Social entrepreneurship, Entrepreneurial challenges

Unit II: Entrepreneurship Development 9 Hours

Types of start-ups, Entrepreneurial class Theories, Entrepreneurial training; EDP Programme, Characteristics of entrepreneurial leadership, Components of Entrepreneurial Leadership, Source of innovative ideas, Entrepreneurship and creativity.

Unit III: Project Planning 9 Hours

Concept of Project and classification of Project, Identification, Project Formulation, Project Report, Project Design, Project Appraisal, Profitability Appraisal, Social cost benefit analysis, financial analysis, Developing a Marketing plan-customer analysis, sales analysis, steps in marketing research, Marketing Mix; business plan preparation, elements of a business plan; Business plan failures

Unit IV: Project Financing & Venture Capital 9 Hours

Financing Stages; Sources of Finance; Venture Capital; Criteria for evaluating new-venture proposals; Evaluating the Venture Capital-process; Sources of financing for Indian entrepreneurs.

Unit V: Entrepreneurship Training 9 Hours

Designing appropriate training programmers to inculcate entrepreneurial spirit, significance of entrepreneurial training, training for new and existing entrepreneurs, role of entrepreneurship development institutes, MSMES in providing entrepreneurial training.

Note: Discuss case studies from every unit

Text Books

1. Kumar, Arya and Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Pearson, India.
2. Hishrich, Peters, Entrepreneurship: Starting, Developing and Managing New Enterprise, Irwin.

Reference Books

1. Allen K. R., Launching New Ventures: An Entrepreneurial Approach, Cengage Learning.
2. Rama Chandran K., Entrepreneurship Development, Tata McGraw-Hill, India.
3. Roy, Rajeev, Entrepreneurship, Oxford University Press
4. Vasant, Desai, Small – Scale Industries and Entrepreneurship, Himalya Publication, India

Web References

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

CONTROL COPY ATTESTED

Chairman
Board of Studies

MI 20MBM06 Performance Management and Talent Management 3 0 0 3

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

Code	Course Outcomes
20MBM06.1	Know about performance management process
20MBM06.2	Understand the performance management system
20MBM06.3	Understand the issues and challenges in implementation of performance management system
20MBM06.4	Understand the talent management approaches
20MBM06.5	Understand the talent management practices and process of companies

Unit I: Introduction 9 Hours

Performance management process, Objectives of performance management system; Historical development in India, Performance management and performance appraisal, Linkage of performance management system with other HR practices

Unit II: Performance Management System 9 Hours

Performance planning, Ongoing support and coaching, Performance measurement and evaluation, Performance management and appraisal; Methods of performance appraisal, Appraisal Communication; Counselling, Identifying potential for development, Linking pay with performance

Unit III: Issues in Performance Management 9 Hours

Implementing performance management system - Strategies and challenges, Role of HR professionals in performance management, Performance management as an aid to learning and employee empowerment, Performance management documentation, Performance management audit, Ethical and legal issues in performance management

Unit IV: Talent Management 9 Hours

Concept and approaches, Frame work of talent management, Talent identification, integration and retention

Unit V: Talent Management Practices and Process 9 Hours

Building the talent pipeline, Managing employee engagement, Key factors and different aspects of talent management, using talent management processes to drive culture of excellence

Note: Discuss case studies from every unit

Text Books

1. Bhattacharyya, D. K., “Performance Management Systems and Strategies”, Pearson Education
2. Robert B, “Performance Management”, McGraw-Hill Education, India
3. ASTD, “Talent Management: Strategies for success from six leading companies”, Cengage Learning

Reference Books

1. Armstrong M, & Baron A, “Performance Management and Development”, Jaico Publishing House, Mumbai
2. Rao T. V, “Hurconomics for Talent Management: Making the HRD missionary business – driven”, Pearson Education

Web References

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

CONTROL COPY ATTESTED

Chairman
Board of Studies