AR - 20

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

CIVIL ENGINEERING

For

B.TECH. FOUR YEAR DEGREE PROGRAMME
(Applicable for the batches admitted from 2020-21)

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)

Approved By AICTE, New Delhi
Recognized under 2(f),12(b) of UGC
Permanently Affiliated to JNTUG, Vizianagaram.
Accredited by NBA (UG Programs; CSE, ECE, EEE, ME, CE & IT)
Accredited by NAAC (UGC) with A+ Grade
K. Kotturu, TEKKALI-532 201, Srikakulam, Andhra Pradesh

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

VISION OF THE DEPARTMENT

To become a pioneer in the field of civil engineering by providing high quality education and research to serve the public consistently with competitive spirit professional ethics.

MISSION OF THE DEPARTMENT

M1. Provide quality knowledge and advance skills to the students in order to expertise theoretically and practically in the areas of civil engineering.

M2. Improve the professional potentiality of the students and staff through educational programs to expand the knowledge in the field of civil engineering

M3. Inculcate healthy competitive spirit towards the higher education and successful career in the field of civil engineering to serve the nation ethically.

M4. Provide students and faculty with opportunities to create, disseminate and apply knowledge by maintaining a state of the art research.

PROGRAM EDUCATIONAL OBJECTIVES

On successful completion of B. Tech. Civil Engineering program graduates will

PEO1. Be employed as a practicing civil engineer in construction, design, testing and allied fields.

PEO2. Engage in self-directed learning research or to undertake higher studies in the rapidly changing civil engineering environment.

PEO3. Create new methods / processes to meet the needs of the society with their civil engineering knowledge.

PEO4. Create themselves as ethical and responsible professionals with good communication skills and demonstrate leadership skills.

PROGRAM OUTCOMES

Engineering graduates will be able to

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of B. Tech. Civil Engineering programme graduates will be able to

PSO-1 Specify, design, supervise, test and evaluate civil engineering structures with integrity as per drawings using basic engineering concepts.
PSO-2 Survey, map, plan & layout of infrastructures viz. canals, roads, etc. and apply knowledge of environmental & geotechnical engineering
PSO-3 Acquire knowledge of various techniques, skills and engineering tools required for civil engineering structures including all types of buildings, irrigation structures, highways, railways, docks &harbours etc.

Academic Regulations 2020 (AR20) for B. Tech

(Effective for the students admitted into I year from the Academic Year 2020-21 onwards)

1. Award of B.Tech. Degree:

A student will be declared eligible for the award of the B. Tech. Degree if he/she fulfills the following academic regulations.

Registered for **160** credits and he/she must secure total **160** credits.

Students, who fail to complete their four-year course of study within **8** years or fail to acquire the **160** Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Courses of study:

The following courses of study are offered at present with specialization in the B.Tech Course.

S. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology
07	42-CSM	CSE (Artificial Intelligence and Machine Learning)
08	44-CSD	CSE (Data Science)

And any other course as approved by the authorities of the University from time to time.

3. Credits (Semester system from I year onwards):

S. No	Course	Credits
1	Mandatory Course	0
2	Theory Course	3
3	Laboratory Course	1.5
4	Integrated Course	4.5
5	Interdisciplinary/Open Elective Course	3
6	Skill-Oriented/Skill-Advanced/Soft Skills Course	2
7	Internship	1.5/03
8	Project work	12

4. Interdisciplinary/Open Electives:

There are two interdisciplinary electives in II year II semester and III year I semester and one open elective in IV year I semester. The student can choose any one interdisciplinary elective/open elective courses offered in the respective semester. The pattern of Midterm examinations and End examinations of these courses is similar to regular theory courses and the valuation is purely internal.

5. MOOCs:

Explore all possibilities to run at least one subject in every semester from II year I semester onwards as a MOOCs.

6. NCC/NSS activities:

All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during II year I semester or II year II semester and evaluated during the II year II Semester. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

7. Evaluation Methodology:

The performance of a student in each semester shall be evaluated with a maximum of 100 marks for theory course, laboratory and other courses. The project work shall be evaluated for 200 marks.

7.1 Mandatory Courses:

Mandatory course is one among the compulsory courses and does not carry any Credits. The list of mandatory courses is shown below:

- Induction Program
- Constitution of India
- Environmental Science
- Human Values

No marks or letter grade shall be allotted for all mandatory non-credit courses.

7.2 Theory course (100 marks):

For theory course, the distribution shall be **40** marks for internal midterm evaluation and **60** marks for the External End Examinations. Out of **40** internal midterm marks, **25** marks are allotted for descriptive exam, 10 marks for two assignments (**5** marks for each assignment) or one case study (group-wise), and **5** marks for objective test.

7.2.1 Pattern for Internal Midterm Examinations (25 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **30** marks and will be scaled down to **25** marks, with the duration of **90** minutes.

For final calculation of internal marks, weightage of **70%** will be given to the student who performed well either in first Midterm or second Midterm and **30%** weightage will be given to other Midterm examination.

Midterm paper contains three descriptive type questions with internal choice. Each question carries **10** marks (3×10=30M). The first Midterm examination will be conducted usually after 8 weeks of instruction or after completion of 50% syllabus (i.e. first 3 Units), and the second Midterm examination will be conducted usually at the end of instruction after completion of remaining 50% syllabus (i.e. remaining 3 Units).

7.2.2 Objective test (5 marks):

For theory courses of each semester, there shall be 2 Objective tests to be conducted along with Midterm exam. Each Objective test is to be held for **10** marks with the duration of **10** minutes and will be scaled down to **5** marks.

For final calculation of objective test marks, weightage of **70%** will be given to the student who performed well either in first objective test or second objective test and **30%** weightage will be given to other objective test.

7.2.3 Pattern for External End Examinations (60 marks):

The question paper shall have descriptive type questions for **60** marks. There shall be one question from each unit with internal choice. Each question carries **10** marks. Each course shall consist of six units of syllabus. The student should answer total **6** questions. (6X10M=60M)

7.3 Laboratory Course (100 marks):

For laboratory course, there shall be continuous evaluation during the semester for **40** internal marks and **60** semester end examination marks. Out of the **40** marks for internal, **25** marks for day–to–day evaluation, **5** marks for record and **10** marks to be awarded for internal laboratory written test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

For the course Engineering Graphics and Design, the distribution shall be **40** marks for internal evaluation (**20** marks for day–to–day evaluation, and **20** marks for internal tests) and **60** marks for end examination.

For the award of marks for internal tests, weightage of **70%** will be given to the student who performed well either in first test or second test and **30%** weightage will be given to other test.

7.4 Integrated Course (100 marks):

Integrated courses are exclusively designed to provide a unique learning experience of layered learning where students have a chance to practice while learning. These courses are designed by blending both theory and laboratory components one over the other.

Assessment for **100** marks as given below:

<table>
<tr><th>Category</th><th>Marks</th><th>Assessment</th></tr>
<tr><td rowspan="2">Internal</td><td>20</td><td>Internal assessment of Laboratory carried out for 40 marks will be scaled down to 20 marks.</td></tr>
<tr><td>20</td><td>Internal assessment of Theory carried out for 40 marks will be scaled down to 20 marks.</td></tr>
<tr><td rowspan="2">End examination</td><td>40</td><td>End examination of Laboratory carried out for 60 marks will be scaled down to 40 marks.</td></tr>
<tr><td>20</td><td>End examination of Theory carried out for 60 marks will be scaled down to 20 marks.</td></tr>
</table>

For Integrated courses, the evaluation of Theory and Laboratory are carried out separately as per evaluation method given in 7.2 and 7.3.

A candidate shall be declared to have passed in integrated course if he/she secures a minimum of **40%** aggregate marks i.e. **40** out of **100** (Internal & Semester-end examination marks put together), subject to a minimum of **35%** marks i.e. **21** marks out of **60** in semester end examination; in addition to that he/she has to secure minimum of **14** marks (out of **40**) in Laboratory end examination and minimum of **7** marks (out of **20**) in Theory end examination.

7.5 Skill Oriented/Skill Advanced Course (100 marks):

Out of a total of **100** marks for the Skill-Oriented/Skill-Advanced Course, **40** marks shall be for the internal evaluation and **60** marks for semester-end examination.

The internal evaluation shall be made on the basis of seminar given by each student on the topic of his/her Skill-Oriented/Skill-Advanced Course, which was evaluated by internal committee constituted by HOD.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consists of an External examiner, Head of the department and Internal supervisor of the Skill Oriented/Skill-Advanced Course

7.6 Soft Skills (100 marks):

One Soft Skills course is there in III year II semester and Soft skills shall be evaluated for **100** marks. Evaluation pattern of Soft Skills course is similar to the Theory course and evaluation is purely internal.

7.7 Internship (100 marks):

All the students shall undergo Community Internship as well as Industrial Internship. Community Internship is for a minimum period of **2** weeks after II year II Semester and Industrial Internship is for a minimum period of **4** weeks after III year II Semester.

Self study report for the Community Internship after the II year II Semester shall be submitted and evaluated during the III year I Semester and Self study report for the Industrial Internship after the III year II Semester shall be submitted and evaluated during the IV year I Semester.

The Self study report will be evaluated for a total of **100** marks consisting of **40** marks for internal assessment and **60** marks for semester-end examination.

Internal assessment for **40** marks shall be done by: internal supervisor in case of community internship and internship supervisor in industry in case of internship in an industry based on day to day observation.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consisting of an External examiner, Head of the department and Internal supervisor of the Internship.

7.8 Project (200 marks):

Out of a total of 200 marks for the Project, **80** marks shall be for Project Internal Evaluation and 120 marks for the semester-end Examination.

The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee. Out of **80** internal marks: **20** marks allotted for literature survey, **30** marks for results and analysis, **15** marks for first seminar (usually after 8 weeks) and **15** marks for second seminar (at the end of the semester).

The semester-end examination (Viva – Voce) shall be conducted by the committee, consisting of an External examiner, Head of the Department and Supervisor of the Project. The evaluation of project shall be made at the end of IV year.

7.9 Honors/Minor Programme:

The curriculum provides flexibility to enable the competent students to register for B. Tech. degree with Honors/Minor by earning additional **20** credits which are over and above **160** credits for the award of B. Tech. (Regular) degree. The students registered for B. Tech (Honors) shall not be permitted to register for Minor or vice versa.

He/She shall register Honors/Minor during II B.Tech II semester provided he/she secures ≥ 8 CGPA and clearing all the courses in single attempt till II B.Tech I semester. In case of students admitted through lateral entry, the CGPA compliance will be considered from II B.Tech I semester onwards.

If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses of Honors/Minor.

All the students who maintain ≥ 8 CGPA are eligible to enroll for B. Tech with Honors/Minor; however, registration for Honors/Minor degree will be limited to maximum of 35% of the total intake in a particular batch of students.

The students shall have the scope to earn these additional 20 credits from II year II semester to IV year I semester and at any point of time if he/she wishes to withdraw from B. Tech (Honors/Minor) program, the additional credits acquired till that time will get lapsed and cannot be used to compensate with those 160 credits needed for the award of B.Tech degree.

To acquire 20 additional credits, the students shall register for four 4-credit courses under the list of the courses offered by the respective departments and acquire the balance 4 credits by taking two MOOCs NPTEL courses with not less than 8 weeks duration. The student can complete these two MOOCs NPTEL courses during II year II semester to IV year I semester and evaluated and included in the IV year II Semester grade memo.

For the award of B. Tech. degree with Honors the additional 20 credits shall be earned by taking the courses offered by the respective department of study in one domain. A set of four courses are offered under each of the domains preferably from the new emerging areas as recommended by the BoS.

For the award of B. Tech degree with Minor the additional 20 credits shall be earned by taking the inter-disciplinary courses offered preferably from the new emerging areas by other departments.

These additional courses offered by the program may change from time to time based on the demand and resources availability. The courses may be offered in different modes i.e. guided learning/taught courses/Blended mode or combination.

Evaluation methodology of Honors/Minor courses will be similar to the regular B.Tech theory course/laboratory course/integrated course. No Supplementary examination for the courses offered in B.Tech Honors/Minor Program. If a student fails in a course (offered under B.Tech Honors/Minor Program), that course will not be reflected in Grade Memo. The courses passed under Honors/Minor program will not be counted for CGPA/SGPA calculation.

The student who acquires 20 additional credits and maintained ≥ 8 CGPA and acquiring 160 credits in regular B.Tech course and clearing all the courses in single attempt will be awarded the B.Tech degree with

Honors/Minor. Any student who fails to fulfill these conditions will automatically get deregistered for B. Tech (Honors)/B.Tech (Minor) without any notification.

Honors/Minor shall not be awarded under any circumstances without completing the regular B. Tech programme in which a student got admitted.

The student is not permitted to repeat any course offered by any department to fulfil credit requirement for Honors/Minor program.

8. Attendance Requirements:

A student shall be eligible to appear for the semester-end examinations, if he/she acquires a minimum of **75%** of attendance in aggregate of all the subjects.

Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below **75%**) in each semester with genuine reasons shall be approved by a committee duly appointed by the college. The condonation approved otherwise can be reviewed by the College Academic Committee. A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

Shortage of Attendance below **65%** in aggregate shall in NO case be condoned.

A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. He/she may seek re-admission for that semester when offered next.

The overall attendance in each semester of regular B. Tech course and Honors/Minor course shall be computed separately.

A student shall maintain an attendance of **75%** in each course of Honors/Minor to appear for semester end examination of Honors/Minor. Condonation of shortage of attendance up to **10%** (**65%** and above and below **75%**) in each course with genuine reasons shall be approved by a committee duly appointed by the college. A separate fee stipulated by the college shall be payable towards condonation of shortage of attendance in Honors/Minor.

A student detained due to lack of attendance in Honors/Minor course shall not be permitted to continue Honors/Minor programme, but he/she can continue regular B. Tech programme.

9. Minimum Academic Requirements:

9.1 Conditions for pass and award of credits for a course:

A candidate shall be declared to have passed in individual course if he/she secures a minimum of **40%** aggregate marks i.e. **40** out of **100** (internal & semester-end examination marks put together), subject to a minimum of **35%** marks i.e. **21** marks out of **60** in semester end examination.

On passing a course of a programme, the student shall earn assigned credits in that Course.

9.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Level	Letter Grade	Grade Points
>= 90%	Outstanding	A+	10
80 – 89%	Excellent	A	9
70 – 79%	Very Good	B	8
60 – 69%	Good	C	7
50 – 59%	Fair	D	6
40 – 49%	Satisfactory	E	5
< 40%	Fail	F	0
-	Absent	AB	0

9.3 Calculation of Semester Grade Points Average (SGPA) for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA.

The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad \text{(for all courses passed in a semester)}$$

Where CR = Credits of a Course
GP = Grade points awarded for a course

9.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for entire programme:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad \text{(for the entire programme)}$$

Where CR = Credits of a course
GP = Grade points awarded for a course

- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- As per the AICTE regulations, conversion of CGPA into equivalent percentage as follows:
  Equivalent Percentage = (CGPA – 0.75) x 10

9.5 Award of Divisions:

Class Awarded	CGPA Secured	Remarks
First Class with distinction	$\geq$ 7.75 (Without any supplementary appearance)	From the CGPA secured from 160 Credits
First Class	$\geq$ 6.75	
Second Class	$\geq$ 5.75 and <6.75	
Pass Class	$\geq$ 5.0 and <5.75	

9.6 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.7 Conditions for Promotion:

(i) A student will be promoted to second year if he/she satisfies the minimum attendance requirement.

(ii) A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if the number of credits is in fraction, it will be rounded off to a lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.

(iii) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

10. Course pattern:

(i) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(ii) A student is eligible to appear for the end examination in a subject, but when absent for it or failed in the end examinations he/she may appear for that subject's supplementary examinations, when offered.

(iii) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold well with the regulations he/she first admitted.

11. Minimum Instruction Days:

The minimum instruction days for each semester shall be **90**.

12. There shall be no branch transfer after the completion of admission process.

13. General:

(i) Wherever the words "he," "him," "his," occur in the regulations, they include "she," "her," "hers" as well.

(ii) The academic regulation should be read as a whole for the purpose of any interpretation.

(iii) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

(iv) The college may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

****

Academic Regulations 2020 (AR20) for B. Tech (Lateral Entry Scheme)

(Effective for the students admitted into II year from the Academic Year 2021-22 onwards)

1. Award of B. Tech. Degree:

A student will be declared eligible for the award of the B. Tech. Degree if he/she fulfills the following academic regulations.

Registered for **121** credits and he/she must secure total **121** credits.

Students, who fail to complete their three-year course of study within **6** years or fail to acquire **121** Credits for the award of the degree within **6** academic years from the year of their admission shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Promotion Rule:

A lateral entry student will be promoted from II year to III year if he satisfies the minimum required attendance in II year.

A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if the number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

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

****

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1	If the student possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phone with any student or students in or outside the exam hall with respect to any matter	Expulsion from the examination hall and cancellation of the performance in that subject only. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year.
3	If the student impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the student smuggles the answer book or additional sheet or takes out or arranges to send out the question paper or answer book or additional sheet during or after the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive

		semesters from class work and all semester-end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of the seat.
5	If the student uses objectionable, abusive or offensive language in the answer script or in letters to the examiners or writes to the examiner requesting him to award pass marks	Cancellation of the performance in that subject.
6	If the student refuses to obey the orders of the Chief Superintendent/Assistant -Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walkout or instigates others to walk out or threatens the officer-in charge or any person on duty in or outside the examination hall or causes any injury to any of his relatives either by words spoken or written or by signs or by visible representation, assaults the officer-in-charge or any person on duty in or outside the examination hall or any of his relatives, or indulges in any other act of misconduct or mischief which results in damage or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination hall and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	If the student leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of the seat.
8	If the student possesses any lethal weapon or firearm in the examination hall	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clauses 6, 7, 8	In case of student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations

		and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and. a police case will be registered against them.
10	If the student comes in a drunken condition to the examination hall	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny	Cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work of that semester/year examinations.

Aditya Institute of Technology and Management, Tekkali

R20 – COURSE STRUCTURE (1st. B.Tech.)

Civil Engineering

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (1st Sem)	MC	20MCT101	Induction Program	3 weeks			0.0
	HS	20HST101	English	3	0	0	3.0
	BS	20BST101	Linear Algebra and Calculus	2	1	0	3.0
	BS	20BST106	Engineering Physics	3	0	0	3.0
	ES	20EST101	Basic Electrical Engineering	3	0	0	3.0
	ES	20ESL102	Workshop and Manufacturing practice	1	0	4	3.0
	HS	20HSL101	Language Proficiency Lab	0	0	3	1.5
	BS	20BSL101	Physics Lab	0	0	3	1.5
	ES	20ESL101	Basic Electrical Engineering Lab	0	0	3	1.5
Total				**12**	**1**	**13**	**19.5**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (2nd Sem)	MC	20MCT102	Environmental Science	2	0	0	0.0
	BS	20BST102	Differential Equations	2	1	0	3.0
	BS	20BST107	Chemistry	3	0	0	3.0
	PC	20CET101	Surveying and Geomatics	3	0	0	3.0
	ES	20ESI102	Programming for Problem Solving	3	0	3	4.5
	ES	20ESL103	Engineering Graphics & Design	1	0	4	3.0
	BS	20BSL102	Chemistry Lab	0	0	3	1.5
	PC	20CEL101	Surveying Lab – 1	0	0	3	1.5
Total				**14**	**1**	**13**	**19.5**

Aditya Institute of Technology and Management, Tekkali

R20 – COURSE STRUCTURE (2nd . B.Tech.)

Civil Engineering

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B. Tech. (1st Sem)	MC	20MCT203	Constitution of India	2	0	0	**0**
	ES	20EST203	Engineering Mechanics	2	1	0	**3**
	PC	20CET202	Construction materials and Concrete Technology	3	0	0	**3**
	PC	20CET203	Strength of Materials	2	1	0	**3**
	PC	20CET204	Engineering Geology	3	0	0	**3**
	PC	20CET205	Fluid Mechanics &Hydraulic Machines	3	0	0	**3**
	PC	20CEL202	Concrete Testing Lab	0	0	3	**1.5**
	PC	20CEL203	Strength of Materials Lab	0	0	3	**1.5**
	PC	20CEL204	Fluid Mechanics & Hydraulic Machines Lab	0	0	3	**1.5**
	SC	20CES201	Skill Oriented Course – I	1	0	2	**2**
Total				**17**	**1**	**11**	**21.5**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B. Tech. (2ndSem)	BS	20BST203	Complex Variables and Statistical Methods	3	0	0	**3**
	ES	20ESI204	Python Programming	3	0	3	**4.5**
	PC	20CET206	Structural Analysis	2	1	0	**3**
	PC	20CET207	Geotechnical Engineering	3	0	0	**3**
	OE	20IET21X	Interdisciplinary Elective – I	3	0	0	**3**
	PC	20CEL205	Building Planning and Drawing	0	0	3	**1.5**
	PC	20CEL206	Geotechnical Engineering Lab	0	0	3	**1.5**
	SC	20CES202	Skill Oriented Course – II	1	0	2	**2**
Total				**15**	**0**	**11**	**21.5**

Interdisciplinary Elective -1:

Course Code	Offered by Dept.	Course	Offered for Dept.
20IET211	BS&H	Transform Theory	MECH/CIVIL
20IET212	BS&H	Numerical Methods	ECE/EEE
20IET213	BS&H	Introduction to Number Theory	CSE/IT
20IET214	CIVIL	Elements of building planning	MECH
20IET215	CIVIL	Remote Sensing	ECE/EEE/CSE/IT
20IET216	EEE	Mathematical Modeling and Simulation	ECE/MECH/CIVIL/CSE/IT
20IET217	MECH	Fundamentals of Material Science	ECE/EEE/CIVIL/CSE/IT
20IET218	ECE	Introduction to Electronic Measurements	EEE/MECH/CIVIL/CSE/IT
20IET219	CSE	UNIX Utilities	ECE/EEE/MECH/CIVIL
20IET21A	IT	Fundamentals of Data Structures	ECE/EEE/MECH/CIVIL
20IET21B	TPC	Advanced Coding – I	CSE/IT
20IET21C	TPC	Competitive Programming – I	ECE/EEE/MECH/CIVIL

Honors/Minor Course: Smart Cities						
20SCT201	HM	Urban Planning and Essentials of Smart Cities	**4**	**0**	**0**	**4**
Community Internship (2 weeks) mandatory during summer vacation						

Aditya Institute of Technology and Management, Tekkali

R20 – COURSE STRUCTURE (3rd . B.Tech.)

Civil Engineering

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B. Tech. (1st Sem)	MC	20MCT305	Human Values	2	0	0	0
	PC	20CET308	Design of concrete Structures	3	0	0	3
	PC	20CET309	Transportation Engineering	3	0	0	3
	PC	20CET310	Environmental Engineering	3	0	0	3
	PE	20CEE31X	Professional Elective– I	3	0	0	3
	OE	20IET31X	Interdisciplinary Elective – II	3	0	0	3
	PC	20CEL307	Environmental Engineering Lab	0	0	3	1.5
	PC	20CEL308	Transportation Engineering Lab	0	0	3	1.5
	SC	20CES303	Skill Advanced Course – I	1	0	2	2
	I/P	20CEP301	Community Internship	0	0	0	1.5
Total				**18**	**0**	**8**	**21.5**

Course Code	Professional Elective– I
20CEE311	Advanced Structural Analysis
20CEE312	Watershed Management
20CEE313	Bridge Engineering

Interdisciplinary Elective – II

Course Code	Offered by Dept.	Course	Offered for Dept.
20IET321	BS&H	Fundamentals of Fuzzy Logic	All
20IET322	CIVIL	Geographical Information System	ECE/EEE/MECH/ CSE/IT
20IET323	EEE	Renewable energy sources	ECE/MECH/CIVIL/CSE/IT
20IET324	MECH	Fundamentals of ROBOTICS	ECE/EEE/CIVIL/CSE/IT
20IET325	ECE	Principles of communications	EEE/MECH/CIVIL/CSE/IT
20IET326	CSE	JAVA Programming	ECE/EEE/MECH/CIVIL
20IET327	IT	Introduction to DBMS	ECE/EEE/MECH/CIVIL
20IET328	TPC	Advanced Coding – II	CSE/IT
20IET329	TPC	Competitive Programming – II	ECE/EEE/MECH/CIVIL

Honors/Minor Course: Smart Cities							
20SCT302	HM	Smart Energy & Transportation Systems	**4**	**0**	**0**	**4**

Aditya Institute of Technology and Management, Tekkali

R20 – COURSE STRUCTURE (3rd . B.Tech.)

Civil Engineering

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B. Tech. (2nd Sem)	PC	20CEI311	Design of Steel Structures	3	0	3	4.5
	PC	20CET312	Irrigation and Water Resource Engineering	3	0	0	3
	PC	20CET313	Foundation Engineering	3	0	0	3
	PE	20CEE32X	Professional Elective– II	3	0	0	3
	PE	20CEE33X	Professional Elective– III	3	0	0	3
	PC	20CEL309	Design and Detailing of Irrigation Structures	0	0	3	1.5
	HS	20HSL302	Professional Communication Skills Lab	0	0	3	1.5
	SC	20SSS301	Soft Skills	1	0	2	2
Total				**16**	**0**	**11**	**21.5**

Course Code	Professional Elective– II
20CEE321	Advanced Surveying
20CEE322	Advanced Design of Reinforced Concrete Structures
20CEE323	Environmental Pollution and Solid Waste Management

Course Code	Professional Elective– III
20CEE331	Transit system and Transport Planning
20CEE332	Repair and Rehabilitation of Structures
20CEE333	Ground Improvement Techniques

Honors/Minor Course: Smart Cities						
20SCT303	HM	Smart water & waste management systems	**4**	**0**	**0**	**4**
Industrial Internship (4 Weeks) (Mandatory) during summer vacation						

Aditya Institute of Technology and Management, Tekkali
R20 – COURSE STRUCTURE (4^{th} B.Tech.)

Civil Engineering

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
IV B. Tech. (1^{st} Sem)	HSSC	20HST403	Managerial Economics and Management Science	3	0	0	3
	PC	20CET414	Quantity Surveying and Valuation	3	0	0	3
	PE	20CEE44X	Professional Elective– IV	3	0	0	3
	PE	20CEE45X	Professional Elective– V	3	0	0	3
	OE	20OET41X	Open Elective	3	0	0	3
	PC	20CEL410	Structural Design Lab using software tools	0	0	3	1.5
	PC	20CEL411	Geographic Information System Lab	0	0	3	1.5
	SC	20CES404	Skill Advanced Course – II	1	0	2	2
	I/P	20CEP402	Industrial Internship	0	0	0	3
Total				**16**	**0**	**8**	**23**

Course Code	Professional Elective– IV
20CEE441	Remote Sensing and Geographic Information System
20CEE442	Earthquake Resistant Design of Structures
20CEE443	Finite Element Methods

Course Code	Professional Elective– V
20CEE451	Prestressed Concrete
20CEE452	Pavement Analysis and Design
20CEE453	Construction and Project Management

Course Code	Offered by Dept.	Open Elective	Offered for Dept.
20OET411	MBA	HRD & Organizational behavior	All
20OET412	MBA	Project Management	All
20OET413	MBA	Entrepreneurial Development	All
20OET414	MBA	Digital Marketing	All
20OET415	CIVIL	Environmental Impact Assessment	All
20OET416	EEE	Energy Audit Conservation and Management	All
20OET417	MECH	Optimization Techniques	All
20OET418	CSE	Blockchain Technologies	All
20OET419	IT	IT systems Management	All
20OET41A	CSM	API and Micro Services	All

Honors/Minor Course: Smart Cities						
20SCT404	HM	ESSENTIAL COMPONENTS OF SMART CITIES	4	0	0	4
4 weeks mandatory internship during summer vacation						

Aditya Institute of Technology and Management, Tekkali

R20 – COURSE STRUCTURE (4^{th} B.Tech.)

Civil Engineering

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
IV B. Tech. ($2^{nd.}$Sem.)	I/P	20CEP403	Project work	0	0	0	12
Total							**12**
	HM	20SCM405	MOOC Course – I				2
	HM	20SCM406	MOOC Course – II				2

ENGLISH

(For CSE / IT / CE / ME)

Course Code: 20HST101

L	T	P	C
3	0	0	3

Course Objectives

- To enable students build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To help students learn rules of using punctuation marks and prepositions appropriately in writing
- To aid students acquire appropriate and adequate letter writing skills
- To get students develop reading skills and enhance their essay writing skills

Course Outcomes

- Students will be able to comprehend printed texts of different genres more easily and they will be able to make appropriate word choice.
- Students will be able to write short texts masterly.
- Students will be able to construct grammatically correct sentences.
- Students will be able to use punctuation marks and prepositions correctly in speech and writing.
- Students will be able to communicate through letters and emails effectively.
- Students will be able to comprehend unfamiliar passages, and will be able to write *essays.*

Course Syllabus

Unit–I: Father's Help by R K Narayan
Synonyms and Antonyms — One-word substitutes
Unit–II: My Early Days by A P J Abdul Kalam
Tense— Voice — *If* clauses
Unit-III: The Road Not Taken by Robert Frost
Reported Speech—Degrees of Comparison — Simple, Compound, Complex Sentences
Unit–IV: Politics and the English Language by George Orwell
Punctuation —Prepositions
Unit–V: Mother's Day by J. B. Priestly
Letter Writing — E-mail Writing
Unit–VI: Chipko Movement
Reading Comprehension—Essay Writing

Suggested Readings:

1. On Writing Well. William Zinsser. Harper Resource Book. 2001
2. Practical English Usage. Michael Swan. Oxford University Press. 1995.
3. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
4. Hugging the Trees: The Story of the Chipko Movement. Thomas Weber. Viking Publishers, New Delhi, 1988.

Linear Algebra and Calculus
(Common to All)

Course Code: 20HST101

L	T	P	C
2	1	0	3

Course Objectives:

- Understand the process of calculation of rank, solution of System of Linear Homogeneous and Non Homogeneous equations by Gauss Elimination method.
- Learn the process of calculating the Eigen values, Eigenvectors and Quadratic Forms.
- Understand the concepts of multiple integrals and their usage.
- Learn the properties of Gamma and Beta Functions, their relation and evaluation of improper integrals.
- Understand the concepts of gradient, divergence, curl of scalar and vector point functions.
- Understand and calculate Line Integral, Surface Integral, Volume Integral, concepts of Green's, Stokes and Gauss Divergence theorems in converting one integral form to another

Course Outcomes: The student will be able to:

- Calculate the rank and solve linear homogeneous and non homogeneous equations by Gauss Elimination method.
- Calculate eigen values, eigen vectors and estimate the nature of the matrix.
- Evaluate multiple integral in both Cartesian and polar coordinates.
- Apply Beta and Gamma functions to solve improper integrals.
- Calculate gradient, divergence, curl of a scalar and vector point functions and derive vector identities.
- Solve a Line Integral, Surface Integral, Volume Integral, apply Green's, Stokes and Gauss Divergence theorems in converting one integral form to another.

UNIT-I: Linear System of Equations (8 hrs)

Matrices – Rank- echelon form – Normal form – System of Linear Homogeneous and Non Homogeneous equations – Gauss Elimination method- Applications- Matrix representation for a Graph- Current in an electrical circuit.

.

UNIT-II: Eigen Values, Eigen Vectors, Quadratic Forms (8 hrs)

Eigen values – Eigenvectors – Properties (an over view)- Diagonalization- Quadratic Forms- Reduction of Quadratic Forms to Canonical Form- Rank-Nature-Index-Signature.

UNIT-III: Multiple Integrals (8 hrs)

Double integral (Cartesian and polar form) -Change of order of integration -Change of variables (Cartesian to polar)- Triple integrals – Change of variables (Cartesian to spherical/cylindrical).

UNIT-IV: Special functions: (8 hrs)

Gamma and Beta Functions – Properties - Relation between Beta and Gamma functions-
Evaluation of improper integrals.

UNIT-V: Vector Differential Calculus (8 hrs)

Scalar and Vector point functions- Vector differentiation - Directional derivatives – Gradient, Curl and Divergence- Vector identities.

UNIT-VI: Vector Integral Calculus (8 hrs)
Vector Integration –Line Integral, Surface Integral, Volume Integral – Green Theorem, Stokes Theorem and Gauss Divergence theorem (without proofs with simple illustrations only).

Suggested Text Books

1. **B.V. Ramana,** Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi, 2014.
2. **Dr.B.S.Grewal,** Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

Reference Books

3. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
5. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
6. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

ENGINEERING PHYSICS
(Common for ME & CE)

Course Code : 20BST106

L	T	P	C
3	0	0	3

COURSE DESCRIPTION:

This course encompass Fundamental Concepts of Physics that include

- Waves and Oscillations
- Wave Optics
- Lasers
- Fiber Optics
- Introduction to solid state physics
- Materials Science

Those are inevitable for any Engineering student so that these prerequisites aid the student to readily understand Day to Day Engineering Problems with Pragmatic Approach.

COURSE OBJECTIVES

- To Recognize the nature of Oscillation in terms of energy exchange
- To Realize the principles of optics in designing optical devices
- To Comprehend the Principles of Lasers
- To Infer the Principles of Fiber Optics
- To Summarize general principles of crystal and molecular structures
- To Identify Magnetic properties and Superconducting properties

COURSE OUTCOME: Will be able to

- CO1 Resolve the knowledge of Oscillations in terms of energy exchange
- CO2 Apply the principles of optics in designing optical devices
- CO3 Illustrate the Principles of Lasers
- CO4 Outline the Principles of Fiber Optics.
- CO5 Interpret general principles of crystal and molecular structures.
- CO6 Infer Magnetic properties and Superconducting properties

UNIT- I: WAVES & OSCILLATIONS

Damped Oscillations: Harmonic oscillator; Differential Equation of Wave Motion, Damped Harmonic oscillator; Over-Damped, Critically Damped and Under-Damped Oscillations

Forced Oscillations: Resonance and Quality Factor

UNIT- II : Wave Optics

Interference - Introduction, Principle of Superposition of Waves, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light.

Diffraction - Introduction, Differences between Interference and Diffraction, Fraunhofer Diffraction due to Single Slit – Intensity Distribution.

UNIT-III : Lasers

Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients (Qualitative), Population Inversion, Optical Resonator and Lasing Action, Ruby Laser [Three Level System], Helium-Neon Laser [Four Level System], Applications of Lasers in Industry, Scientific and Medical Fields.

UNIT-IV : Fiber Optics

Fiber Optics - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Applications of Optical Fibers in Communication

UNIT-V : Introduction to Solid State Physics

Crystal Structure - Introduction, Basic Terms – Lattice, Basis, Crystal Structure, Coordination Number, Atomic Radius, Packing Fraction, Free Volume, Lattice Parameters, Unit Cell and Primitive Cell, Crystal Systems and Bravais Lattices, Structure and Packing Fractions of Simple Cubic, Body Centered Cubic and Face Centered Cubic Crystal Structures.

UNIT-VI : Materials Science

Magnetic Materials: Types of Magnetic Materials (Dia, Para, Ferro, Ferri&Antiferro), Hysteresis, Weiss Theory of Ferromagnetism, Soft and Hard Magnetic Materials.

Superconductivity: Introduction, Meissner Effect, Type-I & Type-II Superconductors, Applications

Texts

1. A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers
2. Fundamentals of Physics by Resnick, Halliday and Walker

References

1. University Physics by Young and Freedman
2. Solid State Physics by S. O. Pillai, New Age International Pubishers
3. Engineering Physics, Volume-I&II, P.K.PalaniSwamy, Scitech Publications Hyderabad
4. Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
5. Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

BASIC ELECTRICAL ENGINEERING

Course Code: 20EST101

L	T	P	C
3	0	0	3

Course objectives:

- To introduce the basic knowledge of electric circuits
- To illustrate knowledge with network reduction techniques.
- To analyze AC circuits.
- To provide knowledge on Magnetic circuits.
- To become familiar with DC Generator.
- To understand the concept of DC Motor.

Course outcomes:
CO1: Able to summarize different electrical circuits.
CO2: Able to construct network reduction techniques
CO3: Able to outline the basics of AC circuits.
CO4: Able to state magnetic circuits.
CO5: Able to examine DC Generator.
CO6: Able to explain DC Motor.

UNIT –I Introduction to Electric Circuits
Basic definitions, Electrical circuit elements (R, L and C), Voltage and current sources Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation, Kirchhoff's Laws, , simple problems.

UNIT-II Network Reduction Techniques
Star-Delta transformation, Nodal Analysis, Super node, Mesh analysis, super mesh-Problems.

UNIT-III AC Circuits
Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, simple problems.

UNIT-IV Magnetic circuits
Basic definitions of magnetic flux, flux density, Reluctance, Magneto motive force (m.m.f), magnetic field intensity, magnetic permeability and susceptibility. Comparison between magnetic and electrical circuits, inductively coupled circuits, coefficient of coupling, dot convention, simple problems on magnetic circuits.

UNIT-V DC Generator
Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

UNIT-VI DC Motor
Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

TEXT BOOKS

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

REFERENCE BOOKS .

1. Basic Electrical Engineering Dr.K.B.MadhuSahu scitech publications (india) pvt.ltd.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

WORKSHOP AND MANUFACTURING PRACTICE
(Common for all Branches)

Course Code: 20ESL102

L	T	P	C
1	0	4	3

COURSE OBJECTIVES:

- The Engineering Workshop Practice for engineers is a training lab course spread over entire semester. The modules include training on different trades like Fitting, Carpentry, Black smithy etc… which makes the students to learn how various joints are made using wood and other metal pieces.

COURSE OUTCOMES:

On completion of this course, students should be able to:

CO 1. Make half-lap, mortise & tenon, corner dovetail or bridle wooden joints.
CO 2. Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
CO 3. Forge MS rod from round to square cross-section, or into L- or S- bend.
CO 4. Fabricate MS pieces into either a straight, square, dovetail or V-fit.
CO 5. Connect a staircase or a tube light house-wiring electrical circuit.

I. Wood Working Technology - Familiarity with different types of wood and tools used in wood Working technology.

Tasks to be performed:

1) Half – Lap joint 2) Mortise and Tenon joint
3) Corner Dovetail joint 4) Briddle joint.

II. Sheet Metal Working – Familiarity with different types of tools used in sheet metal working, developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.

Tasks to be performed:

1) Square Tray 2) Taper side Tray
3) Conical Funnel 4) Elbow Pipe.

III. Forging Technology – Familiarity with different types of tools used in forging technology. Knowledge of different types of furnaces like coal fired, electrical furnaces etc...

Tasks to be performed:

1) round M.S rod to square bar 2) L bend in given M.S. Rod.
3) S bend in given M.S. Rod. 4) heat treatment tests like annealing, normalizing etc...

IV. Fitting Technology – Familiarity with different types of tools used in fitting technology.

Tasks to be performed:

1) “V” – fitting 2) square fitting
3) Dovetail fitting 4) Straight fitting

V.HOUSE WIRING

1) Tube light connection
2) Staircase connection

Note: Any two jobs from each trade must be performed by the student.

LANGUAGE PROFICIENCY LAB
(CSE / IT / CE / ME)

Course Code: 20HSL101

L	T	P	C
0	0	3	1.5

Course Objectives

- To enable students develop neutralized accent
- To assist students utter words intelligibly
- To enhance the ability of students to speak spontaneously
- To help students converse aptly as the context demands
- To get students acquire perceptive abilities in professional conversations
- To aid students grasp and interpret information provided in graphs and tables

Course Outcomes

- Students will be able to recognize differences among various accents and speak with neutralized accent.
- Students will be able to pronounce words accurately with the knowledge of speech sounds and use appropriate rhythm and intonation patterns in speech.
- Students will be able to speak extemporaneously about anything in general.
- Students will be able to generate dialogues for various situations.
- Students will be able to present posters perceptively and concisely.
- Students will be able to comprehend and interpret data provided in graphs and tables.

Course Syllabus

Unit I: Listening Comprehension of Audio and Video clips of different accents
Unit II: Pronunciation—Intonation—Stress—Rhythm
Unit III: JAM — Narration of an Event
Unit IV: Situational Dialogues
Unit V: Poster Presentation
Unit VI: Interpretation of Data in Graphs and Tables

Suggested Readings:

1. Communication Skills. Sanjay Kumar and Pushpa Lata. OUP. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Speak Well. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
4. Strengthen Your Communication Skills. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
5. Strengthen Your Steps. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
6. Technical Communication. Meenakshi and Sangeetha. OUP. New Delhi. 2013.

PHYSICS LABORATORY
(Common to All Branches)

Course Code : 20BSL101

L	T	P	C
0	0	3	1.5

Course Description:

This Laboratory course is intended to apply the scientific method to expedite experiments that include

- Error analysis
- Waves Fundamentals
- Mechanics
- Physical Optics
- Lasers and Fiber Optics
- Semiconductor devices

So that student can verify theoretical ideas and concepts covered in lecture through host of analytical techniques, statistical analysis and graphical analysis.

Course Objectives:

- To Operate Sensitive Instruments for precision measurements
- To Identify Error for targeted accuracy
- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To Determine relevant parameters associated with Interference and Diffraction phenomena using Travelling Microscope and Spectrometer.
- To Exhibit Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To Characterize semiconducting material devices.

Course Outcomes: Will be able to

CO1 Demonstrate the ability for precision measurements to design instrumentation
CO2 Estimate the Error for targeted accuracy
CO3 Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
CO4 Apply the knowledge of Optics to calculate geometrical parameters of thickness of thin object and radius of curvature of a lens
CO5 Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
CO6 Evaluate characteristics of semiconducting material devices

LIST OF EXPERIMENTS

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing
3. Determination of Rigidity Modulus of the Material of Wire using Tensional Pendulum

4. Determination of Acceleration due to Gravity (g) using Compound Pendulum
5. Newton’s Rings – Determination of the Radius of Curvature of a given Plano Convex Lens
6. Determination of Thickness of Thin Object using Wedge Method
7. Verify the characteristic curve of NTC Thermistor.
8. Determination of width of a single slit using LASER
9. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
10. Determination of Energy Band Gap using the given Semiconductor

Manual / Record Book

1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.

2. Lab Manual of Engineering Physics by Dr.Y. Aparnaand Dr. K. VenkateswaraRao
(VGS bookslinks, Vijayawada)

BASIC ELECTRICAL ENGINEERING LAB

Course Code: 20ESL101

L	T	P	C
0	0	3	1.5

Course Objective:

To introduce the student to study different electrical components and to verify the basic laws related to electrical engineering, Speed control of D.C. motor, testing of transformer, electrical wiring system through study, practice, and experiments.

Course Outcomes:

Students will be able to

CO1: Label various types of electrical components.

CO2: Demonstrate various basic electrical laws.

CO3: Demonstrate speed control DC motor & Characteristics of generator.

CO4: Experiment with lamps.

CO5: Examine electrical wiring system

List of Experiments:

1. Study of electrical components.
2. To verify Ohm's law.
3. To verify (a) Kirchhoff's current law (b) Kirchhoff's voltage law.
4. To verify the total resistance of the series and parallel connected circuits.
5. Find armature resistance, field resistance and filament Lamp Resistance using V-I method.
6. Magnetization characteristics of DC shunt generator.
7. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
8. Fluorescent tube connection.
9. (a) One way control of lamp
   (b) Two way control of lamp
10. Fan wiring.

Additional Experiments:

11. Soldering and bread board precautions.
12. To find voltage current relationship for series RL circuit and determine power factor.

Environmental Science
(Common to all Branches)

Course Code: 20MCT102

L	T	P	C
2	0	0	0

Course Objectives:

- Memorize the knowledge of environment and status of different resources on earth.
- Identify the significance, arrangement, causes of annihilation and conservation of ecosystems and biodiversity..
- Identify the significance, types and conservation of biodiversity.
- Discriminate causes, effects of a variety of pollutions and suitable control methods.
- Identify the hurdles of sustainable development; evaluate the different environmental management and legal issues.
- Describe the population growths, health problems and evaluate the environmental assets.

Course Outcomes: By Studying this Course Student will

- Recognize and speaks well again on the general issues of environment and know how to conserve resources for better usage.
- Explain and demonstrate the ecosystems setup, assess.
- Recognize and conserving of diversity to upkeep.
- Examine a range of pollution problems along with control and their eco-friendly disposal methods.
- Translate the sustainable development practice through clean development mechanisms.
- Evaluate the changing trends of world population and compile the information in order to document the environmental assets.

Unit – I (*6 lectures*)
Importance of Environmental Studies and Natural Resources: Definition of Environment – Importance - Need for Public Awareness
Forest Resources - Use and over exploitation - deforestation - consequences - case study
Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment
Food Resources – Food security concept - changes caused by agriculture and overgrazing -effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – concept of sustainable agricultural methods - case study
Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources

Unit – II (*3 lectures*)
Ecosystems: Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow – Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession

Unit-III (*3 lectures*)
Biodiversity and its conservation: Definition of Biodiversity - Values of biodiversity - Bio-geographical classification of India - Hot Spots of India - Endangered and endemic species of India –Threats to biodiversity - Conservation of biodiversity

Unit – IV (*6 lectures*)
Environmental Pollution: Definition – causes - effects - control measures of Air pollution -Water pollution - Noise pollution – Marine Pollution - Nuclear hazards.

Solid waste Management: Causes - effects - disposal methods of urban waste – biomedical wastes - case studies
Disaster management: floods – earthquakes – cyclones

Unit – V (*6 lectures*)
Social Issues and the Environment: Concept of Unsustainable and Sustainable development –Water conservation: Rain water harvesting- Watershed management – Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion -World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act - Forest (Conservation) Act

Unit – VI (*4 lectures*)
Human Population and the Environment: Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health

Text Books:
1. Shashi Chawla. 2015, *A Text book of Environmental Studies*, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, *Environmental Studies,* Revised edition, TMH, New Delhi

Reference Books:
1. Odum, E.P, *Fundamentals of Ecology*, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.
2. P. D. Sharma, *Ecology and Environment*, Revised edition, Rastogi Publications (P) Ltd.
3. Cunningham, W.P., Cunningham, M.A., *Principles of Environmental Science*, TMH, New Delhi.
4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, Mc Graw – Hill Internationaledition.
5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, PearsonPublications.

Differential Equations
(Common to All)

Course Code : 20BST102

L	T	P	C
2	1	0	3

Course Objectives:

- To solve the first order Ordinary Differential equations and apply to Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
- To solve second and higher order ordinary differential equations.
- Derive the Fourier series expansion of one variable functions.
- Understand Taylor's, Maclaurin's series expansion and rules of calculating extreme value of two or more variable functions.
- Learn the methods of solving first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
- Understand the method of solving a linear Partial differential equation with constant coefficients by method of Separation of Variables, solve a one dimensional Wave and a one dimensional Heat equation.

Course Outcomes: The student will be able to:

- Apply the mathematical tool for the solution of Ordinary Differential equations, Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
- Evaluate higher order homogenous and non-homogenous linear differential equations with constant coefficients.
- Estimate the Fourier series expansion of one variable functions.
- Estimate the Taylor's, Maclaurin's series expansion of two variable functions and extreme values of two or more variable functions.
- Evaluate a first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
- Evaluate a one dimensional Wave and Heat equation.

UNIT-I : Ordinary differential equations of first order: (8 hrs)
Linear type - Bernoulli type–Exact type - Equations reducible to exact type- Orthogonal Trajectories-Newton's law of cooling - Law of Growth and Decay.

UNIT-II: Ordinary differential equations of higher order : (8 hrs)
Higher order homogenous and non-homogenous linear differential equations with constant coefficients-Complimentary Functions-Particular integrals for the functions of type sin(ax+b)/cos(ax+b), x^m, e^{ax} , $e^{ax}V(x)$ - Method of variation of parameters, Applications-LCR circuits.

UNIT-III: Fourier Series: (8 hrs)
Fourier Series -Even and odd functions– Fourier series of functions defined in the interval (0, 2π), (-π, π), (0, 2c),(-c,c) - Half range Fourier sine and cosine series

UNIT-IV : Partial Differentiation (8 hrs)
Functions of two or more variables-Partial differentiation-Total Derivative- Taylor's and Maclaurin's Series (without proof) - Maxima, minima of functions without constraints and functions with constraints (Lagrange method of undetermined multipliers).

UNIT-V : Partial Differential Equations of first order (8 hrs)
Partial differential Equations - Formation of partial differential equations– solutions of first order quasi-linear (Lagrange) partial differential equations and first order non-linear (standard type) partial differential equations.

UNIT-VI: Applications of Partial Differential Equations (8 hrs)
Solution of linear Partial differential equations with constant coefficients – Method of Separation of Variables- One dimensional Wave and Heat equations.

Suggested Text Books

1. B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

CHEMISTRY
(Common to All Branches)

Course Code: 20BST107

L	T	P	C
3	0	0	3

Course Objectives:

The students will become familiar and understand about:

- Rationalise the importance of water for society and industrial needs.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- To become familiar in moulding methods of preparation of different types of plastic materials
- Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
- Rationalise reference electrodes and science of corrosion.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Course Outcomes:

The course will enable the student to:

- Rationalise the importance of water for society and industrial needs.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Differentiate different moulding techniques of plastic materials
- Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
- Rationalise the science of corrosion.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Unit-1: Water Technology *(9 lectures)*

Hardness of Water – Temporary and Permanent Hardness - Units of Hardness - Estimation of Hardness by EDTA Method - Problems on Temporary and Permanent Hardness - Disadvantages of Hard Water – Softening Methods of Hard Water- Zeolite or Permutit Process - Ion Exchange Process - Methods of Treatment of Water for Domestic Purposes – Sedimentation, Coagulation, Filtration, Disinfection - Sterilization, Chlorination, Break Point chlorination, Ozonisation.

Unit-2: Spectroscopy *(8 lectures)*

Spectroscopy - Electronic Spectroscopy - Types of Electronic Transitions - Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts - Introduction to I.R. Spectroscopy – Fingerprint Region – Introduction to NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift- Splitting – Coupling Constant.

Unit-3: Polymers and Plastics *(7 lectures)*

Definitions of Polymer, Polymerization – Functionality – Degree of polymerization - Types of Polymerization (Addition and Condensation Polymerizations) - Plastics – Definition, Thermoplastics, Thermosetting Plastics – Compounding of Plastics – Moulding of Plastics into Articles (Compression, Injection, Transfer and Extrusion Moulding Methods) - Preparation, Properties and Engineering Uses of PVC and Bakelite

Unit-4: Organic Reactions *(7 lectures)*

Types of Organic reactions: Addition - Electrophilic, Nucleophilic and Free radical - Substitution - Electrophilic, Nucleophilic (SN^1 and SN^2) and Free radical – Elimination (E_1 and E_2) – Rearrangement Reactions (Claisen, Pinacol Pinacolone Rearrangement).

Unit-5: Corrosion and Its Control *(9 lectures)*

Definition of Corrosion – Theories of Corrosion (Chemical & Electrochemical) – Mechanism of Electrochemical Corrosion (Oxygen Absorption Type and Hydrogen Evolution Type) - Galvanic Series - Factors Influencing Corrosion – Corrosion Control Methods - Proper Designing, Modifying the Environment, Cathodic Protections – Sacrificial Anodic Protection and Impressed Current Cathodic Protection. Metallic (Anodic and Cathodic) Coatings – Methods of application on metals (Galvanizing and Tinning).

Unit-6: Green Chemistry & Energy *(8 lectures)*

Introduction to green chemistry – Definition and 12 principles of green chemistry.

Types of energy sources – Renewable & Non-Renewable - Introduction to solar energy – harnessing of solar energy – photo voltaic cells – Concentrated Solar power plants.

Introduction of Energy storage devices: Principle& mechanism of Batteries & Supercapacitors, Types of Batteries (Alkaline & Lead-Acid) - Difference between Batteries and Supercapacitors.

Suggested Text Books:

(i) University chemistry, by B. H. Mahan
(ii) Elementary organic spectroscopy: principles and applications, by Y. R. Sharma
(iii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
(iv) "Engineering Chemistry", P. C. Jain and Monica Jain, Dhanpat Rai Publications, Co., New Delhi, 2004, 16^{th} Edition

Reference books:

(i) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(ii) Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
(iii) Physical Chemistry, by P. W. Atkins
(iv) Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
(v) Concise Inorganic Chemistry: Fifth Edition by J.D. Lee

Surveying and Geomatics

Course Code:20CET101

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

• To measure the land area by plane table and chaining.
• To explain the conventional methods of surveying
• To apply the concept of leveling to prepare the contour maps
• To apply the concept of tachometer in angular measurement, elevation and distance between an object
• To determine the relief and tilt displacements from the aerial photographs
• To demonstrate the working principle of remote sensing

COURSE OUTCOMES:

On completion of the course, the students will be able to:

• Measure the land area by plane table and chaining.
• Explain the conventional methods of surveying
• Apply the concept of leveling to prepare the contour maps
• Apply the concept of tachometer in angular measurement, elevation and distance between an object
•Determine the relief and tilt displacements from the aerial photographs
•Demonstrate the working principle of remote sensing

UNIT I

Introduction: Surveying definition & objectives, plane surveying principles and classification, scales, Errors and Mistakes.

Chain Surveying: Principles, Equipment, Working from whole to part, Types of tapes and chains, selection of stations, offsets, Tape Variations, Errors and Corrections

UNIT II

Compass Surveying: Types of compass, Measurement of directions and angles, types of compass, meridians and bearings, local attraction, magnetic declination, traversing, plotting of traverse, adjustment of closing error.

UNIT III

Levelling and Contouring: Description of a point (position) on the earth's surface, instruments for leveling, principle and classification of leveling, bench marks, leveling staff, readings and booking of levels, field work, longitudinal section and cross section, plotting the profile, height (level) computations, contours, characteristics of contours, methods of contouring, interpolation, contour gradient, contour maps.

UNIT IV

Theodolite and Tacheometric Surveying: Principle of theodolite survey, Theodolite component parts, observations, Traversing, traverse computations, Trigonometrical Surveying, Tacheometry, principle of tacheometry, methods of tacheometry, tacheometry as applied to subtense measurement, fundamentals of total station and GPS.

Curves: Types of curves, design and setting out – simple and compound curves.

UNIT V

Photogrammetry Surveying : Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy.

UNIT VI

Remote Sensing and GIS: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation. Introduction to GIS.

TEXT BOOKS:

1. Duggal S K, "Surveying (Vol – 1, 2 & 3), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4th edition, 2017.
2. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Laxmi Publications, 17th edition, 2016.
3 Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
4. Anji Reddy M., Remote sensing and Geographical information system, B.S. Publications, 2001.
5. Surveying and levelling by R. Subramanian, Oxford university press, New Delhi, 2nd edition, 2014.

REFERENCES:

1. Chandra A. M., Plane Surveying, New Age International Publ., 2007.
2. Geomatics Engineering by Manoj, K. Arora and Badjatia, Nem Chand & Bros, 2011

Programming for Problem Solving
(Common to all Branches)

Course Code: 20ESI102

L	T	P	C
3	0	3	4.5

Course Objective

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes

Co1 Understand the fundamentals of C programming

Co2 Choose the loops and decision making statements to solve the problem

Co3 Make use of pointers to access arrays, strings and implements different operations on arrays, and work with textual information, characters and strings.

Co4 Apply programming to write modular programs, user defined functions to solve real time problems and allocate memory using dynamic memory management functions.

Co5 Create user defined data types including structures and unions to solve problems.

Co6 Implement files operations in C programming for a given application and able to handle errors during program execution.

UNIT: 1

Introduction to Programming

Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Operator precedence, Structure of C program, Basic I/O statements.

Exercise Questions: 1

Ex 1: Write the C programs to calculate the following
- a) Area of triangle when sides are given.
- b) Program for Type Casting.
- c) Interchanging values of two variables.

Ex 2: Write the C programs to perform the following
- a) Read lower case character and convert into upper case.
- b) Find maximum of 3 values using conditional operator.
- c) Calculate area and perimeter of circle.

UNIT: 2

Control Structures

Decision statements: if, if-else, nested if and switch, **Iterative statements:** for, while, do while and nested loops **Branching:** Break, continue, goto.

Exercise Questions: 2

Ex 3: Write C programs for the following using decision making statements
- a) Program to find roots of quadratic equation.
- b) Find the Largest among 3 values.
- c) Calculate the grades of a student.

Ex 4: Write C programs for the following using Iterative Statements

a) Arithmetical operations using switch-case.
b) Read a number and display in reverse.
c) Check for Armstrong number property

Ex 5:

a) Generate Fibonacci series.
b) Generate Prime numbers between two numbers.
c) Write a program in C to display the pattern like right angle triangle using an asterisk

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

UNIT: 3

Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, Pointer to pointer, arrays and pointers, Dynamic memory allocation

Exercise Questions: 3

Ex 6: Implement the following using arrays

a) Largest and smallest from a list of elements.
b) Program for Linear Search.
c) Program for Bubble Sort.

Ex 7: Implement the following using arrays

a) Matrix addition.
b) Matrix Multiplication.
c) Program using string handling functions

Ex 8: Implement the following using DMA Functions

a) Find the sum and average of list of elements using DMA Functions
b) Implementation of call by reference and call by valve.

Ex 9:

a) Implement C Program using any numerical methods

UNIT: 4

Functions: Definitions, Declaration, Types of Functions, Parameter passing, Passing Arrays to functions, Recursion, library functions, functions and pointers, and Storage classes,

Exercise Questions: 4

Ex 10:

a) Factorial using recursion and non recursion.
b) GCD using recursion and non recursion.
c) To count the digits of a given number using recursion

UNIT: 5

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, passing structure to function, nested structures, and unions.

Exercise Questions: 5

Ex: 11

a) Implementation of array of structure
b) Demonstration of Union

UNIT: 6

Files: Definition, Types of files, Opening modes, File IO Functions, Random access functions, Preprocessor directives.

Exercise Questions: 6

Ex 12:

a) Copy the contents of one file into another.
b) Count the number of characters, words and lines in a file.

Text Books

1. "The C - Programming Language", B. W Kernighan, Dennis M. Ritchie, 2nd Edition, PHI.

2. "A Structured Approach Using C" by Behrouz A. Forouzan, Richard F. Gilberg 3rd Edition

3. "Problem solving Through 'C'- User Friendly Approach", Dr. G.S.N Murty, S Vishnu Murty, First Edition, MANTECH Publications Pvt.Ltd., 2020

References

1. "Let Us C", Yashwant Kantikar, 8th Ed., PBP Publications 2012.
2. "C Programming", E. Balagurusamy, Tata Mc Graw Hills,2011,New Delhi, India.

Web Links

1. https://www.tutorialspoint.com › Cprogramming › C – Home
2. https://www.programiz.com/c-programming

ENGINEERING GRAPHICS & DESIGN

Course Code: 20ESL103

L	T	P	C
1	0	4	3

COURSE OBJECTIVES:
- Able to develop drawing skills.
- To draw orthographic views from the given isometric view and vice verse
- To understand the fundamentals of computer aided design and drafting

COURSE OUTCOMES:
- Draw projection of points and straight lines in first angle projection.
- Project plane surfaces and simple solids inclined to one reference plane.
- Convert orthographic views into isometric projections and vice-versa.
- Draw basic lines and profiles with commonly used operations in drafting software.
- Generate 2D drawings along with dimensioning in drafting software.

LIST OF EXERCISES:

PART-A: Conventional Engineering drawing
1 Projections of points
2 Projections of straight lines inclined to one reference plane only.
3 Projections of planes inclined to one reference plane only.
4 Projections of simple solids inclined to one reference plane only.
5 Conversion of isometric views into orthographic views
6 Conversion of orthographic views into isometric views.

PART-B: Basic Computer aided engineering drawing (2-D drawings)
1. Commands – Axes, Coordinate points, Creation of lines, Polylines, Square, Rectangle, Polygons, Spines, Circles, Ellipse, Text.
2. Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curves.

Note: Six Exercises are to be completed by using AutoCAD software

TEXT BOOKS:
1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

REFERENCE BOOKS:
1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

CHEMISTRY LAB
(Common to All Branches)

Course Code: 20BSL102

L	T	P	C
0	0	3	1.5

Course Objectives:

***The students will become familiar and understand about*:**

- Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc
- Measure molecular/system properties such as surface tension and viscosity.
- Measure molecular/system properties such as pH, conductance of solutions, redox potentials, etc
- Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colurimeter), partition coefficient, and adsorption of acetic acid by charcoal etc.

Course Outcomes:

***The students will learn to*:**

- Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc.
- Measure molecular/system properties such as surface tension and viscosity.
- Measure molecular/system properties such as pH, conductance of solutions, redox potentials, etc
- Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colurimeter), partition coefficient, and adsorption of acetic acid by charcoal, etc.

LIST OF EXPERIMENTS: Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Hardness of water sample by EDTA Method.
3. Conductometric estimation of Acid by Base.
4. Conductometric estimation of mixture of acids by base.
5. Potentiometric Titrations.
6. Synthesis of a polymer/drug.
7. Determination of acid value of an oil
8. Chemical analysis of a salt
9. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method
10. Colurimetric estimation of iron
11. pH metric titrations
12. Determination of the partition coefficient of a substance between two immiscible liquids
13. Adsorption of acetic acid by charcoal Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg
14. Potentiometric Titration of a Chloride-Iodide Mixture.
15. Determination of Chloride content present in given water sample.
16. Determination of kinematic viscosity of given lubricating oil.

TEXT BOOKS:

1. "Practical Engineering Chemistry" by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2. "Lab Manual on Engineering Chemistry" by Sudharani, Dhanpat Rai Publications, Co., New Delhi., (2009).

REFERENCE BOOKS:

1. "Engineering Chemistry Lab Manual" by Shuchi Tiwari (2010), SCITECH Publications.
2. "Vogel's Text Book of Quantitative Chemical Analysis", 6th Edition by G. J. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3. "A Text Book of Engineering Chemistry" by R. N. Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4. "A Text Book on experiments and calculations Engineering" by S.S. Dara, S.Chand & Company Ltd. (2003).
5. "Instrumental methods of Chemical Analysis", Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

Surveying lab-I

Course Code: 20CEL101

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

The Students will have

• Measure survey of an area by chain survey and plotting to do chaining across obstacles,
• Prepare residential building by perpendicular offset, introduction of tie lines
• Do temporary adjustments of prismatic compass
• Find distance between two inaccessible points with compass, a given area by prismatic compass.
• Practice radiation method, intersection methods, setting out simple curve
• Practice Fly leveling, check leveling, contouring

COURSE OUTCOMES:

On completion of the course, the students will get ability to:

1. Determine area, chaining across obstacles and prepare outline of residential building using chain survey
2. Determine distance between two inaccessible points and area of closed traverse by using
3. prismatic compass
4. Compute the measurement of horizontal and vertical angle by Theodolite
5. Determine reduced levels for L.S and C.S of road profiles using dumpy or auto level
6. Draw contouring by taking R.Ls using leveling instrument

EXCERCISES:

1. Survey of an area by chain survey (closed traverse) & Plotting
2. Chaining across obstacles
3. Determination of distance between two inaccessible points with compass.
4. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
5. a) Measurement of horizontal and vertical angle by Theodolite
   b) Distance between inaccessible points by Theodolite
6. Setting out of simple curve.
7. Introduction to leveling instrument, leveling staff. Reading of level staff, temporary adjustments of leveling instrument.
8. Fly leveling (differential leveling)
9. Check leveling - L.S. & C.S. of a road profile.
10. One exercise on contouring.

Constitution of India
(Common to all Branches)

Course Code: 20MCT203

L	T	P	C
2	0	0	0

Course Objectives
1. To help Students regulate their behavior in a social environment as Engineering Professionals.
2. To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
3. To understand the political and constitutional parameters in work environment.
4. To understand the need and strengths of our nation and adopt their knowledge for future career.

Course Outcomes
By the end of this course the student will be able to
1. Realize the rigidness of our Indian Politics and Administrative aspects.
2. A Student can understand our nation federalism.
3. Can assess different types of risks involved in misadministration.
4. Can create competitive advantage.
5. Summarizes the legal and administrative establishments
6. A student can infer financial aspects for betterment of the National building.

Unit – I
Introduction Historical perspective of the constitution of India - Salient features of The Indian Constitution - Amendment Procedure of The Indian Constitution.42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

Unit – II
Important Features Of Constitution Fundamental Rights(Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 – Articles 19 - Article 21

Unit – III
Parliamentary form of Govt. In India President of India - Emergency provisions –National Emergency – Article 352 - President Rules – Article 356 - Financial Emergency – Article 360 Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary)

Unit – IV
Indian Federalism Union – State relations; - Legislative , Administrative and Financial relations. Local self Govt. – Constitutional Schemes in India (73 & 74 Constitutional amendments)

Unit – V
Parliamentary Committees: Public Accounts Committee - Estimates Committee - Committee on Public Undertakings. - Election commission of India (Article -324) - Comptrollar and Auditor General (CAG) of India (Article – 148 to 150)

Unit-VI
Finance Commission (Article – 280) - Neethi Aayog (Planning Commission) and – Political Parties.

Text Books:
1) Introduction to Indian Constitution by D.D Basu,Lexis Nexis Butterworth wadhwa Nagapur, 2008.
2) Poicits in India by Rajini Kothari, Orient LongMan, 2005.
3) The Indian Constitution by Madhav Khosla by Oxford University Press India, 2012.

Engineering Mechanics

Course Code: 20EST203

L	T	P	C
2	1	0	3

COURSE OBJECTIVES:

Students will have

- To develop an understanding of the principles of statics and the ability to analyze problems using static equilibrium equations.
- To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium.
- To develop the fundamentals of engineering mechanics and problem solving skills essential for mechanical engineering
- To teach the basic principles of mechanics applicable to the motion of particles and rigid bodies.

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine the resultant of a planar force system using resolution of force and principle of moments.
2. Draw free-body diagrams of given rigid bodies and compute unknown forces using equations of equilibrium of a planar force system by graphical and analytical methods.
3. Comprehend the effect of friction on equilibrium of rigid bodies. Analyze the plane trusses by calculating axial forces in the members using method of joints.
4. Calculate centroid and moment of inertia of plane figures of triangular, rectangular and circular cross sections.
5. Predict the motion parameters of bodies under rectilinear, curve linear and general plane motion.
6. Solve the problems involving dynamics of particles and rigid bodies

UNIT- I

System of forces: Fundamental concepts and principles of engineering mechanics – Laws of mechanics – Forces and components - Resultant of coplanar concurrent forces - Vector approach on addition, subtraction of forces.

Equilibrium of force systems: Equilibrium – Free body diagrams – Equations of equilibrium – Equilibrium of planar systems – Graphical methods and analytical methods for equilibrium of planar systems - Equilibrium of rigid bodies - Principle of transmissibility

UNIT II

Moment of a force: Introduction – Principle of moments – Equivalent system of forces – Reduction of system of forces into single force and couple - Resultant of planar force systems.
Moment Applications: Varignon's theorem – Moment of a force and its applications.

UNIT- III

Analysis of Trusses: Types of loads – Types of supports and their reactions – Analysis of plane trusses using method of joints.
Friction: Introduction – Limiting friction – Types of friction and laws of friction – Application of friction - Inclined plane –Ladder, wedge and screw friction.

UNIT- IV Centroid and Centre of gravity: Centroid of lines and areas – Determination of centroid of regular laminas by integration method – Centroid of composite figures – Theorems of Pappus and Guldinus – Concept of center of gravity.

Area moment of inertia: Determination of moment of inertia of area by integration – Moment of Inertia by analytical method – Radius of gyration – Parallel and perpendicular axis theorems – Polar moment of inertia – Concept of mass moment of inertia

UNIT- V

Kinematics: Rectilinear motion – Curvilinear motion – Rectangular components of curvilinear motion - Normal and Tangential components of acceleration.

Kinematics of rigid bodies: Angular motion – fixed axis rotation – Analysis of plane motion.

UNIT- VI

Kinetics: Kinetics of rigid bodies – Fixed axis rotation – rolling bodies - General plane motion – Equilibrium of rigid bodies in plane motion – D'Alembert's Principle- Work Energy Principle- for rigid bodies in plane motion

Text Books:

1. Engineering Mechanics, S.S. Bhavikatti, J.G. Rajasekharappa, New Age Publications,
2. Engineering Mechanics, A.K. Tayal, Umesh Publications, 13th Edition, 2008.
3. Ferdinand L. Singer: Engineering Mechanics, Harper Collins Publishers India, 3rd Edition, 2008.

References Books:

1. Irving. H. Shames: Engineering Mechanics, PHI Publishers, 4th Edition, 2008.
2. Ferdinand P. Beer, E. Russell Johnston (2010), Vector Mechanics for Engineers: Statics and Dynamics (9th Edition), Tata McGraw-Hill International Edition.
3. Russell C Hibbeler, (2009), Engineering Mechanics: Statics and Dynamics (12th Edition), Prentice Hall
4. Timoshenko & Young: Engineering Mechanics, MGH Publishers, 4th Edition, 2010.
5. K.L. Kumar, Engineering Mechanics, TMH Publishers, 3rd Edition, 2009.
6. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill.
7. Engg. Mechanics / S.S. Bhavikati& J.G. Rajasekharappa.

Construction Materials and Concrete Technology

Course Code: 20CET202

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

- To describe physical properties of construction materials which include, Stones, Bricks , Timber
- To make use of construction materials which include cement, admixtures, accelerators, retarders etc.
- To measure hardened concrete water / cement ratio, space ratio, strength in tension & compression, factors affecting strength, curing.
- To Illustrate testing of hardened concrete which include compression tests, tension tests, factors affecting strength, flexure tests, splitting tests, non-destructive testing methods, codal provisions for NDT.
- To distinguish between different types of concretes
- To Interpret Mix design factors in mix proportions, Statistical methods, Acceptance criteria and BIS method of mix design

COURSE OUTCOMES:

After completion of this course students will be able to

- Describe physical properties of construction materials which include, Stones, Bricks , Timber.
- Make useof construction materials which include cement, admixtures, accelerators, retarders etc.
- Measurehardened concretewater / cement ratio, space ratio, strength in tension & compression, factors affecting strength.
- Illustrate testing of hardened concrete which include compression tests, tension tests, factors affecting strength, flexure tests, splitting tests, non-destructive testing methods, codal provisions for NDT.
- Distinguish between different types of concretes.
- InterpretMix design factors in mix proportions, Statistical methods, Acceptance criteria and BIS method of mix design

Unit I

Physical properties of materials, Stone: classification of stones – stone quarrying – precautions in blasting, dressing of stone, Bricks: composition of good brick earth, various methods of manufacturing of bricks-Characteristics of good brick., Timber: Classification of various types of woods used in buildings-Defects in timber. Alternative materials for wood and Aggregates: Classification, properties and selection criteria

Unit II

Cement-Types of cement, Composition, Properties, Uses-Chemical and Mineral admixtures, Acceleration, Retarders, Plasticizers, Water proofers, Mineral admixtures like Fly ash, Silica fume. Ground Granulated Blast Furnace slag(GGBS) and Makaoline. Effects on concrete properties.

Unit IIIFresh concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

Unit IV

Hardened concrete : Water / Cement ratio – Abram's Law – Gelspace ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

Testing of hardened concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests –Splitting tests – Non-destructive testing methods – codal provisions for NDT.

Unit V

Types of Concrete: Ready mix concrete, Shotcrete ,Light weight aggregate concrete, cellular concrete, Nofines concrete, High density concrete, Fibre reinforced concrete, Different types of fibres, Factors effecting FRC, Polymer concrete, High performance concrete, Self compacting concrete, Self healing concrete.

Unit VI

Mix design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistica lmethods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design

Text Books:

1. P.C.Varghese, "Building Materials", Prentice Hall India Learning Private Limited; 2nd edition, 2015
2. S.K.Duggal, "Building Materials", NEW AGE; 4th revised edition, 2012
3. S.C.Rangwala, " Engineering Materials",Charotar Publishing House,2013
4. A.M.Neville, Properties of Concrete, Pearson Education India; 5th edition, 2012
5. Concrete Technology by M.S.Shetty. – S.Chand& Co.; 2006

Reference Books:

1. M.L.Gambhir, Concrete Technology, 5th Ed., Tata Mc.Graw Hill Publishers New Delhi, 2017
2. A.R. Santha Kumar, Concrete Technology by, 2nd Ed., Oxford University Press, New Delhi--2018
3 Dr. B.C. Punmia, Ashokkumar Jain, Arun Kumar Jain, "Building Construction", Laxmi Publications; Eleventh edition, 2016
4 I S 2185 Part I & II PWD & CPWD Specifications

Strength of Materials

L	T	P	C
2	1	0	3

Course Code: 20CET203

COURSE OBJECTIVES:

Students will have

- To compute normal and shear stresses in bars of varying sections and composite bars subjected to external forces and temperature changes
- To determine the shear force and bending moments of the simply supported, cantilever and over hanging beams under various loads.
- To find the flexural stresses and shear stresses in beams of circular, rectangular, I, T and channel sections
- To calculate deflection of cantilever and simply supported beams using double integration, Macaulay's and moment area method.
- To design circular shafts subjected to a given torque and find principal stresses and strains
- To calculate crippling load for a given column

COURSE OUTCOMES:

After completion of this course students will be able to

- Compute normal and shear stresses in bars of varying sections and composite bars subjected to external forces and temperature changes
- Determine the shear force and bending moments of the simply supported, cantilever and over hanging beams under various loads.
- Find the flexural stresses and shear stresses in beams of circular, rectangular, I, T and channel sections
- Calculate deflection of cantilever and simply supported beams using double integration, Macaulay's and moment area method.
- Design circular shafts subjected to a given torque and find principal stresses and strains
- Calculate crippling load for a given column

UNIT – I

Simple stresses and strains:

Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elasticity and plasticity – Elastic moduli and the relationship between them – Bars of varying section – analysis of composite section– Temperature stresses.

UNIT – II

Shear force and bending moment:

Definition of beam –Types of supports - Types of beams – Concept of shear force(S.F.) and bending moment (B.M.) – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, UDL., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Flexural stresses:

Theory of simple bending – Assumptions – Derivation of bending equation - Neutral axis – Determination bending stresses – section modulus of rectangular, circular sections (Solid and Hollow), I, T and Channel section.

Shear stresses:

Derivation of formula – shear stress distribution across various beam sections like rectangular, circular, triangular, I, T sections.

UNIT – IV

Deflection of beams

Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration,Macaulay’s method ,Moment area method (Mohr’s theorems),– Determination of slope and deflection for cantilever and simply supported beams subjected to point loads and U.D.L

UNIT – V

Torsion of circular shafts:

Theory of pure torsion – Assumptions made in the theory of pure torsion- Derivation of Torsion equation– Torsion moment of resistance – Polar section modulus – Power transmitted by shafts

Principal stresses and strains:

Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear

UNIT VI

Columns:

Introduction – Types of columns –long columns – Euler’s Crippling Load- - assumptions- Derivation of Euler’s critical load for various end conditions –Equivalent length of a column – slenderness ratio – Euler’s critical stress – Limitations of Euler’s theory – Rankine – Gordon formula – Secant formula – Empirical formulae – Straight line formula.

Text Books:

1. B. C. Punmia,” Mechanics of Materials”, Laxmi publishers, Delhi, 2017.
2. S. Ramamrutham, “Strength of Materials”, DhanpatRai& Sons, Delhi, 2014
3. Mechanics of Solid, by Ferdinandp Beer and others – Tata Mc.Grawhill Publications, 2000.
4. R. Subramanian, Strength of Materials, 2nd Ed., Oxford University Press, New Delhi,2010
5. Ferdinand P Beer, E. Russell, Johnston, Jr, John T dewolf, Mechanics of Materials, 6th Ed., Tata McGraw-Hill Publications, 2012

Reference Books:

1. S.B. Junnarkar, “Mechanics of structures (Vol-I &Vol-II)”, Charotar Publishing house, 2016
2. Strength of Materials by S. S. Ratan, Tata McGraw Hill, 2016
3. R.K.Rajput, Strength of Materials, 4th Ed, S.Chand & Co, New Delhi, 2007
4. Strength of Materials by A.R.Basu, DhanpatRai& Co, Nai Sarah, New Delhi.
5. Strength of Materials by BhaviKatti.

Engineering Geology

Course Code: 20CET204

L	T	P	C
3	0	0	3

Course Objectives:-

The Students Will able

1. To describe the various properties of minerals
2. To distinguishing features of rocks
3. To explain the geological structures, processes of weathering and classification of soils.
4. To demonstrate the process of ground water exploration
5. To illustrate the knowledge of geological studies for dams and tunnels.
6. To explain the causes and effects and mitigating measures of earth quakes and landslides

Course Outcomes:

After completion of this course students will be able to

1. Identify different minerals.
2. Distinguish features exhibited by the rocks.
3. Identify the geological structures like folds, faults, joints and unconformities present in rock and describe the processes of weathering.
4. Interpret the occurrence of ground water in various lithological formations and location of bore wells
5. Evaluate the suitability of site for the dams and tunnels.
6. Illustrate the causes, effects and mitigating measures of earthquakes and landslides

UNIT I

Introduction: Branches of Geology useful to civil engineering scope of geological studies in various civil engineering projects.

Mineralogy: Definition of Mineral and crystal. Physical properties used in the identification of minerals. Physical properties of Quartz Group, Feldspar Group, Olivine, Calcite, Bauxite, Kyanite and Gypsum.

UNIT II

Petrology: Geological classification of Rocks, Dykes and Sills , Structures and textures, Geological description and Indian occurrence of Granite, Basalt, Dolerite, Gabbro, Sand stone, Shale, Limestone slate, Gneiss, Schist, Quartzite, Marble, and Khondalite.

UNIT III

Geological Structures: Strike and Dip, Classification mode of origin and engineering consideration of Folds, Faults, Joints and unconformities.

Rock Weathering: Definition of Rock weathering, classification of weathering Engineering consideration of Rock Weathering.

Geology of Soils: Formation of soil, Soil profile, important clay minerals, Geological classification of soils, Types of Indian Soils.

UNIT IV

Hydro Geology: Zones of Groundwater, Aquifers, Aquifuge, Aquiclude and Aquitards, Geological controls of Groundwater Movement, cone of depression, Groundwater Exploration Techniques.

UNIT V

Geology of Dams and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site, Analysis of Dam failures in the past, Purpose, effects and lining of tunnels, Influence of Geology for successful Tunnelling.

UNIT VI

Geological Hazards: Earthquakes-Causes and effects, Richter scale, Seismic belts, Seismic zones of India, precautions while constructing engineering structures- Land Slides-Causes, effects and methods of mitigating measures.

Text Books:

1. Parbin Singh, "*Engineering and general Geology*", S. K. Kataria & sons, New Delhi 2013.
2. N. Chenna Kesavulu, "*Text book of Engineering Geology*", Laxmi Publications Pvt Ltd; third edition, 2018.
3. P.C. Varghese, "*Engineering Geology for Civil Engineers*", PHI learning private Ltd., 2013.

References:

1. F. G. Bell, "*Fundamentals of Engineering Geology*", Aditya Books Pvt. Ltd., New Delhi, 2016
2. D. P. Krynine and W. R. Judd, "*Principles of Engineering Geology and Geotechnics",* CBS publishers and Distribution Pvt. Ltd, 2018.
3. Subinoy Gangopadhyay, "*Engineering Geology*", Oxford University press, 2013.
4. Geological Survey of India, "*Seismo Tectonic Map of India*" 2005.

Fluid Mechanics and Hydraulic Machines

Course Code: 20CET205

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Student will have

- To Explain the importance of fluid properties and their influence on fluid motion
- To study concepts of fluid flows and apply equation of continuity, flow net analysis.
- To solve various problems related to fluid flow through closed conduits.
- To analyze and design most economical open channels for different flows
- To compute hydrodynamic forces of jets on various vanes and analyze the performance of various turbines under different operating conditions and governing of turbines and surge tanks.
- To determine the performance of centrifugal pumps under different operating conditions.

COURSE OUTCOMES:

After completion of this course students will be able to

- Explain the importance of fluid properties and their influence on fluid motion
- Summarize concepts of fluid flows and apply equation of continuity, flow net analysis.
- Solve various problems related to fluid flow through closed conduits.
- Analyze and design most economical open channels for different flows
- Compute hydrodynamic forces of jets on various vanes and analyze the performance of various turbines under different operating conditions and governing of turbines and surge tanks.
- Determine the performance of centrifugal pumps under different operating conditions.

UNIT I

Introduction : Dimensions and units– Physical properties of fluids specific gravity, viscosity, surface tension,capillarity, vapor pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Manometers: Differential Manometers.

Fluid Statics: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of Pressure. Derivations and Problems.

UNTI – II

Buoyancy & Flotation: stability of floating bodies Meta Center, Meta centric height.

Fluid kinematics: Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and rotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flow net.

UNIT – III

Fluid dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow,applications of Bernouil's equation; Venturi meter and syphon. Momentum equation - forces on pipe bend. Reynold's experiment – Characteristics of Laminar & Turbulent flows.

UNIT – IV

Open channel flow: Types of flows - Type of channels – Velocity distribution – Energy and momentum correction factors – Chezy's, Manning's formulae for uniform flow – Most Economical sections. Critical flow: Specific energy-critical depth – computation of critical depth – critical, sub-critical and super critical flows-Non uniform flow-Dynamic equation for G.V.F., Mild, Critical, Steep, horizontal and adverse slopes-surface profiles - Rapidly varied flow, hydraulic jump, energy dissipation.

UNIT– V

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency, principle of Angular Momentum.

Hydraulic turbines: Layout of a typical Hydropower installation – Heads and efficiencies-classification of turbines Pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency.

UNIT – VI

Centrifugal pumps: Pump installation details-classification-work done- Manometric head-minimum starting speed losses and efficiencies-specific speed multistage pumps-pumps in parallel and series - performance of pumps-characteristic curves-NPSH-cavitations.

Text Books:

1. P.N Modi and S.M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulic Machines", 21st Edition, Standard BookHouse, 2017.
2. R.K. Bansal, "A textbook of Fluid mechanics and hydraulic machines", 10thEdition, Laxmi Publications (P) Ltd., NewDelhi, 2018.
3. Introduction to Fluid Machines by S.K. Som& G. Biswas, Tata McGraw Hill Pvt. Ltd.3rd edition, 2017

Reference Books:

1. A.K.Jain, "Fluid Mechanics Including Hydraulic Machines",12th Edition, Khanna Publishers, New Delhi, 2014
2. D S KUMAR, Fluid Mechanics and Fluid Power Engineering,Publisher: S K KATARIA & SONS-NEW DELHI,2013
3. Fluid mechanics and fluid machines by R.K. Rajput,**Publisher:** S Chand & Company (2016)

Concrete Testing Lab

Course Code: 20CEL202

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

- To tests on cement which include determination of fineness of cement, specific gravity of cement, normal consistency of cement, soundness of cement, compressive strength of cement
- To tests on aggregate which include determination of fineness modulus of fine and course aggregate, bulk density of fine and course aggregate, Specific Gravity of Fine and coarse aggregate, bulking of sand
- To tests on fresh concrete which include determination of workability of concrete by slump cone test, compaction factor test and vee-bee consistometer test.
- To tests on hardened concrete which include, determination of compressive Strength of concrete cube and concrete cylinder, determination of split tensile strength of concrete cylinder.
- To demonstrate the non-destructive testing of concrete (rebound hammer),

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine Compressive Strength and physical properties of cement viz. fineness, Specific Gravity, Normal Consistency, Initial and Final Setting time, Soundness .
2. Determine physical properties of aggregates viz.Fineness Modulus, Bulk Density, Specific Gravity, Bulking of Sand and Water absorption.
3. Determine Workability of fresh Concrete by Slump Cone, Compaction factor, Vee-bee Consistometer and Flow table test
4. Determine Compressive Strength of concrete cube &cylinder &Split tensile strength of Concrete cylinder
5. Demonstrate Rebound hammer test.

LIST OF EXPERIMENTS

TESTS ON CEMENT

1. (a) Determination of Fineness of Cement.
   (b) Determination of Specific Gravity of Cement by Lechatlier Flask.
2. (a) Determination of Normal Consistency of Cement.
   (b) Determination of Initial and Final Setting time of Cement.
3. (a) Determination of Soundness of Cement.
   (b) Determination of Compressive Strength of Cement.

TESTS ON AGGREGATE

4. (a) Determination of Fineness Modulus of Fine Aggregate
   (b) Determination of Fineness Modulus of Coarse Aggregate.
5. (a) Determination of Bulk Density of Fine aggregate.
   (b) Determination of Bulk density of Coarse aggregate.
6. (a) Determination of Specific Gravity of Fine aggregate.
   (b) Determination of Specific Gravity of Coarse Aggregate.
7. Determination of Bulking of Sand.

TESTS ON FRESH CONCRETE

8. (a) Determination of Workability of Concrete by Slump Cone test.
   (b) Determination of Workability of Concrete by Compaction Factor test.
   (c) Determination of Workability of Concrete by Vee-bee Consistometer test.

TESTS ON HARDENED CONCRETE

9. (a) Determination of Compressive Strength of Concrete cube.
   (b) Determination of Compressive Strength of Concrete cylinder.
10. Determination of Split tensile strength of Concrete cylinder.

DEMONSTRATION

1. Non-destructive testing of Concrete (Rebound hammer).

Strength of Materials lab

Course Code: 20CEL203

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

- to practice tension test, bending test on cantilever beam
- to practice bending test on simple support beam,
- to practice torsion test, hardness test, spring test
- to practice compression test on wood/steel/brick, impact test, shear test, bending on UTM
- to verify Maxwell's Reciprocal theorem on beams
- to practice deflect test on continuous beam

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine tensile, compressive, bending and shear strength of the construction materials using UTM.
2. Determine deflection and modulus of elasticity of simply supported, cantilever & continuous beams made up of steel & wood
3. Examine hardness of mild steel using Brinel and Rockwell hardness testing machine
4. Calculate torsional rigidity of mild steel using torsion testing machine
5. Compute stiffness of the spring by spring testing machine
6. Evaluate impact strength of mild steel by using Izod &Charpy testing machine

List of experiments

1. Tension test on MS and HYSD bars
2. Bending test on Cantilever beam (Steel).
3. Determination of Modulus of Elasticity by conducting Bending test on simple support beam (Wood).
4. Torsion test on MS bar.
5. Hardness test on steel
6. Compression test on Close coiled Helical Spring
7. Compression test on wood
8. Impact test on Mild Steel bar
9. Shear test on Wood
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Deflection test on Fixed beam
12. Bending test on RS Joist under UTM
13. Add-on Demonstration Compression Test on Brick

Fluid Mechanics and Hydraulic Machines Lab

Course Code: 20CEL204

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

- to study how to calibrate of venturimeter & orifice meter.
- to study how to determine of coefficient of discharge for a small orifice and external mouth piece by a constant head method.
- to study how to calibrate of Trapezoidal Notch and /or Triangular Notch.
- to study how to determine Coefficient of loss of head in a sudden contraction and friction factor and impact of jet on vanes.
- To study how to determine efficiency of Pelton wheel turbine, centrifugal pump and reciprocating pump.

COURSE OUTCOMES:

After completion of this course students will be able to

1. Evaluate Coefficient of discharge of Venturimeter and Orifice meter.
2. Examine Coefficient of discharge for a small orifice and external mouth piece by a constant head method.
3. Compute Coefficient of discharge of Trapezoidal Notch and /or Triangular Notch.
4. Determine loss of head in a sudden contraction and friction factor and force exerted by jet onvanes.
5. Measure efficiency of Pelton wheel turbine
6. Calculate efficiency of centrifugal pump and reciprocating pump.

LIST OF EXPERIMENTS

1. Calibration of Venturimeter
2. Calibration of Orifice meter.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by constant head method.
5. Calibration of contracted Trapezoidal Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Impact of jet on vanes.
8. Performance test on Pelton wheel turbine
9. Efficiency test on centrifugal pump.
10. Efficiency test on reciprocating pump.

Complex Variables and Statistical Methods

(Common for CIVIL, MECH & EEE Branches)

Subject Code: 20BST203

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Test if a function is analytic, harmonic and then construct a harmonic conjugate function.
- Evaluate integrals using the Cauchy Integral theorem.
- Identify singular points of a function then calculate residues using Residue Theorem.
- Understand the concepts of discrete and continuous distributions.
- Understand the concept of sampling theory.
- Analyze the testing of hypothesis by t-test, z-test, Chi-square test.

COURSE OUTCOMES:

On completion of this course, students will be able to

1. Construct a harmonic and conjugate harmonic function.
2. Evaluate integrals using the Cauchy Integral formulae.
3. Identify singular points of a function then calculate residues using Residue Theorem.
4. Obtain probability of random variable.
5. Execute Central limit theorem for Sampling Distributions.
6. Perform the large and small sample tests.

.

UNIT-I

Complex Functions: Functions of a complex variable- analyticity and its properties -Cauchy-Riemann equations in Cartesian and polar coordinates (without proof). Harmonic and conjugate harmonic functions-Milne-Thompson method.

UNIT-II

Complex Integral: Cauchy's integral theorem (without proof)-Cauchy's integral formula (without proof)-Generalized Cauchy's integral formula (without proof).

UNIT-III

Residues: Singular point –types of singularities- isolated, essential, removable –Pole of order m. Residue – Evaluation of residues – Residue theorem (without proof) and its applications.

UNIT-IV

Random Variables and Distributions: Discrete and Continuous Random Variables –Properties. Distributions- Binomial – Possion's -Normal distribution.

UNIT-V

Sampling Theory: Introduction to Sampling Theory -Population and Samples –Sampling distribution of means (σ known and σ unknown)- Central limit theorem- point estimation –Maximum error estimation-Interval estimation.

UNIT-VI

Tests of Hypothesis: Hypothesis-null and alternative hypothesis – type-I and type-II error –level of significance –one tail and two tail test, z-test, Student's-t-test, F-test, Chi-square test.

Text Books:

1. Complex Analysis And Statistical Methods, Dr.B.Krishna Gandhi, Dr.T.K.V.Iyengar and S.Ranganatham and Dr.M.V.S.S.N.Prasad, S.Chand & Company.
2. Probability and Statistics for Engineers, Miller and Freund's, Prentice Hall of India.
3. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers.

Reference Books:

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt. Ltd.
2. Probability and Statistics, Athanasios Papoulis, Pearson education.

Python Programming

Subject Code: 20ESI204

L	T	P	C
3	0	3	4.5

Course Objectives

This course will enable students to

- Learn Syntax and Semantics and create Functions in Python
- Handle Strings and Files in Python
- Understand Lists, Dictionaries and Regular expressions in Python
- Understand use of functions and file handling in python
- Implement Object Oriented Programming concepts in Python
- Introduction to Regular Expressions and matching in Python

Course Outcomes

By the end of this course the student will be able to

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
2. Demonstrate proficiency in handling Strings and File Systems
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions
4. Implement file handling functions and user defined functions in python
5. Interpret the concepts of Object-Oriented Programming as used in Python
6. Implement Regular Expressions and matching in Python

Unit – I

Introduction to Python: History, Features, Installing Python, Running Python, Operators, Statements and Expressions.

Control Structures: Conditional Statements, Loops

Exercise Questions: 1

Ex 1: Write the python programs to calculate the following

a) Find the factorial of given number
b) To print all the prime numbers below n. n value should be taken from the user at the time of execution

Ex 2: Write the python programs to perform the following

a) To check given number Armstrong or not.
b) To check Strong number.
c) To print Fibonacci series.

Unit – II

Data Types: Mutable vs immutable data type, Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Dictionaries and Set Types

Exercise Questions: 2

Ex 3: Write the python programs to calculate the following

a) Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.

b) Write a Python program to remove the characters which have odd index values of a given string.
c) To remove punctuations from the string
d) Write a Python program to count repeated characters in a string
e) Write a Python program to count Uppercase, Lowercase, special character and numeric values in a given string

Ex 4: Write the python programs to perform the following

a) Implement a STACK program by using PYTHON.
b) Implement a QUEUE program by using PYTHON.
c) Implement a Python Program for creating a dictionary and display its keys alphabetically.
d) Write a Python program to convert a list into a nested dictionary of keys.
e) Write a python program to remove duplicates from the list

Unit – III
Functions: Definitions, Declaration, Parameter passing, calling functions
File Handling: creating a file, opening a file, I/O with file (read, write, append), closing a file

Exercise Questions: 3
Ex 5: Write the python programs to calculate the following
a) To find HCF or GCD of two numbers
b) To find sum of natural numbers using recursive function
Ex 6: Write the python programs to perform the following

a) Read a file line by line into a list
b) Get filename, line count, file extension, file creation and modification date .
c) Reads and displays the content of the file
d) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

Unit – IV
Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

Exercise Questions: 4
Ex 7: Write the python programs to calculate the following

a) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
b) Write a python program to define a module and import a specific function in that module to another program.

Unit – V
Classes in Python: Principles of Object Orientation, Creating Classes, Instance Methods, Special Methods, class Variables and Inheritance, Data base connectivity.

Exercise Questions: 5
Ex 8: Write the python programs to calculate the following

a) Define a class, which have a class parameter and have a same instance parameter.
b) Define a class named 'Shape' and its subclass 'Square'. The Square class has an 'init' function which takes a given length as an argument. Both classes have an area function which can print the area of the shape, where Shape's area is 0 by default.

Unit-VI

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Exercise Questions: 6

Ex 9: Write the python programs to calculate the following

a) implement Re.findall, re.split, re.sub, re.subn, re.search and Match.group.

b) Write a Python program to check the validity of a password (input from users).

Validation :

- At least 1 letter between [a-z] and 1 letter between [A-Z].
- At least 1 number between [0-9].
- At least 1 character from [$#@].
- Minimum length 6 characters.
- Maximum length 12 characters.

Text Books

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, Prentice Hall.
2. Brian jones, David Beazley "Python Cookbook ", 3rd Edition.

References Books

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.
2. Think Python, Allen Downey, Green Tea Press

Web Links

https://docs.python.org/3/tutorial/index.html

https://pythonprogramminglanguage.com

Structural Analysis

Course Code: 20CET206

L	T	P	C
2	1	0	3

COURSE OBJECTIVES:

Students will have

- To analyze propped cantilever for various loads.
- To analyze fixed beams for various loads.
- To apply the strain energy methods
- To determine two hinged and three hinged arches for various loads.
- To analyze continuous beams by Clapeyron's theorem for different support and loading conditions.
- To find the member forces, bending moment and shear force diagrams of moving loads and interpret influence lines

COURSE OUTCOMES:

After completion of this course students will be able to

1. Draw SFD & BMD of propped cantilever for various loads.
2. Evaluate SFD & BMD of fixed beams for various loads.
3. Apply the strain energy methods
4. Determine two hinged and three hinged arches for various loads.
5. Analyse continuous beams by Clapeyron's theorem for different support and loading conditions.
6. Find the member forces, bending moment and shear force diagrams of moving loads and interpret influence lines

UNIT–I

Introduction to Static and Kinematic indeterminacy:.

Analysis Of Pin Jointed Plane Frames: Determination of forces in members of plane, pin-jointed, , perfect trusses by (i) method of joints and (ii) method of sections. Analysis of cantilever and simply supported trusses

UNIT – II

Propped Cantilever Beam: Analysis of propped cantilever beam with U.D.L, central point load, eccentric point load– Shear force and bending moment diagrams.

Fixed Beams: Introduction to statically indeterminate beams with U.D.L, central point load, eccentric point load- Shear force and bending moment diagrams

UNIT – III

Strain Energy: Strain energy due to axial load- Strain energy due to shear force- Strain energy due to bending, Castigliano's theorem-I, Castigliano's theorem –II-problems related to beams.

UNIT IV

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear for (uniform support) parabolic arches with point load and UDL where support hinges at the same level.

Two hinged arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear for parabolic arches with point load and uniformly distributed load

UNIT – V

Analysis Continuous Beams (Clapeyron's theorem of three moments): Introduction-Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, continuous beams with different moment of inertia for different spans, shear force and Bending moment diagrams.

UNIT – VI

Moving Loads: Introduction, maximum S.F. and B.M. at a given section and absolute maximum S.F. and B.M. due to single concentrated load, UDL longer than span, UDL shorter than span.
Influence Lines: Definition of influence line , influence line the reactions , influence line for S.F.,influence line for B.M.-Load position for maximum S.F. at a section – Load position for maximum B.M. at sections, single point load

TEXT BOOKS:

1. Analysis of Structures – Vol. I & 2 by Bhavakatti, Vikas Publishing House; Fourth edition, 2011 & 2013
2. V.N. Vazirani, M.M Ratwani and S.K. Duggal, ‗Analysis of Structures-Vol I', 17th Ed.,, Khanna Publishers, New Delhi,2015
3 . V.N. Vazirani, M.M Ratwani and S.K. Duggal, ‗Analysis of Structures-Vol II', 16th Ed., Khanna Publishers, New Delhi,2015
3. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi
4. Comprehensive Structural Analysis-Vol.I&2 by Dr. R. Vaidyanathan & Dr.P.Perumal- Laxmi Publications; Third edition, 2017
5. Statistical indeterminate structures by C.K.Wang, McGraw Hill Education; 1st edition, 2017

REFERENCES :

1. Structural Analysis (Matrix Approach) by Pundit and Gupta, McGraw Hill Education; 2nd edition 2008.
2. Theory of structures by Ramamutham, Dhanpat Rai Publishing Company Private Limited, Ninth edition, 2014
3 C.S. Reddy, Basic structural Analysis, 3rd Ed., Tata McGraw-Hill Education, New Delhi, 2011
4.T.S. Thandavamoorthy, Analysis of Structures, 1st Ed., Oxford University Press, New Delhi, 2011.
5. Structural analysis by R.C.Hibbler, Pearson Education India, 6th Edition, 2006
6. S.B.Junnarkar, Mechanics of Structures Vol.I, 31st Ed., Charotar Publishing House, 2015.
7. S.B.Junnarkar, Mechanics of Structures Vol.II, 24th Ed., Charotar Publishing House, 2015

Geotechnical Engineering

L	T	P	C
3	0	0	3

Course Code: 20CET207

COURSE OBJECTIVES

Students will have

- Understand the soil formation and determine the index properties of these soils and classify them
- To impart the concept of seepage of water through soils and determine the discharge of water through soils.
- To impart the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
- Analyze the stress below the soils under different conditions.
- To enable the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.
- To study and calculate the effective stress of soils at different depths

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine the index properties of soils, classify them and establish their inter-relationships.
2. Illustrate seepage of water through soils and determine the discharge of water through soils
3. Analyze the stress below the soils under different conditions
4. Determine the magnitude and the rate of consolidation settlement
5. Calculate the effective stress of soils at different depths
6. Determine the shear parameters of sands and clays and the areas of their application

UNIT I:

Type of Soils, Index Properties:

Inter-relationships and Soil Characterization Types of soil and soil formation, Geological cycle, Phase diagrams, Basic terms, Functional relationships based on index properties, Physical characterization of soil- Dry and Wet sieve analysis, Atterberg's Indices, Soil Structures, Soil Water and its types, Standard nomenclature & IS Soil Classification, Numericals.

UNIT II:

Permeability and Seepage:

Darcy's law and its validity, Factors affecting permeability, Laboratory permeability tests, Permeability of stratified soil masses, Seepage pressure, 2-D flow and Laplace's equation, Flow net construction, Quick condition, Piping Failure.

UNIT III:

Effective Stress And Pore Water Pressure:

Introduction, Stresses when No Flow Takes Place Through the Saturated Soil Mass, Stresses When Flow Takes Place Through the Soil from Top to Bottom, Stresses When Flow Takes Place Through the Soil from Bottom to Top,Effective Pressure Due to Capillary ,

UNIT IV:

Compaction & Consolidation of soil:

Definitions, Differentiate between compaction and consolidation, Compaction mechanism and proctor tests, field compactions methods, factors affecting compaction, Consolidation mechanism through spring analogy, fundamental definitions, Terzaghi's one dimensional consolidation theory (only formula), Time factor, pre-consolidation pressure, consolidation

UNIT V:

Stress Distribution:

Causes of stresses in soil, Boussinesque's and Westergard's equation, Pressure Bulb,
Stress distribution on horizontal and vertical planes, Stresses due to different shapes of footings, New-mark's influence chart, Numericals.

UNIT VI:

Shear Strength of Soil :

Mohr's strength theory, Mohr- coulomb's strength theory, Modified Mohr coulomb's theory, shears parameters through lab and field tests based on drainage conditions, Numericals. Tests will be covered in lab sessions.

Text Books:

1 Basic and Applied Soil Mechanics by Gopal Ranjan &ASR Rao, New age International Pvt . Ltd, New Delhi, Third edition, 2016
2. Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi, 2009.
3.Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, Sixteenth edition, 2017.
4. Principles of Geo technical Engineering by B. N. Das and K.Sobhan, Cengage India Private Limited; Ninth edition, 2017

References:

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).
2. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork.
3. Geotechnical Engineering by Purushotham Raj
4. Fundamentals of soil mechanics by D.W.Taylor
5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.

Building Planning and Drawing

Course Code: 20CEL205

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

- To read about objectives of building byelaws, FAR, FSI, principles underlying building byelaws, classification of bye buildings, open space requirements, lighting and ventilation requirement
- To read about minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings
- To read about Aspect, prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Roominess, Circulation, Furniture requirements, Sanitation and economy and effect of Sun, factors, effecting the orientation, to find out the facing of a house.
- To draw sign conventions, English & Flemish bond of odd & even courses for one, one and half and two, two and half brick walls, paneled door, paneled and glazed door, paneled & glazed windows
- To draw flat roof buildings, given line diagram with specifications to draw, plan, sections section and elevation.

COURSE OUTCOMES:

Students will get ability

1. Interpret building bye laws and regulations
2. Draw sign conventions and bonds
3. Draw doors, windows, ventilators and roofs
4. Explain the principles of planning and orientation of the building
5. Distinguish residential buildings and its standard dimensions.
6. Draw plan, elevation and sectional elevation of sloped and flat roof buildings

PART-A

UNIT – I

Building Bye-laws and Regulations: Introduction –Objectives of building bye-laws – Floor area ratio (FAR) – Floor space Index (FSI) – Principles underlying building bye-laws – classification of buildings – Open space requirements –lighting and ventilation requirement-Building services- Plumbing, Electrical fixtures

UNIT – II

Sign conventions and bonds: Brick, Stone, Plaster, Sand filling, Concrete, Glass, Steel, Cast iron, Copper alloys, Aluminum alloys etc., Lead, Zinc, tin, and white lead etc., Earth, Rock, Timber and Marble. English bond & Flemish bond odd & even courses for one, one and half, two and two and half brick walls.

UNTI – III

Doors, windows: Paneled Door, paneled and glazed door, paneled windows and glazed windows

UNTI – IV: Principles of Planning and Orientation of the Residential Building: Aspect, prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Roominess, Circulation, Furniture requirements, Sanitation and economy. Effect of Sun, factors effecting the orientation, to find out the facing of a house,

Residential Buildings: Minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings. Draw the line plan of a residential building for a given site plan

UNTI –V:Public buildings: Planning of educational institutions, hospitals and dispensaries. Requirements and minimum standards for various public buildings. Draw the line plan of a school and hospital for given site plan

UNIT – VI

Drawing practice: Flat roof building, given line diagram with specifications to draw, plan, elevation and sectional elevation.

TEXT BOOKS:

1. N. Kumara Swamy and. A. KameswaraRao, "Building Planning and Drawing", 8th Edition, Charotar Publications, 2010
2. Gurucharan Singh, "Building Planning, Scheduling and Design", 2nd Edition, Khanna Publishers, 2010.
3. 3. R.L. Peurifoyetal, Construction Planning, Equipment and Methods, 7th Edition, Tata Mc. Graw Hill Publications, 2010.

REFERENCES:

1. Building Byelaws by State and Central Governments and Municipal Corporations.
2. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.

Geotechnical Engineering Lab

Course Code: 20CEL206

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:
Students will have

- To know how to find Atterberg's Limits, Field Density, Relative density of sand.
- To know how to do Grain size analysis, compaction test, CBR Test.
- To know how to do Unconfined Compression test, Triaxial Compression test.
- To know how to do Direct Shear test, Vane Shear test etc.,
- To know how to ddetermine Consolidation of soil.

COURSE OUTCOMES:
Get ability to

1. Evaluate Atterberg's limits and Differential free swell for clayey soils.
2. Examine relative density, dry density & moisture contents in the field and laboratory by core cutter, sand replacement and compaction tests.
3. Determine permeability of soils
4. Analyze coarse and fine grain sizes in laboratory.
5. Determine shear strength and shear strength parameters by vane shear, tri-axial, direct shear & unconfined compression tests in laboratory.
6. Measure CBR value and consolidation settlement & swell pressure in laboratory.

LIST OF EXPERIMENTS

1. Atterberg's Limits.
2. Field Density-Core cutter and Sand replacement methods
3. Relative Density of Sand
4. Grain size analysis - Sieve Analysis and Hydrometer analysis
5. Permeability of soil - Constant and Variable head tests
6. Compaction test
7. Consolidation Test
8. CBR test
9. Unconfined Compression test
10. Direct Shear test.
11. Vane Shear test.
12. Differential free swell (DFS)

At least **Eight**experiments shall be conducted.

LIST OF EQUIPMENT:
1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for
a) Core cutter method
b) Sand replacement method
4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer

6. Permeability apparatus for
    - Constant head test
    - Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests
8. Oedometer Test

Reference

AR-18 Lab Manual of AITAM.

Transform Theory

(Common for MECH & CE branches)

Course Code: 20IET211

L	T	P	C
3	0	0	3

Course Objectives:

Students will have

- To study the Laplace transform of different basic functions and its properties.
- To study Inverse Laplace Transforms and apply Laplace transforms to solve differential equations.
- To Study the mathematical tool of Fourier transforms their properties and applications.
- To study Inverse Fourier transforms their properties.
- To study the mathematical tool of Z- transform, their properties and implementation.
- To study Inverse Z Transforms and apply Z- transform to solve Difference Equations.

Course Outcomes:

The student will be able to:

1. Evaluate Laplace Transform of different functions utilizing its properties.
2. Evaluate Inverse Laplace Transform of different functions and solve Differential Equations.
3. Estimate Fourier transform/ Fourier sine(cosine) Transform of functions.
4. Estimate inverse Fourier transform/ inverse Fourier sine(cosine) transform of different functions.
5. Evaluate Z-transform of different functions utilizing different properties.
6. Evaluate inverse Z- transform of different functions and solve Difference Equations utilizing different properties.

UNIT-I

Laplace Transforms: Laplace Transform for elementary functions – Properties- 1^{st} shift and 2^{nd} shifting theorems - Laplace transform of derivative, integrals, multiplication by t^n and division by t- unit step and unit impulse function.

UNIT-II

Inverse Laplace Transforms: Inverse Laplace Transform –Evaluation by partial fractions, convolution theorem (without proof), application of Laplace transforms to solve ordinary differential equations.

UNIT-III

Fourier Transforms: Fourier Integral Theorem (without proof)- Fourier sine and cosine integrals –complex form of Fourier Integral - Fourier transform – Fourier sine and cosine transforms – properties.

UNIT-IV

Inverse Fourier Transforms: Inverse Fourier Transforms, Inverse sine and cosine transforms - properties – Convolution Theorem.

UNIT-V

Z- Transforms: Z-transform – Linear property – Damping rule – Shifting rule – Initial and final value theorems- Z transforms of functions multiplied and divided by n.

UNIT-VI

Inverse Z- Transforms: Inverse Z-Transforms of basic functions, Partial fractions, Convolution theorem. Application of Z transforms to solve Difference Equations.

Suggested Text Books

1) B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2) Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

Reference Books

1. Advanced Engineering Mathematics , Erwin Kreyszig, 9th Edition, John Wiley & Sons.
2. Engineering Mathematics for first year, Veerarajan T., Tata McGraw-Hill, New Delhi.
3. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Publications.

Mathematical Modeling and Simulation

(Interdisciplinary Elective – I)

(ECE/MECH/CIVIL/CSE/IT)

Course Code: 20IET216

L	T	P	C
3	0	0	3

Course Objectives:

By the end of this course, students in this class will understand the basic principles of programming and implementing mathematical concepts in MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations. The ultimate goal is to motivate the students for their profession and for future courses in curriculum.

Course Outcomes:

1. Translate mathematical methods to MATLAB code.
2. Generalize results and represent data visually.
3. Apply computer methods for solving a wide range of engineering problems.
4. Utilize computer skills to enhance learning and performance in other engineering and science courses.
5. Demonstrate professionalism in interactions with industry.
6. Understands about Scilab.

UNIT I

Introduction to Matlab: Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Clearing Operations, Commands, Data types, Operators.

UNIT II

Data and Data Flow in Matlab: Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Functions.

UNIT III

Matlab Programming: Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

UNIT IV

Matlab Advanced: Plotting graphs, Creating Plot & Editing Plot, MATLAB-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

UNITV

Simulink-I:

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling,

UNITVI

Simulink-II: Converting Mathematical Model into Simulink Model, Running Simulink Models, Introduction to scilab.

Text Books:

1. Getting Started With Matlab: A Quick Introduction for Scientists and Engineers (English) by RudraPratap, OXFORD University Press.
2. Matlab Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication

Reference Books:

1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang, WenwuCao, Tae-SangChung,JohnMorris.
3. https://in.mathworks.com/products/simulink.html

Fundamentals of Materials Science
(Interdisciplinary Elective – I)

Course Code: 20IET217

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

- To classify engineering materials and their structures.
- To illustrate plastic deformation in single crystal engineering materials.
- To explain hot and cold working phenomenon
- To select materials for a particular application based on mechanical properties.
- To describe toughness, creep and fatigue in materials
- To summarise the necessity of making components using powder metallurgy.

COURSE OUTCOMES:

After completion of this course, students should be able

1. Classify engineering materials and their structures.
2. Illustrate plastic deformation in single crystal engineering materials.
3. Explain hot and cold working phenomenon
4. Select materials for a particular application based on mechanical properties.
5. Describe toughness, creep and fatigue in materials
6. Summarise the necessity of making components using powder metallurgy.

UNIT-I

Introduction: Introduction, classification of materials, crystal defects.

UNIT-II

Plastic deformation of single crystals: Plastic deformation of single crystals. Deformation by slip, Deformation of single crystal. Deformation by twinning.

UNIT-III

Hot working & Cold working: Recovery, recrystallization and grain growth. Solidification mechanism.

UNIT-IV

Mechanical properties: Mechanical properties. Tensile stress-strain diagrams, proof stress, yield stress diagrams, modules of elasticity. Hardness Testing: -Rockwell, Brinell and Vickers.

UNIT-V

Impact toughness: Charpy V-Notch, fracture, ductile, brittle, creep, creep mechanisms, fatigue-mechanism-factors to improve fatigue resistance

Unit- VI

Powder Metallurgy: Definition, Methods of production of metal powders, Stages in powder metallurgical components preparation, Design considerations.

TEXT BOOKS:

1. An introduction to material Science – V Raghavan.
2. Mechanical Metallurgy – GE Dieter.
3. Material Science – Callister.

REFERENCE BOOKS:

1. Material Science for Engineers – Vanvlack.
2. Material Science for Engineers – Schakleford.

Introduction to Electronic Measurements
(Interdisciplinary Elective-I)

Course Code: 20IET218

L	T	P	C
3	0	0	3

Course Objectives:
Students will have
- To provide knowledge of performance characteristics and classify static errors of different measuring instruments.
- To construct DC Ammeter, DC Voltmeter, Ohmmeters for measurement of unknown current, voltage and resistance.
- To introduce various Signal generators and Harmonic Distortion analyzers.
- To become familiar with the working of CRO and special Oscilloscopes for measurement of electronic parameters.
- To construct AC and DC bridges for measurement of unknown Resistance, Inductance and Capacitance.
- To understand working principles of transducers for the measurement of non-electrical quantities.

Course Outcomes:
At the end of the course, the student will be able to:
1. Define various performance characteristics and classify static errors of Instruments.
2. Calculate the resistance values for construction of DC voltmeter, Ammeter and Ohmmeters.
3. Explain the working of various signal generators and analyzers for distortion measurements.
4. Describe the working and use of CRO and special oscilloscopes.
5. Determine the value of unknown resistance, inductance, capacitance and frequency of excitation.
6. Classify transducers and identify suitable transducer for measuring various non-electrical quantities.s

Unit - I
Performance characteristics of instruments: Static characteristics - accuracy, resolution, precision, expected value, error and sensitivity, Error in measurement, Types of Static error, Dynamic characteristics - speed of response, fidelity, lag and dynamic error.

Unit - II
DC Meters: DC Ammeter Construction, Multirange ammeter, Universal Shunt and Extending Range. RF ammeter. DC Voltmeter – Construction, Multirange voltmeter, Extending Range. Ohmmeters - Series type and shunt type.

Unit - III
Signal Generators and Harmonic Distortion Analyzers: Signal Generators - Standard signal generator, AF sine and square wave generator, Function Generator.
Harmonic Distortion Analyzers: Fundamental Suppression Type – Resonance Bridge, Wien's Bidge, Bridged T-Network.

Unit - IV
CRO and Special Oscilloscopes: CRT features, Block Diagram of oscilloscope, Dual Beam CRO, Dual trace oscilloscope, Storage oscilloscope.

Unit - V

DC and AC Bridges: DC Bridge – Measurement of Resistance – Wheatstone's Bridge. AC Bridges - Measurement of inductance - Maxwell's Bridge, Anderson's bridge. Measurement of capacitance – Schering's Bridge and Wien's Bridge

Unit - VI

Transducers: Classification, Resistive Transducer – Potentiometer type – Pressure Transducer and Position Transducer, unbonded and bonded strain gauges, Thermistor, Inductive Transducer- LVDT, Capacitive Transducer – Pressure Transducer, Temperature Transducer-Thermocouple.

Text Books:

1. Electronic instrumentation – H.S.Kalsi, Tata McGraw Hill, 2004, 2/e.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 2002, 5/e.

Reference Books:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2003, 2/e.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2004, 2/e.

https://nptel.ac.in/courses/108/105/108105153/
http://nitttrc.edu.in/nptel/courses/video/108105153/108105153.html

Unix Utilities
(IT, Mechanical, ECE, EEE, CIVIL)

Course Code: 20IET219

L	T	P	C
3	0	0	3

Course Objectives

Students will have

- Know about UNIX operating system
- Understand important commands which are used in UNIX
- Learn shell programming
- Study UNIX file system
- Understand the process mechanism

Course Outcomes

1. Describe UNIX Architecture and Functions of OS
2. Demonstrate the basic set of commands and utilities in UNIX system
3. Design and Implement of UNIX file system
4. Familiar with various shell commands
5. Develop shell scripts to automate various tasks
6. Analyze the different types of processes in UNIX environment

Unit – I

Introduction to Unix- Brief History, What is Unix-Unix Components, Operating system services, Assumptions about hardware. Introduction to the Kernel: Architecture of the UNIX operating system, Introduction to system concepts – Kernel data structures – System administration.

Unit – II

Using Unix-Commands, **Unix**-Some Basic Commands-. Unix Command - man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip. Unix Utilities:- Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, Text processing utilities and backup utilities , detailed commands to be covered are tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, comm, cmp, diff, tr.

Unit – III

The File system –The Basics of Files-What's in a File-Directories and File Names- Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

Unit – IV

Using the Shell-Command Line Structure-Met characters-Creating New Commands- Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More
on I/O Redirection-Looping in Shell Programs.

Unit – V

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command- Branching Control Structures-Loop Control Structures-

The Continue and Break Statement- The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

Unit – VI

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation- The Trap Command-The Stty Command-The Kill Command-Job Control.

Text Books

1. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Parson.
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.

Reference Books

1. Unix and shell programmingby B.M. Harwani, OXFORD university press.
2. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
3. Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India

Fundamentals of Data Structures
(Interdisciplinary Elective-1)

Course Code: 20IET21A

L	T	P	C
3	0	0	3

Course Objectives:
Students will have

- To compute the time and space complexities and calibrate the performance of a given algorithm.
- To compare the performances of various Searching and Sorting techniques.
- To illustrate the applications of Stacks and Queues.
- To demonstrate the advantages of dynamic memory allocation via linked lists.
- To implement the basic operations and Traversals on binary Trees.
- To understand traversals and shortest path algorithms on a Graph.

Course Outcomes:
On completion of this course, the student will be able to:

- Compute the time and space complexities and calibrate the performance of a given algorithm.
- Compare the performances of various Searching and Sorting techniques.
- Illustrate the applications of Stacks and Queues.
- Demonstrate the advantages of dynamic memory allocation via linked lists.
- Implement the basic operations and Traversals on binary Trees.
- Understand traversals and shortest path algorithms on a Graph.

Unit – I
Introduction: Basic Concepts of Data Structures and types of Data Structures; Performance Analysis of algorithms; Asymptotic Notations (O,Ω, θ)

Unit – II
Searching: Linear Search, Binary Search: Algorithm & Analysis; Sorting: Methodology & Performance Analysis of Sorting Algorithms: Selection, Bubble, Insertion, Quick, Merge sort.

Unit – III
Stacks: Definition, operations, Applications of Stacks: Conversion of infix to postfix expression
Queues: Definition, operations, Applications of Queues;

Unit – IV
Linked Lists: Comparison with Arrays; Operations on Singly linked list: Creation, Insertion, Deletion, Traversing; Operations on Doubly linked list; Operations on Implementation of Stack and Queue using Linked Lists.

UNIT-V
Trees: Basic Terminology of Trees; Binary Tree: Traversals; Binary Search Tree Operations: Insert, Delete;

UNIT-VI
Graph: Basic Terminologies and Representations of Graphs; Graph traversal algorithms: Breadth-FS & Depth-FS; Minimum spanning tree algorithms: Prim’s and kruskal's algorithms

Text Books:

1. Mark Allen Weiss , "Data Structures and Algorithm Analysis", Fourth Edition , Pearson.
2. Ellis Horowitz, SartajSahni, "Fundamentals of Data Structures", Illustrated Edition,Computer- Science Press.

Reference Books

1. Michel T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithm Analysis", 2nd Edition, John Wiley & Sons, Inc.
2. Adam. Drozdek , "Data Structure And Algorithms In C++", 4th edition, Cengage.

Competitive Programming-I

(Common to ECE, EEE, MECH and CIVIL)

Course Code: 20IET21C

L	T	P	C
3	0	0	3

Course Objectives

Students will have

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of optimized solution for problem solving

Course Outcomes

After completion of the course, the students will be able to

1. Solve problems using programming
2. Design solution using OOP principles
3. Analyze time and space Complexity of a Solution.
4. Select appropriate container to organize data for problem solving.
5. Design a Relational Database schema for a subject of interest
6. Identify Redundancy in the Database using Normal Forms

Unit – I

CPP Essentials:

Basics: Basic Syntax, Variables, Data types, Operators, Input and output, Conditional Statements and loops, pointers and Dynamic memory allocation, arrays , vector , built in functions, user defined functions.

Problems to Practice: Missing Number ,Integer to English Words ,Integer to Roman, Roman to Integer, 2sum, 3sum,3sum closet,4sum, Remove duplicates in a list, Circular Array Loop, Fruit Into Baskets,, K-diff Pairs in an Array, Move Zeroes, Rotate Array, Flipping an Image, circular Array Loop

Unit – II

OOP Principles: Implementation of OOP principles (Encapsulation, Abstraction, Inheritance, Polymorphism) in cpp and Exception Handling.

Unit – III

Algorithm Analysis: Characteristics of algorithm, Algorithm Analysis-operation count , step counts,. asymptotic complexity, recurrence equations

Unit – IV

Standard Template Library: Containers, Container Classes, Vectors, Lists, Iterators, Maps, Set structures, Bit set, Stack, Queue, Deque, Priority queue.

Recursion: Recursion and its applications, Exhaustive search using Backtracking.

Problems to Practice: Permutations, Palindrome Partitioning, Beautiful Arrangement, N-Queens , Path with Maximum Gold

Unit – V

Introduction to DBMS, ER Model, ER to Relation Model Conversion

SQL Part1: SQL Command, Data Types, Operators and Expressions, DDL statements, DML statements, Functions, Sorting Data, Grouping Data

Unit – VI

SQL Part2: Cartesian Product and Inner Join, Self Join, Outer Join, Subquery, Independent Subquery, Correlated Subquery

Normalization: Functional Dependency and Normal Forms (1NF, 2NF, 3NF, BCNF)

Text Books

1. The Complete Reference C++ by Herbert Schildt ,4th Edition
2. Raghurama Krishnan, Johannes Gehrke: Database Management System, TATA McGrawHill 3rd Edition

Reference Books

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley –Fundamentals of Algorithms, PHI, New Delhi, 2005.
3. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.

Reference Links

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

Urban Planning and Essentials of Smart Cities

Course Code: 20SCT201

L	T	P	C
4	0	0	4

COURSE OBJECTIVES

Students will have

- To interpret and illustrate trends of urbanisation.
- To explain various urban development plans.
- To illustrate design and development of urban development projects.
- To comprehend essential aspects of smart and sustainable cities.
- To infer policy planning and development of smart cities.
- To recognize the role of Governance in addressing the urban challenges and key issues

COURSE OUTCOME

1. Interpret and illustrate trends of urbanisation.
2. Explain various urban development plans.
3. Illustrate design and development of urban development projects.
4. Comprehend essential aspects of smart and sustainable cities.
5. Infer policy planning and development of smart cities.
6. Recognize the role of Governance in addressing the urban challenges and key issues

UNIT I

Basics of Urbanisation:

Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas, Trends of Urbanisation at International, National, Regional and State level.

UNIT II

Urban Plan Formulation:

Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights, Special Economic Zones- Development of small town and smart cities-case studies

UNIT III

Planning And Design Of Urban Development Projects:

Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Implementation, Constraints and Implementation, Financing of Urban Development Projects

UNIT IV

Overview of Smart Cities:

Defining smart cities, Dimension, components and categories of smart cities. Global Standards and performance benchmarks, Practice codes.

UNIT V

Planning of Smart Cities:

General prerequisites of smart cities, Policy frame work for smart cities. India 100 smart cities policy and mission, planning and development.

UNIT VI

Smart Governance:

Definitions, functions, objectives and benefits of smart Governance. Infrastructure for smart governance. Initiatives and implementation stages of smart governance.

Text Books:

1. Allen G.Noble, (Eds), ‘Regional Development and Planning for the 21st Century: New Priorities and New Philosophies’, Aldershot, USA, 1988.
2. Andy Pike, Andres Rodriguez-Pose, John Tomaney, ‘Handbook of Local and Regional Development’, Taylor & Francis, 2010
3. Andreas Faludi and Sheryl Goldberg, ‘Fifty years of Dutch National Physical Planning, Alexandrine Press, Oxford, 1991.
4. Daniel G. Parolek, AIA, Karen Parolek, Paul C. Crawford, FAICP, Form Based Codes: A Guide for Planners, Urban Designers, Municipalities, and Developers, John Wiley & Sons, 2008
5.Smart Cities: Big Data and the Quest for a New Utopia, Anthony M. Townsend, ISBN: 978-0-393-08287-6

References:

1. A.B. Gillion and Simon Eisner, “The Urban Pattern”, CBS Publishers and Distributors, Delhi. 2. Ward S (2002), “Planning the 20th Century City” John Wiler & Sons.
3. R. Ramachandran, “Urbanisation and Urban Systems in India”, Oxford Publications.
4. FAIR, G.M., GAYER, J.C. AND OKUN, D.A., “Elements of water supply and Waste water Disposal”, John Wiley & Sons, New York.
5. TCPO AND MINISTRY OF WORKS AND HOUSING, “Norms and Standards for Urban Water Supply and Sewerage Services”, New Delhi.
6. National Institute of Urban Affairs, ”status of water supply, sanitation and solid waste management in urban area” 2005,
7. Transforming City Governments for Successful Smart Cities, Editor: Manuel Pedro Rodriguez-Bolivar ISBN: 978-3-319-03166-8

HUMAN VALUES

L	T	P	C
2	0	0	0

Subject Code: 20MCT305

COURSE OBJECTIVES

- To explainthestudentshowtogoverntheprofessionalbehaviorintheircareer as employee.
- To interpret the culture when they are working in different organizations.
- To understand value of education and self- development.
- To anticipate good value sin students.
- To let the student know about the importance of character.
- To let the student understand the personality and behavior development.

COURSE OUTCOMES

By the end of this course the student will be able to

CO1: Analyze ethical behavior in the workplace
CO2: Adapt appropriate behavior in the family and society
CO3: Understand the challenging environment in workplace
CO4: Understand the Global culture in engineering problems
CO5: Identify the importance of Human values in real life
CO6: Assess over all personality of an individual

UNIT–I

INTRODUCTION TO VALUES AND MORALS: Theory of Evolution – Ethics as a necessity for spiritual evolution-- Description of Human Values & Morals ---- Values --- Integrity, Honesty, Courage, Empathy, Personality, Character, Self Confidence, Respectfor Others,7 Way sofMisusing Truth – Work Culture, Social Responsibility, Responsibilities as a Citizen, Co operation and Commitment, Caring andSharing Religionvs. Spirituality, Philosophy, Customs and Practices --- Impediments to Responsibility – Self-Interest, Fear, Self-Deception, Ignorance, Ego, Narrow Vision, Uncritical Acceptance of Authority, Group Thinking

UNIT–II

MIND AND ITS MYSTERIES: What is Mind? Mind and Body, Mind and Food, Mental faculties, Theory of perception, Memory, Tendencies, Thought Creates the World-- Power of Thought, Thought Culture, Desires, Pleasure and Pain -- Cultivation of Virtues, Control of Senses and Mind--Discrimination, Dispassion, Sacrifice–Concentration, Meditation and Enlightenment

UNIT–III

RISK, SAFETY AND ENVIRONMENT: Difficulties in Estimating Risk—Approach to Acceptable Risk, Regulator's Approach to Risk – Engineer's Liability, Changing Legal Rights of the Employees--OrganizationalDisobediencebyContraryAction,byNon-Participation,by Protest – Environmental Laws and Judicial Intervention in Related Matters-Environmental Movements.

UNIT–IV

NON-ETHICAL PRACTICES IN VOGUE: Engineer's Responsibility for Rights - Respect for Authority – Conflict of Interests - Occupational crime -- Global Issues – How Multinational Corporations Influence Government Decisions, Riskand Public Policy- Engineers as Managers, Advisors and Experts, Engineers as Moral Leaders Problem of Bribery, Extortion, Grease Payments, Nepotism exits between Politicians and Industrialists. Case Study–Chinese Minister Sentenced to Death for Corruption

UNIT–V

VALUES AND SELF-DEVELOPMENT: Social values and individual attitudes. Work ethics, Indian vision of humanismMoralandnon-moralvaluationStandardsandprinciplesValuejudgments

UNIT-VI

PERSONALITY AND BEHAVIOR DEVELOPMENT: Soul and Scientific attitude Positive Thinking. Integrity and discipline Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brother hood and religious to lerance true friendship, happiness Vs suffering, love for truth. Aware of self destructive habits, Association and Cooperation, Doing best for saving nature

TEXT BOOKS:

1. CharlesEHarris,MichealJRabins,“EngineeringEthics,CengageLearning (2009)
2. Mike Martin and Rol and Schinzinger, “Ethicsin Engineering” McGrawHill, (2005)
3. Mind, Its Mysteries and Control ,Swami Sivananda ,Divine Life Society Pub (1994)
4. Chakroborty,S.K.“ValuesandEthicsfororganizationsTheoryandpractice”,Oxford University Press, New Delhi (1998)
5. Dr SB. Nageswararao " Humour in Management " Walnut Publications, Bhubaneswar (2022)

DESIGN OF CONCRETE STRUCTURES

Course Code: 20CET308

L	T	P	C
3	0	0	3

Course Objectives:

The objective of the course is to

- Explain the basics concepts of Limit state design.
- Describe the design of flexure.
- Explain the basic concepts such as shear, bond.
- Explain all types of simply supported slabs in detail.
- Explain the classification of columns.
- Explain Isolated square and rectangular footing.

Course Outcomes:

On completion of the course, the students will be able to:

1. Understand the concepts of limit state method.
2. Design of T-beam and doubly reinforced section
3. Demonstrate and design the basic concepts such as shear and bond.
4. Design different types of simply supported slabs by limit state method.
5. Design short columns by limit state method.
6. Design different types of isolated footings by limit state method.

UNIT-I

Introduction of Limit State Design: Working Stress method (concepts) limit state design-Basic statistical principles- characteristic loads – characteristic strength – partial load and safety factors – representative stress – strain curves for cold worked deformed bars and mild steel bars. Based on IS Code: 456-2000. Comparison of Limit state method with working stress and ultimate load method. Assumptions in limit state design – stress – block parameters.

Analysis of singly reinforced beams by LSM method.

UNIT-II

Design for Flexure limiting moment of Resistance, limit state design and analysis of doubly reinforced rectangular beams and T -beam sections with examples.

UNIT – III

Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions.

UNIT – IV

Slabs: Classification of slabs, design and detailing one - way slabs, two - way slabs, and continuous one way slabs using Coefficients (conventional) of IS code- all with respect to simply supported only.

UNIT-V

Design of Compression Members: Slenderness ratio, effective length of a column, design of short - under axial loads, uniaxial and biaxial bending (Use of SP 16), Design of slender column, P-M interaction (Only for Demonstration) – I S Code provisions.

Footings: types of footings. Distribution of base pressure. General Design considerations for footings. Design of Isolated rectangular, square footing.

NOTE: All the designs to be taught in Limit State Method (IS456-2000)

UNIT-VI

Text Books:

1. Design of reinforced concrete foundations by P.C. Varghese, PHI learning private Limited, 2009.
2. Reinforced concrete design by N. Subramanian, Oxford publication, New Delhi, 2017.
3. Reinforced concrete design by S.Unnikrishna Pillai &Devdas Menon, Tata Mc.GrawHill, New Delhi, 2016.

References:

1. Reinforced Concrete Structures by Park and Pauley, John Wiley and Sons, 1975.
2. Reinforced concrete structural elements – behaviour, Analysis and design by P.Purushotham, Tata Mc.Graw-Hill, 1994.
3. Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, NewDelhi, 2008.
4.Fundamentals of Reinforced concrete design by M.L. Gambhir, Printice Hall of India Private Ltd., New Delhi, 2006.

TRANSPORTATION ENGINEERING

Course Code: 20CET309

L	T	P	C
3	0	0	3

COURSEOBJECTIVES:

The objective of the course is to

- Explain about highway development and planning in India, highway alignment and engineering surveys.
- Explain about various elements of highway geometric design.
- Explain about highway materials such as soil, aggregates, bitumen and bituminous mix design.
- Explain about construction of different types of roads and highway maintenance.
- Explain about basic traffic engineering characteristics such as volume, speed, density, accidents and about Intersections
- Explain about Highway Capacity and relatable to Parking & accidental Studies.

COURSEOUTCOMES:

On completion of the course, the students able to:

1. Understand the importance of highway development and different road classifications.
2. Evaluate the Geometric design elements of the highway.
3. Identify and gain knowledge about highway materials used in highway construction.
4. Understanding the mechanism of different types of roads and their construction.
5. Apply basic parameters of traffic, parking studies, road accident analysis and identifying grade and grade separated intersections
6. Analyse about Highway Capacity, parking studies, road accidents.

UNITI

Highway development and planning: Invention of wheel - Different modes of transportation, role of highway transportation in India, Necessity for Highway Planning - Different Road Development Plans - Classification of Roads, Road Network Patterns.

Highway Alignment: Alignment - Factors controlling Alignment, Engineering Surveys for Highways - Drawings and Reports.

UNITII

Geometric design: Importance of Geometric Design, Highway Cross Section Elements – Pavement Surface Characteristics, Sight Distance - Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance.

Design of Horizontal Alignment - Design of Super elevation and Extra widening, Design of Transition Curves, Design of Vertical Alignment, Grade Compensation.

UNITIII

Highway materials: Soil, Aggregate, Bitumen and Tar, Tests on aggregates -Aggregate Properties and their Importance, Tar properties - Differentiation between Tar and Bitumen, Bitumen - different forms of bitumen - tests on bitumen - Bituminous Concrete, requirements of Design Mix - Marshalls Method of Bituminous Mix design, Modified Hubbard Field method of mix design.

UNITIV

Highway Construction: Construction of Roads -Earthen roads, W.B.M. Roads, Bituminous Roads - distresses; Cement Concrete roads –Tie bars and Dowel bars, distresses. Highway Maintenance, Highway drainage -Arborical culture -Street lighting.

UNITV

Traffic engineering: Elements of Traffic Engineering - Vehicle & Road User Characteristics, Accessibility & Mobility concept, Traffic Volume studies & methods, Speed Studies – Time Mean Speed, Space Mean Speed, Travel time and Delay studies, Origin - Destination studies,

UNITVI

Highway capacity: Highway capacity and level of service (LOS) - capacity of urban and rural roads, PCU concept and its limitations.

Parking: Parking Studies – Problems of parking, types of parking facilities – on street & off street, Accidents -Causes and Mitigative measures

TEXTBOOKS:

1.S.K.Khanna, C.E.G.Justo& A. Veeraragavan "Highway Engineering", Nemchand& Bros., 10th Edition, 2017.
2. Dr. L.R.Kadiyali and Lal " Traffic Engineering & Transport Planning" Khanna Publications, 7th Edition, 2012.
3. V.N.Vazirani and S.P.Chandra, "Transportation Engineering- Vol. I", Khanna Publications, 4th Edition, 1994.

REFERENCES:

1. S.P.Bindra, "Highway Engineering" Dhanpat Rai & Sons. – 4th Edition (1981)
2. ITE Hand Book, Highway Engineering Hand Book, Mc Graw - Hill
3. Indian Road Congress, Ministry of Road Transport and Highways, and Special Publications

ENVIRONMENTAL ENGINEERING

Course Code: 20CET310

L	T	P	C
3	0	0	3

Course Objectives:
This course enables the students:

1. To describe the importance of water quality and quantity and interpret the design of water supply systems.
2. To apply the appropriate technologies for water treatment.
3. To interpret the concepts of water supply systems designing and management.
4. To explain the impacts of sewage and select conveyance systems for sewage and storm water.
5. To identify and apply suitable process for the sewage treatment and sludge management.
6. To interpret the air and noise pollution concepts and control measures.

Course Outcomes:
After completion of this course, students will be able to:

1. Examine and explain various sources of water, water quality and quantity estimation.
2. Analyze the appropriate water treatment technology.
3. Interpret the concepts of water supply systems designing and management.
4. Understand and determine the fundamentals of wastewater generation, conveyance system, wastewater quality and different discharge standards.
5. Explain and illustrate various methods of wastewater and sewage sludge treatment.
6. Examine the air and noise pollution concepts and control measures.

Unit-I:
Introduction: Sources of Water - Comparison from quality and quantity – intakes, infiltration galleries. Waterborne diseases - protected water supply - population forecasting methods, design period - types of water demand - factors affecting – fluctuations - fire demand - storage capacity, drinking water quality standards: IS 10500.

Unit-II:
Water Treatment Process, Filtration and Disinfection: Layout and general outline of water treatment units – Aeration, sedimentation – principles – design factors – coagulation - jar test, flocculation, clarifier design – coagulants – feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation – disinfection – theory of chlorination, chlorine demand – other disinfection practices.

Unit-III:
Water Supply Systems: Requirements - methods and layouts - Design of distribution systems - Hardy Cross and equivalent pipe methods - Service reservoirs - Capacity by Mass Curve Method. Joints, sluice valves, air valves. Scour valves and check valves, water meters.

Unit-IV:
Conservancy and Water Carriage Systems: Sewage and storm water estimation - characteristics of sewage – decomposition of sewage, examination of sewage – B.O.D. Equation. C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses.

Unit-V:

Layout and General Outline of Waste Water Treatment Plants and Disposal of Sewage: Waste water treatment plant – Flow diagram – primary treatment - design of screens – grit chambers – skimming tanks – sedimentation tanks – biological treatment – trickling filters – Activated sludge processes (ASP). Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying - septic tanks working principles and design – soak pits.

Unit-VI:

Air and Noise Pollution: Definition and classificationof air pollutants – sources and effects – air pollution meteorology – Control of particulates – Gravity settlers, cyclone filters, ESPs – Control of gaseous pollutants – Adsorption – Absorption – Combustion - Condensation, air quality standards and limits. Definition and impacts of noise pollution – permissible limits of noise – measurement of noise and control of noise pollution.

Text Books:

1. Water Supply Engineering: Environmental Engineering - Vol. I, by S.K. Garg, Khanna Publishers, New Delhi
2. Sewage Disposal and Air Pollution Engineering: Environmental Engineering - Vol. II, S.K. Garg, Khanna Publishers, New Delhi
3. Elements of environmental engineering by K.N. Duggal, S. Chand Publishers, 1996
4. Water supply and sanitary Engineering by G.S. Birdi, Birdie J. S Dhanpat Rai & Sons Publishers, 2010.
5. Water Supply Engineering, Vol. 1, B.C.Punmia, Ashok Kr. Jain, Arun Kumar Jain, Laxmi Publications Pvt.Ltd New Delhi, 2 edition, 1994
6. Environmental Engineering, Peavy, H., Rowe, D.R, Tchobanoglous, G. Mc-Graw - Hill International

Reference Books:

1. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and Environmental Engineering Organization, Ministry of Urban Development.
2. Encyclopedia of Environmental Science and Engineering, McGraw-Hill, Inc.3rd edition-1993.
3. Water Supply Engineering: S. K. Garg, Khanna Publishers, New Delhi.
4. Water supply: Don D. Ratnayaka Malcolm, J. Brandt, Michael Johnson, 6th edition, 2009
5. Manual on Water Supply and Treatment. Ministry of Urban Development, New Delhi
6. Metcalfe and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
7. Water and Wastewater Engineering – designs, principle and practice, Mackenzie L. Davis. McGraw-Hill Education

ADVANCED STRUCTURAL ANALYSIS
(Professional Elective– I)

Course Code: 20CEE311

L	T	P	C
3	0	0	3

Course Objectives:
The objective of the course is
- To study slope deflection methods.
- To study moment distribution method
- To learn problems on continuous beams and single bay portal frames by Kani's method.
- To study stiffness method applied to continuous beams.
- To study flexibility method applied to continuous beams portal frames
- To study the plastic theory for different types of beams

.Course Outcomes:
Students will get ability to:
1. Analyze the moments of the members by slope deflection methods.
2. Analyze the moments of the members by distribution method
3. Analyze problems on continuous beams and single bay portal frames by Kani's method.
4. Analyze continuous beams by stiffness method
5. Analyze continuous beams and portal frames by flexibility method
6. To apply the plastic theory for different types of beams

UNIT – I
Slope deflection method: Assumptions in slope deflection method -application to the analysis of statically indeterminate beams with and without settlement of supports – rigid jointed plane frames with and without side sway.

UNIT – II
Moment Distributionmethod – Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – story portal frames – including Sway.

UNIT – III
Kani's method- Analysis of continuous beams – including without sinking and with sinking- analysis of single bay portal frames with and without sway.

UNIT – IV
Stiffness Method-Introduction- Analysis of continuous beams- portal frame non sway analysis. (Maximum of two unknowns). Simple space structures.S

UNIT – V
Flexibility Method-Introduction- Analysis of continuous beams- Simple rigid frame non sway analysis. (Maximum of two unknowns).

UNIT – VI
Introduction to Plastic Analysis: Introduction-Assumption in plastic theory-plastic hinge-plastic moment or collapse moment-collapse load- load factor- shape factor- collapse load for Different types of beams i.e. simply supported beam with central point load- simply supported beam with udl,

TEXT BOOKS:

1. Structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi, 3rd edition 2010.
2. Structural Analysis (Matrix Approach) by Pundit and Gupta – Tata Mc.Graw Hill publishers, 2nd edition, 2008.
3. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi, 10th edition, 2009.
4. Comprehensive Structural Analysis-Vol.I&2 by Dr. R. Vaidyanathan& Dr. P.Perumal- Laxmi Publications pvt. Ltd., New Delhi, 3rd edition 2016.
5. Statistical indeterminate structures by C.K.Wang, 1953.
6. Analysis of Structures – Vol. I & 2 by Bhavakatti, Vikas publications, 4th edition, 2010.
7. Indeterminate Structural Analysis by K.U. Muthu, H. Narendra, MagantiJanardhana, M. Vijayanand, I K International Publishing House, 2014

REFERENCES:

1. Theory of Structures by S.P. Timoshenko and D. H. Young, Tata Mc.Graw Hill publishers 2002.
2. Analysis of structures by Vazrani&Ratwani – Khanna Publications, 1994.
3. Theory of structures by Ramamutham, Dhanpatirai publications, 2014.
4. Structural analysis by T.S ThandavaMoorthy, Oxford University Press, 2011.
5. Structural analysis by R.C.Hibbler, 6th edition 2006.
6. Basic structural analysis by Muttu&Janarthan, 3rd edition 2019.

WATERSHED MANAGEMENT
(Professional Elective– I)

Course Code: 20CEE312

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To explain the concept, objectives, need &Integrated and multidisciplinary approach of watershed development, characteristics of watershed
- To explain the principles of erosion which include Types, factors affecting, Effects, estimation of soil loss of erosion etc.,
- To explain the different measures to control erosion which include contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control works, rock fill dams, brushwood dam, Gabion structures.
- to discuss the water harvesting which include Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks
- To explain the Land management which include Land use and Land capability classification, management of forest, agricultural, sustainable agriculture, dry land agriculture, Reclamation of saline and alkaline soils.
- To discuss the Ecosystem management which include Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, , bio-mass management, , silvi pasture, horticulture, grassland and wild land social forestry and afforestation.

COURSE OUTCOMES:

1. Understand concepts and characteristics of watershed management.
2. Discuss principles of erosion
3. Understand various measures to control erosion.
4. Describe about rain water harvesting and its structures.
5. Describe about land management.
6. Describe about ecosystem management.

UNIT-I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.
Characteristics of watershed: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II

Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation, revised universal soil loss equation.

UNIT-III

Measures to control erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control works, rock fill dams, brushwood dam and Gabion structures.

UNIT-IV

Water harvesting: Rainwater harvesting and harvesting structures, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.\

UNIT-V

Land management: Land use and Land capability classification, management of forest land, management of agricultural land, sustainable agriculture, dry land agriculture, Reclamation of saline and alkaline soils.

UNIT-VI

Ecosystem management: Role of Ecosystem, soil enrichment, cropping pattern, management of grassland and wild land, social forestry and afforestation.

TEXT BOOKS:

1. JVS Murthy (2017), Watershed Management, 2nd edition, New Age International Publishers.
2. R. Awurbs and WP James (2015), Water Resource Engineering, 1st edition, Prentice Hall Publishers.

REFERENCE:

1. VVN Murthy (2013), Land and Water Management, 6th edition Kalyani Publications.
2. D.K.Majumdar (2014), Irrigation and Water Management, 2nd revised edition, Printice HallIndia.

BRIDGE ENGINEERING
(Professional Elective– I)

Subject Code: 20CEE313

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have
- To explain the basic Components of a Bridges
- To explain of R.C.C. Culverts and T-Beam Bridges.
- To discuss various types of steel bridges
- To discuss the Pier and Abutments.
- To explain the Importance of bearings
- To explain pre-stressed concrete girder and box girder bridges.

COURSE OUTCOMES:

After completion of this course students will be able to
1. Understand the basic Components of a Bridges.
2. Design of R.C.C. Culverts and T-Beam Bridge.
3. Design of various types of steel bridges.
4. Illustrate the Pier and Abutments.
5. Understand the Importance of bearings
6. Design of prestressed concrete girder and box girder bridges.

UNIT I

Introduction and Investigation for Bridges: Components of a Bridge, Classification, Standard Specifications, Need for Investigation, Selection of Bridge Site, Preliminary Data to be Collected, Preliminary Drawings, Determination of Design Discharge, Economical Span, Location of Piers And Abutments, Vertical Clearance Above HFL, Scour Depth, Choice of Bridge Type, Importance of Proper Investigation.

UNIT II

Design Consideration of RCC bridges: Various types of bridges (brief description of each type), Design of R.C.C. Culverts and T-Beam Bridges.

UNIT III

Design Consideration of steel bridges: Various types of steel bridges (brief description of each type), Design of welded plate girder bridge. Design Principles of continuous bridges and box girder bridges.

UNIT IV

Sub Structure for Bridges: Pier and Abutments Caps; Materials for Piers and Abutments, Design of Pier, Design of Abutment, Backfill behind Abutment, Approach Slab.

UNIT V

Bearings for Bridges: Importance of bearings, bearings for slab bridges, bearings for girder bridges, expansion bearings, fixed bearings, design of elastomeric pad bearing. Foundations for bridges, Scour at abutments and piers, grip length, types of Foundations.

UNIT VI

Analysis and design of concrete girder and box girder bridges considering only primary torsion, Design of end block, Theory on open web girder.

Text Book(s)

1. Krishna Raju N., Design of Bridges, 4/e, Oxford & IBH Publishing, 2008.
2. Jagadish. T.R and Jayaram. M.A, Design of Bridge Structures, 2/e, PHI Learning Pvt. Ltd., 2009.

Reference Book(s):

1. D.Johnson Victor, Essentials of Bridge Engineering, 6/e, Oxford & IBH Publishing Co. Pvt. Ltd., 2007.
2. Ponnuswamy.S, Bridge Engineering, 2/e, Tata McGraw Hill Education, 2007.

FUNDAMENTALS OF FUZZY LOGIC
(Interdisciplinary Elective –II)

L	T	P	C
3	0	0	3

Subject Code: 20IET321

COURSE OBJECTIVES

The student will be able to

- Understand the concepts of fuzzy sets, membership functions and their operations.
- Understand the concepts of fuzzy relations and their operations.
- Frame linguistic variables, analyze the fuzzy quantifiers and understand Fuzzy Inference.
- Understand the concept of constructing simple fuzzy sets.
- Understand the process of Fuzzification and Defuzzification by using different methods.
- Understand the concepts of Mamdani Approach & Takagi Sugeno's Approach with simple examples.

COURSE OUTCOMES

Student is able to

1. Perform different fuzzy operations on fuzzy sets.
2. Perform different fuzzy operations on fuzzy relations.
3. Construct linguistic variables, estimate the fuzzy quantifiers as per the requirement, perform Fuzzy Inference.
4. Construct a simple Fuzzy set.
5. Perform the process of Fuzzification and Defuzzification by using different methods for simple engineering problems.
6. Apply Mamdani Fuzzy Model & Takagi Sugeno Model for simple Engineering problems.

UNIT-I

Fuzzy set Theory: Crisp Sets- an overview, Fuzzy sets – membership functions -types of membership functions: Triangular, Trapezoidal, Gaussian-examples. Basic Fuzzy set operations- union, intersection, complement. Properties of Fuzzy Sets. ,

UNIT-II

Fuzzy Relations: Cardinality, operations, properties, fuzzy Cartesian product and composition, fuzzy tolerance and equivalence relations, forms of composition operation.

UNIT-III

Fuzzy Logic: Classic and fuzzy logic, approximate reasoning, Natural language, linguistic hedges, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference -fuzzy rule based systems, graphical technique of inference.

UNIT-IV

Construction of Fuzzy sets: Methods of construction –an overview, Direct methods with one expert, Direct methods with multiple experts, constructions from Sample data –examples.

UNIT-V

Fuzzy Expert System –Fuzzification & De-fuzzification: Fuzzy Controllers, Fuzzy Logic Control-Fuzzification- Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules. Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method.

UNIT-VI

Fuzzy Expert System : Mamdani Approach & Takagi Sugeno's Approach with simple examples.

Text books:

1. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George. J. klir / Bo Yuan, Prentice-Hall of India Pvt Limited.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms, S.Rajasekharan, G.A.Vijayalakshmi Pai, Prentice-Hall of India Pvt Limited.

References

1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, 3rd edition, John wiley & sons Ltd.

RENEWABLE ENERGY SOURCES
(Interdisciplinary Elective – II)

Subject Code: 20IET323

L	T	P	C
3	0	0	3

Course Objective:

- To outline the concept regarding solar radiation.
- To Outline the concept regarding the collection of solar energy and storage of solar energy
- To outline the concept regarding different types of wind mills.
- To outline the concept regarding different types of biomass digesters and geothermal energy conversion.
- To Outline the concept regarding ocean energy conversion
- To Outline the concept regarding direct energy conversion

Course Outcomes:

After completion of this course the student can able to
CO1: Define different kind of solar radiation.
CO2: Understand different methods of collection of solar energy and storage of solar energy.
CO3: Classify different types of wind mills.
CO4: Classify different types of biomass digesters and geothermal energy.
CO5: Classify different types of ocean energy extracting techniques.
CO6: Distinguish different kinds of direct energy conversion techniques.

UNIT – I
Principles of solar radiation:
Role and potential of new and renewable source, the solar energy option, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation.

UNIT-II
Solar energy collection, storage and applications:
Flat plate and concentrating collectors, Different methods of storage -Sensible, latent heat. Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

UNIT-III
Wind energy:
Sources and potentials, block diagram, **Types**: horizontal and vertical axis windmills. Types of generators and its parts.

UNIT-IV
Biomass and Geothermal energy:
Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield. Resources, types of wells, Open loop and closed loop energy conversion.

UNIT-V
Ocean energy:
OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques.

UNIT-VI

Direct energy conversion (DEC):

Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems.

TEXT BOOKS:

1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS:

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

FUNDAMENTALS OF ROBOTICS
(Interdisciplinary Elective –II)

Subject Code: 20IET324

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
- This subject gives the knowledge about the fundamentals of the robotics technology and its wide area of applications in various fields.
- This gives the knowledge about the kinematic and dynamic aspects of the robot construction and designing aspects of the robots.

COURSE OUTCOMES:
On completion of this course, students should be able to
CO1: Discuss basic fundamentals and Describe commonly used robot configurations.
CO2: Discuss end effectors, drives along with robotics applications.
CO3: Describe working principles of various sensors commonly used in a robot.
CO4: Solve basic transformation problems and rotation matrices.
CO5: Discuss methods of programming and programming languages.
CO6: Discuss robot manufacturing & non-manufacturing applications of robots.

UNIT-I Fundamentals of Robotics:
Introduction to Robotics & Overview –Robotics & Automation – Robotics – Classification of Robots based on Configuration & Control – Terminology - Components of Industrial Robots – DOF, Functions and Specifications of Robot System.

UNIT-II Robot Actuators:
Robotic Actuators – Classification of actuators – Difference between Electric, Pneumatic and Hydraulic actuators, Servo & Stepper Motors, Servo Amplifiers, Control of Robotic Joints, Closed and Open Loop Control System.

UNIT-III Sensing Systems:
Sensing systems – Overview of sensing – Functions of sensing – Types – Optical and Non – Optical Sensors, position sensors: potentiometer, resolvers, and encoders, velocity, proximity, accelerometers, tactile, range sensors, touch and slip sensors, force and torque sensors.

UNIT-IV Homogeneous transformations:
Mapping, mapping between rotated, translated and combined rotated and translated frames, description of objects in space, fundamental rotation matrices, homogeneous transformations, representations & properties – problems and differential motions of a frame.

UNIT-V Programming:
Introduction to robot programming – methods of programming – programming languages. generations of robot programming languages, robot control sequencing, AL, AML, RAIL, RPL, VAL Robot languages.

UNIT-VI Applications:

Introduction – Manufacturing & Non-manufacturing applications – Selection and need of robot for a particular application (Case study), Future applications.

TEXT BOOKS:

1. Industrial Robotics, M. P. Groover, Pearson Education Pub.
2. Robotics & Control, R. K. Mittal, I. J. Nagarath, Tata McGraw Hill Pub.

REFERENCE BOOKS:

1. Robotics, K. S. Fu, Lee, McGraw Hill Pub.
2. An Introduction to Robot Technology, P. Coiffet, M. Chaironze, Kogam Page Pub., London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall Pub.
4. Robot Analysis and Intelligence, Asada, Slow time, Wiley Inter-Science Pub.
5. Introduction to Robotics, John J Craig, Pearson Education Pub.
6. Robot Dynamics & Control, Mark W. Spong, M. Vidyasagar, John Wiley & Sons (ASIA) Pub.

PRINCIPLES OF COMMUNICATIONS
(Interdisciplinary Elective –II)

Subject Code: 20IET325

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Explain the fundamental concepts of modulation and demodulation of Amplitude modulation and Angle modulation schemes.
- Understand various pulse modulation schemes.
- Compare the different types of Digital communication systems
- Understand various Digital modulation schemes.
- Understand the concept of channel capacity, information theory and Shannon's theorem.

COURSE OUTCOMES:

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

CO 1. Determine Modulation Index, Bandwidth and power of AM,DSB- and SSB for the given specifications and also compare various Demodulation techniques of AM.

CO 2. Compute Modulation parameters of FM and PM waves as per the given specifications and also compare FM and PM in terms of characteristics and applications.

CO 3. Describe Sampling theorem and Compute Nyquist sampling rate for the given signal and also compute Modulation parameters of PAM,PWM and PPM for the given specifications.

CO 4. Analyze the PCM,DM and ADM techniques with respect to baud rate bit error rate and also construct the above said signals as per given conditions.

CO 5. Determine Modulation parameters of ASK,FSK,PSK, DPSK and QPSK for the given data and also construct the wave forms for the given specifications.

CO 6. Differentiate noises in communications systems and compute noise figure as per given specifications.

UNIT - I

Amplitude Modulation: Need for modulation, Types of Amplitude modulation, AM, DSB , SSB , Power and BW requirements, generation and Demodulation of AM.

UNIT-II

Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT-III

Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM

UNIT- IV

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM.

UNIT-V

Digital Modulation: ASK, FSK, PSK, DPSK, QPSK.

UNIT-VI

Noise: External noise, Internal noise, noise calculations, noise figure and noise temperature.

TEXT BOOKS:

1. Electronic Communication Systems – Kennedy & Davis, TMH, 4th edition.
2. Digital Communications – Dr. Sanjay Sharma, S.K.Kataria and sons, New delhi, 2015

REFERENCE BOOKS:

1. Communication Systems Engineering – John. G. Proakis, Masoud and Salehi, 2nd Ed. PHI/Pearson, 2004.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.

WEBSITE REFERENCES:

1. https://youtube.com/playlist?list=PLq-Gm0yRYwTgX2FkPVcY6io003-tZd8Ru
2. https://youtube.com/playlist?list=PLmA4L9UCzuEMcZv9QxlBoUJHcNFM2LIpf

JAVA PROGRAMMING

(Interdisciplinary Elective – II)

Subject Code: 20IET326

L	T	P	C
3	0	0	3

Course Objectives

- The objective of the course is to teach the basic concepts and techniques which form the Object Oriented Programming Paradigm.
- Well equipped with Java SDK environment to create, debug and run simple Java programs

Course Outcomes

After completion of this course, the students will be able to:

1. Become familiar with the fundamentals and acquire programming skills in the Java language.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods, using class libraries, etc.
3. Understand and apply various object oriented features like inheritance, polymorphism to solve various computing problems and take the statement of a business problem and from this determine suitable logic for solving the problem.
4. Identify Java's standard packages and the different levels of member access and how they relate to packages and implement error handling techniques using exception handling.
5. Explore common issues encountered when creating a cross-platform multi-threaded applications
6. Develop efficient Java applets to provide interactive features to web applications.

Unit – I

Introduction To Java: Evolution of Java, Java Buzzwords, The Java Virtual Machine, An overview of Java- Simple Java Program, Naming Conventions in Java, Data types, Variables, Expressions, Automatic type Conversion, Operators, Control Statements , Input and Output, Arrays, Strings.

Unit – II

Classes & Objects: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java- Overloading Methods, Static Methods, Recursion, final keyword, this keyword, garbage collection, finalize() method.

Unit – III

Inheritance: Inheritance Basics, Types of Inheritance, The Keyword 'super', Final with inheritance.
Polymorphism: Method Overriding, Dynamic Method Dispatch, Abstract Classes.
Interfaces: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces.

Unit – IV

Packages: Packages, Different Types of Packages, Access Protection, Importing Packages.
Exception Handling: Exception-handling fundamentals, throw Clause, throws Clause, Types of Exceptions: Built-in Exception, User Defined Exception.

Unit – V

Threads: Java Thread Model, Main Thread, Creating a Thread and Running it, Terminating the Thread, Creating Multiple Threads, Thread Synchronization, Thread Priorities.

Unit – VI

Applets: Applet Basics, Applet Life Cycle, A Simple Applet, HTML applet tag, Applet Parameters.

Text books:

1. Herbert schildt (2010), The complete reference, 7th edition, Tata Mc graw Hill, New Delhi.

Reference Books

2. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, PearsonEducation, India.
3. J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
4. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

INTRODUCTION TO DBMS
(Interdisciplinary Elective –II)

Subject Code: 20IET327

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce basic RDBMS concepts, SQL, Database Design and Query processing and also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments, and various Data structures for External Data storage and efficient retrieval.

COURSE OUTCOMES :

Students will be able to:

CO 1. Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
CO 2. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
CO 3. Create /Modify the Structure and write optimized SQL Queries to extract and modify information from Tables or Views.
CO 4. Apply and tell the concept of Triggers and PL/SQL.
CO 5. Apply Normalization techniques and improve the database design by normalization.
CO 6. Apply and tell the concept of transaction, concurrency control and file and page organization.

UNIT-I

Database System Applications, History of Database Systems, Database Systems versus file Systems, View of Data: Data Abstraction, Instances, and Schemas, Data Models: The ER Model, Relational Model, Other Data Models, and Database System Structure.

UNIT-II

Database Design and ER diagrams: Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Conceptual Design with the ER Model, Introduction to the Relational model.

UNIT-III

Introduction to SQL, Data types in SQL, DDL commands, DML commands, DCL commands, TCL commands, Aggregative Operators, Views, Integrity constraints, Logical connectives AND, OR, and NOT.

UNIT- IV

Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Joins, Triggers, PL/SQL introduction, and example programs on PL/SQL.

UNIT- V

Schema refinement and Normal forms: Problems Caused by Redundancy, Decomposition, Properties of Decomposition, Functional Dependencies, Reasoning about FDS: Introduction to Normalization, First Normal form, Second Normal form, Third Normal form, and Fourth Normal form.

UNIT- VI

Introduction to Transaction, Transaction States-Atomicity, Consistency, Isolation, and Durability properties, Schedule, Serializability, Concurrent Executions, File Organization, and Indexing.

TEXT BOOK:

1. Database System Concepts – Abraham Silberschatz, Korth, McGraw hill, 7th Edition, 2021
2. Fundamentals of Database Systems - Elmasri, Navrate, Pearson Education, 7th Edition,2017

REFERENCE BOOKS:

1. Database Management Systems - Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2014.

Web links:

1. https://www.javatpoint.com/dbms-tutorial
2. https://www.javatpoint.com/dbms-sql-introduction

COMPETITIVE PROGRAMMING-II

(Interdisciplinary Elective – II)

(Common to ECE, EEE, MECH and CIVIL)

Subject Code: 20IET329

L	T	P	C
3	0	0	3

Course Objectives:

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of optimized solution for problem solving

Course Outcomes:

After completion of the course, the students will be able to

1. Analyze the problem using Mathematics
2. Develop solution using Dynamic linear Data structures
3. Select appropriate Sorting /Searching technique to solve the Problem
4. Develop solutions using stack and queue
5. Develop solutions using Non-Linear Data Structures
6. Develop Solution to problems using Dynamic Programming.

Unit – I

Number Theory: Modular arithmetic, exponentiation ,Modular exponentiation, Greatest Common Divisor, Extended Euclidean algorithm, Modular multiplicative inverse, Prime Number, Sieve of Eratosthenes.

Problems to Practice: Factorial Trailing Zeroes, Happy Number, Ugly Number, Smallest Integer Divisible by K, Prime Arrangements, Poor Pigs, Check If It Is a Good Array, Rabbits in Forest

Unit – II

Linked List: Singly Linked List, Doubly Linked List and Circular Linked List and Josephus Circle problem

Problems to practice: Add Two Numbers, Swap Nodes in Pairs, Rotate List, Palindrome Linked List, Linked List Cycle, Remove Duplicates from Sorted List

Unit – III

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quick sort and Count Sort

Searching: Linear Search and Binary Search

Practice Problems: Find Peak Element, Guess Number Higher or Lower, Koko Eating Bananas, Find Minimum in Rotated Sorted Array, Sort Colors, Largest Number, Pancake Sorting, Valid Anagram.

Unit – IV

Stacks and Queues: Implementation in Array and Linked list and classic problems on Stacks and Queues.

Problems to practice : Min Stack, Valid Parentheses, Trapping Rain Water, Largest Rectangle in Histogram, Asteroid Collision, Simplify Path, Next Greater Element I, Online Stock Span, Implement Stack using Queues

Unit – V

Trees : Terminology of Tree concept, Types of Trees ,Tree traversal and Binary Search Tree.

Graphs: Terminology, Representation of Graph, Graph Traversal DFS and BFS

Problems to Practice: Word Ladder, Shortest Path in Binary Matrix, Rate In Maze.

Unit – VI

Dynamic Programming : Introduction, Bottom up DP, Top Down DP, Coin Change Problem, Road Cutting problem, Egg dropping problem, 0/1 Knapsack problem, Longest common Sub Sequence problem.

Text Book:

1. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
2. E. Horowitz. et.al. Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Books:

1. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
2. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.
3. Silberschatz, Korth :Database System Concepts. McGraw hill,5th Edition.
4. Elmasri, Navrate:Fundamentals of Database Systems. Pearson Education,6th Edition

Reference Links :

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

ENVIRONMENTAL ENGINEERING LAB

Course Code: 20CEL307

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have:

1. To perform sampling procedure, determine pH, Conductivity of given water sample in the laboratory
2. To determine and estimate Hardness, Alkalinity, Acidity of given water sample in the laboratory
3. To determine and estimate Dissolved Oxygen, Turbidity, Total Solids, Total Dissolved Solids, Total Suspended Solids etc., of given water sample in the laboratory
4. To determine and estimate Iron, Nitrogen, Total Phosphorous, B.O.D, C.O.D of given waste water sample in the laboratory
5. To determine Optimum Coagulant Dose, Chlorides, Chlorine Demand, Coli form of given drinking water sample in the laboratory
6. To determine Percent of Available Chlorine in Bleaching, Residual Chlorine of given drinking water sample in the laboratory

COURSE OUTCOMES:

Upon successful completion of this course, students will get ability to:

1. Demonstrate sampling procedure and determine pH, Conductivity of given water sample in the laboratory
2. Estimate Hardness, Alkalinity, Acidity of given water sample in the laboratory
3. Estimate Dissolved Oxygen, Turbidity, Total Solids, Total Dissolved Solids, Total Suspended Solids etc., of given water sample in the laboratory
4. Estimate Iron, Nitrogen, Total Phosphorous, B.O.D, C.O.D of given waste water sample in the laboratory
5. Determine Optimum Coagulant Dose, Chlorides, Chlorine Demand, Coli form of given drinking water sample in the laboratory
6. Determine Percent of Available Chlorine in Bleaching, Residual Chlorine of given drinking water sample in the laboratory

Exp. No	**Name of the Experiment**
0	Water sampling methods for lab analysis
1	pH Metric Estimation of Acid By Base
2	Determination of Total Hardness By EDTA Method
3	Determination of Acidity Of Water Sample
4	Determination of Alkalinity Of Water Sample
5	Estimation of Dissolved Oxygen in Water Sample
6	Determination of Turbidity of Water
7	Determination of Iron By Thiocyanate Colorimetry
8	Conductometric Estimation Of Acid By Base
9	Determination of Biochemical Oxygen Demand
10	Determination of Total Solids, Total Dissolved Solids and Total Suspended Solids
11	Determination of Optimum Coagulant Dosage
12	Determination of Chloride Content in the Given Sample
13	Determination of the percentage of Available Chlorine in Bleaching Powder
14	Determination of the Residual Chlorine

Reference: AR-20 Lab Manual, AITAM

TRANSPORTATION ENGINEERING LAB

Subject Code: 20CEL308

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

- To demonstrate tests on road aggregates which include, aggregate crushing value and impact resistance factor
- To demonstrate test on aggregate, specific gravity and water absorption, attrition test, abrasion test, shape tests to practice tests on bituminous materials which include viscosity test
- To demonstrate ductility test.
- To demonstrate softening point test
- To demonstrate flash and fire point tests
- To demonstrate penetration test, stripping test

COURSE OUTCOMES:

Students will get ability to:

1. Determine coarse aggregate impact, crushing, abrasion and attrition values using different laboratory testing machines.
2. Determine specific gravity, elongation and flakiness index values of coarse aggregates.
3. Determine the attrition and water absorption of aggregate.
4. Determine viscosity, flash and fire point and softening point of bitumen in laboratory.
5. Determine ductility and penetration of bitumen using ductility testing machine & standard penetrometer respectively.
6. Determine stripping value of bitumen in laboratory.

LIST OF EXPERIMENTS

A) ON ROAD AGGREGATES:

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests

B) ON BITUMINOUS MATERIALS:

1. Viscosity Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Penetration test
6. Stripping test

References:

1. S.K.Khanna&C.E.G.Justo Highway Engineering Lab manual
2. AR-18 Lab Maual of AITAM

SMART ENERGY & TRANSPORTATION SYSTEMS

(Honors/Minor Course)

Course Code: 20SCT302

L	T	P	C
4	0	0	4

Course Objectives:

The objective of the course is

1. To explain smart energy and net zero energy buildings
2. To explain development of smart cities through solar energy
3. To explain Electric vehicles and EV-ecosystems
4. To explain smart transport system
5. To explain ICT support to smart transport system
6. To explain case studies on smart energy and transport system

Course Outcomes:

Students will get ability to:

1. understand smart energy and energy plus building
2. comprehensive importance of solar energy in development of smart cities
3. synthesize the Electric vehicles and EV-ecosystems
4. understand smart transport system
5. comprehensive ICT support in smart transport system
6. study case studies on smart energy and transport system

Unit I

Smart Energy: - Defining the concept of smart energy, Objectives of smart energy; Elements of smart energy management system. Energy efficient building. Net zero energy and energy plus buildings, building codes and energy efficiency, use of renewable energy (RE) challenges in making city energy smart.

Unit II

Solar energy for smart cities – Development of solar cities – Solar street lights, traffic signal boards. Solar energy conversion-Solar thermal systems – Solar photo voltaics (PV) generating systems – Roof top solar systems.

Unit III

Smart Grid-demand management through smart grids. Electric vehicles (EVs), need for electric vehicles, EV-ecosystem components: Vehicles and battery, charging infrastructure types of chargers, new regulations and consumer awareness

Unit IV

Smart transport system-Need for urban smart transport system, objectives and components of urban transport system. Strategies in smart transport system-Transit orientated development (TOD) - non – motorized transport.

Unit V

ICT supported smart transport Real-time traffic information system (RTIS) Real time traffic monitoring system (RTMS), automated fare collection system. Parking information system, public, private & commercial vehicles and smart transport solutions.

Unit VI: - Case studies at International and national level on smart energy and transport system.

Textbooks:

1. The smart city transformations, Amithsatyam, IGORCALZADA.
2. Smart cities, smart mobility, Lukas Necknmann matador, April 2018.

Reference Books:

1. Smart Cities, P.P. Anil Kumar, Pearson India, First edition, September, 2019.

DESIGN OF STEEL STRUCTURES

Course Code: 20CEI311

L	T	P	C
3	0	3	4.5

COURSE OBJECTIVES:

The objective of the course is to

- Understand the basics concepts of bolted connections and designs welded connections
- Design supported, unsupported and plated simply supported beams
- Explain designing tension members as per IS codes
- Explain designing of compression members as per IS code provisions
- Explain designing of gantry girder
- Explain designing of welded plate girder

COURSE OUTCOMES:

Students will get ability to

1. Design IS code bolted connections and designs welded connections.
2. Design beams including detailing.
3. Design tension members including detailing.
4. Design compression members including detailing.
5. Design gantry girder including detailing.
6. Design plate girder including detailing.

UNIT– I

Basics of bolted/riveted connections: Bolted/riveted connections, Types of bolts, Types of bolted joints, Failure of bolted joints, Specifications of bolted joints, Design of foundation bolts.

Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds. IS Code requirements. Design strength of fillet welds subjected to moment acting in the plane and at right angles to the plane of the joints.

Exercise Questions:

1. Design and Detailing of bolted connections of a lab joint
2. Design and Detailing of bolted connections of a double cover butt joint

UNIT – II

Beams: Allowable stresses, design requirements as per IS Code-design of laterally supported and unsupported beams. Design of plated beams.

Exercise Questions:

3. Detailing of framed connection between primary beam and secondary beam.
4. Detailing of bracket welded connection in plane bending

UNIT –III

Tension members: Introduction, Types of tension members, Net sectional Area, Effective net area, Types of failures, Design of tension members.

UNIT – IV

Design of Compression members: Introduction, Effective length of columns, Slenderness ratio, Design of compression members, Built-up sections- Design of lacings and battens. Design Principles of Eccentrically loaded columns and splicing of columns.

Exercise Questions:
5. Design and Detailing of a framed connection between a column and beam
6. Design of lacing system

UNIT – V
Gantry girder: Introduction, Loads, Design of Gantry girders, roof elements – Design of Purlin's.

Exercise Questions:
7. Design and Detailing of Ties and Struts in truss member
8. Detailing of a gantry girder

UNIT – VI
Plate Girder: Introduction, Elements of plate girder, Design consideration – I S Code recommendations, Design of plate welded plate girder- post-critical method, stiffeners.

Exercise Questions:
9. Design and Detailing of plate girder without stiffeners
10. Design and Detailing of plate girder with stiffeners

NOTE- All Designs should be in LIMIT STATE Method

Text Books:
1. Limit state design of steel structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi, 2nd edition, 2017.
2. Design of Steel Structures by Ramachandra. Vol – 1, Scientific Publishers, 2016.
3. Design of Steel structures by Limit state method as per IS-800:2007, S.S.Bhavakatti, I K International Publishing House Pvt. Ltd, 4th edition, 2014.
4. Steel Structures and Design and practices by N.Subramanya, Oxford publications, 2010.
5. Structural Design and Drawing by N.Krishna Raju; University Press, 2009.

Reference Books:
1. Comprehensive Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi, 2nd edition, 2015.
2. Structural design in steel by SarwarAlamRaz, New Age International Publishers, New Delhi, 2018.
3. Design of Steel Structures by Arya and Azmani, Nem Chand Publisher, 2011.

IS Codes:
1) IS-800 – 2007, 2) IS – 875 – Part I, II & III, and 3) Steel Tables.
***These codes and steel tables are permitted in the examination.**

IRRIGATION AND WATER RESOURCES ENGINEERING

Subject Code: 20CET312

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

- to explain engineering hydrology and its applications, types and forms of precipitation,
- to explain the abstractions from precipitation
- to explain hydrograph, separation of base flow, unit hydrograph, ,s-hydrograph,IUH
- to explain ground water Occurrence, aquifer parameters, types of wells, state of flow into wells
- to explain consumptive use, duty and delta, factors affecting duty, methods of irrigation, water logging
- to explain classification of canals, design of Irrigation canals in alluvial soils, gravity dams, river training and CDW.

COURSE OUTCOMES:

Students will get ability to

1. understand the process of hydrologic cycle, types and forms of precipitation,
2. understand about the abstractions from rainfall
3. analyze about hydrograph, unit hydrograph, s-hydrograph,IUH
4. determine ground water Occurrence, aquifer parameters, types of wells, and the discharge into a well
5. describe consumptive use, duty and delta and methods of irrigation, water logging
6. design of Irrigation canals by Kennedy's and Lacey's theories

UNIT – I

Introduction- hydrologic cycle, water-budget equation, world water balance, applications in engineering. Precipitation- forms of precipitation, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area-duration relationships, maximum intensity/depth-duration-frequency relationship, Probable Maximum Precipitation (PMP).

UNIT – II

Abstractions from precipitation- evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, Interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, classification of infiltration capacities, infiltration indices.

UNIT – III

Hydrograph: hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph, S-hydrograph, IUH.

UNIT – IV

Groundwater and well hydrology- forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

UNIT – V

Water withdrawals and uses–Analysis of surface water supply, Water requirement of crops, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, estimation of evapo-transpiration, irrigation requirement. Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation. Water logging: causes, effects and remedial measures.

UNIT – VI

Design of channels- alluvial channels, Kennedy's and Lacey's theory of regime channels. River training and Cross drainage works: river training, classification, and objectives, types of CDW

Text Books:

- Engineering Hydrology, K Subramanya, Edition: 5, 2020,Mc-Graw Hill.
- Ground Water 3rd Edition 2007 By H M Raghunath, New Age International

Reference Books:

- Irrigation and Water Resources & Water Power by P.N.Modi, 11th edition (15 March 2019), Standard Book House.

FOUNDATION ENGINEERING

Subject Code: 20CET313

L	T	P	C
3	0	0	3

COURSEOBJECTIVES:

The objective of the course is to

- Explain the soil exploration and field tests
- Explain the earth slope stability using various methods
- Explain and the earth pressure by various theories
- Explain study safe bearing capacity and settlement of soils
- Explain the load carrying capacity of piles by various methods
- Explain well foundations

COURSEOUTCOMES:

On completion of the course, the students will be able to:

1. Enumerate soil exploration and field tests
2. Analyze earth slope stability using various methods
3. Determine earth pressure by various theories
4. Determine safe bearing capacity and settlement of soils
5. Determine load carrying capacity of piles by various methods
6. Illustrate the well foundations.

UNITI

Soil Exploration- Introduction, methods of site exploration, soil samplers, sampling procedures, trail pits, borings, Penetration tests, Plate load test, Analysis of borehole logs, geophysical investigation methods, Preparation of soil investigation report.

UNITII

Stability of Slopes - Introduction, types of slopes, types of failures and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure, Swedish circle method, friction circle method, Bishop's Simplified method, Taylor's stability number and Stability of slopes of earth dams under different conditions.

UNITIII

Earth pressure theories: Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method.

UNITIV

Shallow foundations: Types - choice of foundation – Location of depth – Factors effecting bearing capacity-Gross, net, Safe Bearing Capacity – Terzaghiand IS Methods,effect of water table-Safe bearing pressure based on N- value – allowable bearing pressure; safe bearing capacity and settlement from plate load test – allowable settlements of structures.

UNIT V

Pile foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups.

UNIT VI

Well Foundations: Types – Different shapes of wells – Components of wells – Sinking of wells – Tilts and shifts.

TEXTBOOKS:

1. Soil Mechanics and Foundation Engineering by Dr K R Arora , A. K. Jain For Standard Publishers Distributors , 6 th Edition, 2002
2. Basic and Applied Soil Mechanics by Gopal Ranjan& ASR Rao, New age International Pvt . Ltd, New Delhi

REFERENCE BOOKS:

1. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy, CRC Press; 1 edition 2002
2. Soil Mechanics by Craig R.F., Chapman & Hall, CRC Press; 8 edition, 2012
3. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
4. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ, 2nd edition.
5. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning India Private Limited; 8 edition, 2015
6. Principles of Foundation Engineering, by Braja M. Das, Cengage; 7 edition, 2013
7. Essentials of Soil Mechanics and Foundations: Basic Geotechnics by David F. McCarthy, Pearson; 7 edition, 2006
8. Soil Mechanics in Engineering Practice by Karl Terzaghi, Ralph B. Peck, and GholamrezaMesri, John Wiley & Sons, INC, 3rd Edition, 1996.

ADVANCED SURVEYING
(Professional Elective– I)

Subject Code: 20CEE321

L	T	P	C
3	0	0	3

Course Objectives:

- To understand the working of Total Station equipment and solve the surveying problems
- To learn about the importance of advanced surveying in field measurements in terms of utility and precision of data collecting.
- To gain an understanding of the fundamentals of electronic distance measures, total stations, and their accuracy.
- To become acquainted with the idea of photogrammetry in preliminary identification and map creation.
- To understand the idea of remote sensing in identifying land characteristics from space and to be introduced to various data collecting techniques such as LIDAR and RADAR.
- To become acquainted with the field of geodesy, coordinate systems, map projections, GPS, its operating principles, data collecting, data processing, and analysis.

Course outcomes:

On completion of the course, the students will be able to:

1. comprehend how Total Station equipment works and how to handle surveying difficulties
2. apply modern surveying techniques in a variety of civil engineering disciplines
3. select the advanced surveying approach that is most suited for the job
4. apply total station and EDM in distance measurement and traversing
5. show the concepts of the earth's surface, projections, and the various coordinates used in map creating
6. GPS may be used in transportation engineering, structural engineering, and land planning.

UNIT I -Fundamentals of Total Station and Electromagnetic Waves: Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies- Refractive index (RI) - factors affecting RI-Computation of group for light and near infrared waves at standard and ambient conditions-Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index- Second velocity correction - Total atmospheric correction- Use of temperature - pressure transducers.

UNIT-II- Electromagnetic distance measurement (EDM) – Principle of EDM Carrier waves – Types of EDM instruments – Distomat – Total Station – Principle – procedure & surveying using Total Station – precise leveling - micro-optic theodolite.

UNIT-III- Photogrammetry – Terrestrial and Aerial Photogrammetry – Horizontal position of a point from photographic measurement – elevation of a point – Determination of focal length of camera - Geometry and scale of vertical photographs – Ground co-ordinates from vertical photographs - Relief displacement – Planimetric mapping from vertical photos – Stereoscopy– Photo interpretation.

UNIT-IV-Remote sensing – concepts – Idealized remote sensing system – characteristics – Types of remote sensing system – Remote sensing from space – Data interpretation – application of remote sensing – LIDAR – RADAR.

UNIT-V-Geodesy – Figure of earth – Classification – Earth surface - Geodetic reference surfaces - Coordinate systems – Geodetic datums and elements – Map – Scale of map – projection – UTM – Map projection of India – Space Geodesy – VLBI – SLR - LLR.

UNIT-VI-GPS Basics – system overview – working principle of GPS – Satellite ranging –calculating position – Ranging errors and its correction – GPS surveying Methods – static, Rapid static, DGPS and Kinematic methods – Real time and post processing DGPS – visibility diagram – GAGAN.

Textbooks:

1. Punmia, B.C. Surveying Vol.III, Standard Publishers, 2005.
2. Duggal, S.K. Surveying Vol. II, Tata McGraw Hill, 2004
3. Satheesh Gopi. The Global Positioning System and Surveying using GPS, Tata McGraw, 2005.

References

1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Satheesh Gopi. Advanced Surveying, Pearson Education, 2007.
3. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
4. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 2003.
5. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin, 1998
6. Arora, K. R. Surveying Vol. III, Standard Book House, 1996.

ADVANCED DESIGN OF REINFORCED CONCRETE STRUCTURES

(Professional Elective– II)

Subject Code: 20CEE322

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The student will able to

- explain the cantilever and counter fort of retaining walls.
- explain circular and rectangular types of RCC water tanks
- explain the circular slabs which include simply supported and fixed end conditions and flat slabs.
- explain the piles and pile caps
- explain and Design earthquake forces for multi-storey structures
- explain and Design wind forces for multi-storey structures

COURSE OUTCOMES:

On completion of the course, the students will be able to:

1. analyze and design of Retaining walls, cantilever and counter fort
2. analyze and design of RCC water tanks on ground, Circular, square and rectangular types.
3. analyze and design of circular slabs and Flat slabs.
4. analyze and design of bored cast-in-situ piles, under reamed piles and Pile cap for three and four piles using bending method.
5. analyze and design of earthquake forces and detailing for ductility.
6. analyze and design of wind forces.

UNIT I Design of Retaining walls: types, behaviour, earth pressure and stability requirements, design of cantilever and counter fort retaining wall, Design of combined footing.

UNIT II Design of RCC water tanks on ground: Circular, square and rectangular types.

UNIT III Slabs: Yield line theory of slabs- circular slab design, circular slab – Simply supported and Fixed end conditions with Uniformly Distributed Loads, Flat slabs.

UNITIV Piles and pile caps: Design of bored cast-in-situ piles (bearing and friction types), under reamed piles. Design of Pile cap for three and four piles using bending method.

UNIT – V Multi-storey building system – detailing for Ductility, Design for wind forces,

UNIT – VI Different types of loadings on bridges according to IRC, Design of RCC Culvert-deck slab for IRC Class AA loading and Class A loading.

Text Books:

1. Advanced Reinforced concrete structures by Vargheesh, Pranties Hall of India Pvt. Ltd, 2nd edition 2005.
2. Design drawing of concrete and steel structures by N.Krishna Raju University Press 2005.
3. Reinforced concrete structures Vol-2 by byB.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publicationsPvt. Ltd., New Delhi, Fifth edition, 2015.

References:

1. Reinforced concrete design by S.U,Pillai and D.Menon, Tata Mc.Ghrawhill Publishing company,3rd edition, 2011.
2. Reinforced Concrete Design byWang John Wiley & Sons; 7th Edition edition, 2006.
3. Codes: Relevant IS: codes.

ENVIRONMENTAL POLLUTION AND SOLIDWASTE MANAGEMENT
(Professional Elective– II)

Subject Code: 20CEE323

L	T	P	C
3	0	0	3

Course Objectives:

This course enables the students:

1. To analyze, how the environment is getting contaminated and probable control mechanisms for them.
2. To learn the processes for conversion of wastes into resources
3. To categorize and evaluate the concepts and abatement of noise pollution
4. To evaluate the management principles of hazardous waste
5. To understand the components of solid waste management system, study and understand collection, transfer and transport options of a municipal solid waste system.
6. To examine the processing options, study operations of various resource recovery and energy recovery facility, study the operation of municipal solid waste landfill.

Course Outcomes:

After completion of this course, students will be able to:

1. Distinguish and analyze the types of air pollution in the environment and understand about their dispersal mechanisms.
2. Analyze the types of water pollution happening in the environment and understand about their effects and potential control mechanisms.
3. Evaluate the potential sources, effects and control methods of noise pollution.
4. Define and examine the treatment and management of radioactive and biomedical wastes
5. Review the components of a solid waste management system, identify the various collection and transport mechanisms of municipal solid waste.
6. Operate processing, material and energy recovery facilities, operate solid waste landfills.

Unit-I:

Air Pollution: Definition, Sources of air pollution. Air pollutants (CO, CO2, SO2, NOx, Hydrocarbons & Aerosols). Green House Effect, Global warming, Acid rain, Ozone layer depletion and Smog. Meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behavior, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion. Air pollutants in indoor environments-private residences-offices-schools-public buildings-ventilation. Ambient air quality and emission standards.

Unit-II:

Water Pollution: Definition and Sources of water pollution. Specific phenomena related with water pollution- Algal bloom, Eutrophication, Biomagnifications/ Bioaccumulation. Water Quality-Physical, chemical and biological parameters of water- Water Quality requirement-Potable water standards, Primary, Secondary and tertiary treatment-Unit operations-unit processes. Membrane process, classification, Materials, membrane configurations, membrane operation, Reverse osmosis, Ultrafiltration, Microfiltration, Nanofiltration, Electrodialysis.

Unit-III:

Noise Pollution: Definition, Sources and health effects of noise Pollution, Measurement of noise and its intensity, Noise Pollution Basics of acoustics- propagation of indoor and outdoor sound- Vibration and its Effects. Noise Control Measures - Sound Absorption, Acoustic Barrier, Vibration Isolation, Vibration Damping, Muffling, Personal Protector, Green Belt Development.

Unit-IV:

Radioactive and Biomedical Waste Management: Sources, classification, health and safety aspects, management of radioactive wastes, Radioactive wastes generated during mining, processing of atomic minerals and in atomic reactors, Disposal of radioactive waste. Biomedical wastes: Sources and categories of biomedical wastes, segregation and color coding, treatment and disposal of biomedical wastes, biomedical wastes management and handling rules.

Unit-V:

Solid Waste Management Fundamentals, Collection and Transportation: Sources and types of Municipal Solid Waste, waste generation rates, factors affecting generation, composition, characteristics, effects of improper disposal of solid waste, Municipal Solid Waste Rules; concept of ISWM system, source reduction of waste — reduction, reuse, recycling, onsite storage methods, handling and segregation of wastes at source. Methods of collection of municipal solid wastes, collection vehicles, primary and secondary collection, collection routes, vehicle routing, transfer station – location and operation.

Unit-VI:

Waste Processing Techniques and Landfill Operation: Objectives of waste processing, component separation and volume reduction, processing technologies — biological and chemical conversion methods, resource and energy recovery from composting, biomethanation, thermal processing methods. Disposal methods, landfills — site selection, essential components of landfill; types of land filling methods, landfill planning – phased operation, leachate management and gas control.

Text Books:

1. Boubel, R. W., Vallero, D., Fox, D. L., Turner, B., & Stern, A. C. Fundamentals of air pollution 4th edition Elsevier, 2008
2. *Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.*
3. Murphy, E., King,E., Environmental Noise Pollution, Elsevier, 2014
4. Tchobanoglous G., Theisen H., Vigil S.: Integrated Solid Waste Management Engineering Principles and Management Issues. Mc-Graw Hill
5. CPHEEO, Ministry of Urban Development: Manual on Municipal Solid Waste Management 2016

Reference Books:

1. Wark and Warner: Air Pollution: Its Origin and Control.
2. Khan Iqbal H., Ahsan, N.: Testbook of Solid Waste Management. CBS Publisher and Distributors (P) Ltd.

TRANSIT SYSTEM AND TRANSPORT PLANNING
(Professional Elective– III)

Subject Code: 20CEE331

L	T	P	C
3	0	0	3

Course Objectives:

The student will able to

1. explain on mass transit systems
2. explain huge intra city traffic for highly populated urban areas
3. explain Transportation surveys for transportation planning
4. explain Trip Generation and Distribution
5. explain Modal Split and Trip Characteristics in urban areas
6. explain the issues of transportation Plan Preparation

Course Outcomes (CO):

After completion of this course, students will be able to:

1. understand the mass transit systems.
2. understand the handling of huge intra city traffic for highly populated urban areas
3. collecting data about travel behaviour and analyzing the data for use in transport planning.
4. understand the Trip Generation and Distribution
5. understand the important concepts about Modal Split and Trip Characteristics in urban areas
6. understand the important concepts about Transportation Plan Preparation and Evaluation

Course Description:

Unit-1:

Mass transit system: introduction to mass transit system, Urban mass rapid transit system, Rail based transit – Metro, Light rail transit system (LRT), Mono rail, Sky rail, Road based transit – Bus rapid transit system (BRTS), Electric trolley bus, commuter Bus / City Bus

Unit-2:

Urban Transportation System Planning: Role of transportation in urban development, Transportation problems in urban areas, Purpose of transportation planning, Transportation planning process and factors affecting it, Travel demand and factors affecting it, Urban transport forecasting.

Unit-3

Transportation Surveys: Study area and zoning, **Survey Types:** Home interview surveys, Commercial vehicle surveys, Taxi surveys, Road side interview surveys, Post card questionnaire surveys, Registration number surveys, Tag surveys, Public transport surveys, Telephone surveys, Inventory of existing transport facilities.

Unit-4

Trip Generation and Distribution:

Trip generation: Trip purpose, Problems of trip generation, Factors influencing Trip Production and attraction rates,

Trip distribution: Methods of trip distribution, Growth Factor Methods, Gravity Models, Time Function iteration models.

Unit-5

Modal Split: Modal split: in the transport process planning problem and factors affecting modal split, classification model split, **Trip Characteristics in urban areas:** Household characteristics, Zonal characteristics, Network characteristics

Unit-6

Transportation Plan Preparation: Travel forecasts to evaluate alternative improvements, impacts of new development on transportation facilities, Master plans, Selection of corridor, Corridor Identification, Corridor deficiency analysis, Economic Impacts of transportation.

Text Books

1. Traffic Engineering and Transportation Planning ,Kadiyali, L. R., 2019 Khanna Publishers, New Delhi
2. Introduction to Transportation Engg and Planning , Hutchison, B. G. McGraw-Hill Book Co.

References:

3. Introduction to Transportation Engg. and Planning ,Morlok, Edward K , McGraw-Hill Book Co.
4. Urban Public Transit System and Technology , Vuchic, Vukan R. PHI Learning, New Delhi

REPAIR AND REHABILITATION OF STRUCTURES
(Professional Elective– III)

Subject Code: 20CEE332

L	T	P	C
3	0	0	3

OBJECTIVES:
The objective of this course is to enable the students to

- Understand different maintenance and repair strategies and their importance.
- Understand different repair materials, grouting materials.
- Know the factors effecting durability and strength of structures.
- Understand various repair protection & retrofitting of structure.
- Conductfieldmonitoringandnon-destructiveevaluationofconcretestructures.
- Understand Seismic Retrofitting of Reinforced Concrete Buildings.

Outcomes:
At the end of the course the students are expected to

1. Understand the different strategies of repair and maintenance of structures
2. Understand the strength and durability of concrete
3. Explain various repair and rehabilitation methods
4. Enlist and explain various non-destructive methods
5. Explain the methods for strengthening the components of a structure
6. Explain demolition methods.

UNIT-I
Maintenance and Repair Strategies: Maintenance, Repair and Rehabilitation, facets of maintenance, importance of maintenance, various aspects of inspection, assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II
Repair materials Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials
Special mortars and concretes Polymer Concrete and Mortar, Quick setting compounds.
Grouting materials: Gas forming grouts, Salfoalumate grouts, Polymer grouts, Acrylate and Urethane grouts.
Bonding agents: Latex emulsions, Epoxy bonding agents.
Protective coatings Protective coatings for Concrete and Steel. **FRP sheets.**

UNIT-III
Strength and Durability of Concrete:
Qualityassuranceandqualitycontrolofconcrete,Strength,durability,thermalpropertiesofconcrete,Cracks,differenttypes,causes,Effectsduetoclimate,temperature,Sustainedelevatedtemperature,Corrosion, Effects of cover thickness.

UNIT-IV
Techniques for Repair and Protection Methods: Non-Destructive testing techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques, corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT-V

Repair, Rehabilitation and Retrofitting of Structures: Strengthening of beams, strengthening of columns, Repair of structures distressed due to corrosion, fire, Leakage, earthquake, Demolition techniques, Engineered demolition methods, Jacketing and fiber raping, Case studies.

UNIT-VI

Seismic Retrofitting of Reinforced Concrete Buildings: Introduction; Considerations in retrofitting of structures; Source of weakness in RC frame building – Structural damage due to the discontinuous load path; Structural damage due to lack of deformation; Quality of workmanship and materials; Classification of retrofitting techniques.

TextBooks:

1. AllenR.T.& EdwardsS.C,RepairofConcreteStructures,BlakieandSons,UK,1987
2. Denison Campbell, Allenand HaroldRoper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991
3. Renovation of Structures" by Perkins.
4. "Repairs of Fire Damaged Structures" by Jagadish,R.

Reference Books:

1. Shetty M.S., "Concrete Technology, Theory andPractice",S.ChandandCompany,2008
2. DovKominetzky.M.S.,"Designandconstructionfailures,GalgotiapublicationsPvtLtd., 2001
3. "Deterioration, Maintenance and Repair of Structures" by Johnson, McGraw Hill.

Web References:

1. https://easyengineering.net/ce6021-repair-and-rehabilitation-of/
2. https://www.academia.edu/4519837/MaintenanceandRehabilitationof Structures

E-TextBooks:

1. https://books.google.co.in/books?isbn=0784470294
2. https://books.google.co.in/books?isbn=0128111844

GROUND IMPROVEMENT TECHNIQUES
(Professional Elective– III)

Subject Code: 20CEE333

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To explain in-situ densification techniques for granular and cohesive soils at surface level and at deeper level.
- To explain methods of stabilization for different types of soils.
- To illustrate different dewatering techniques to improve soil properties.
- To explain about geo synthetics and its applications and reinforced earth.
- To understand components of reinforced earth.
- To describe expansive soils and foundation considerations on expansive soils.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Explain in-situ densification methods for granular and cohesive soils at surface level and at deeper level.
2. Explain methods of stabilization and applications.
3. Illustrate different dewatering techniques to improve soil properties.
4. Explain about geo synthetics and its applications.
5. Explain components of reinforced earth.
6. Illustrate different grouting methods under different conditions in soils.

UNIT – I

Insitu densification methods

Insitu densification methods in granular Soils: Vibration at the ground surface and at depth, Impact at the Ground Surface and at depth. Insitu densification methods in Cohesive soils: Preloading, Vertical drains – Sand Drains and geodrains – Stone columns – thermal methods.

UNIT – II

Stabilization of Soils: Methods of stabilization-mechanical-cement-lime-bituminous and polymer stabilization-chemical stabilization with calcium chloride, sodium silicate and gypsum.

UNIT – III

Dewatering: Dewatering-sumps and interceptor ditches- single and multi stage well points-vacuum well points-Horizontal wells-criteria for selection of fill material around drains-electro osmosis.

UNIT –IV

Geosynthetics: Types, functions and applications of geotextiles (woven; nonwoven; knitted) geogrids, geonet, geomembranes, gabions, geocells and geosynthetic clay liners.

UNIT - V

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

UNIT - VI

Grouting: Objectives of grouting- grouts and their applications- grouting methods- stages of grouting-hydraulic fracturing in soils and rocks- post grout test.

TEXT BOOKS:

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Raj, P. Purushothama (2005), Ground improvement techniques., Laxmi Publications, NewDelhi

REFERENCES:

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy,USA

DESIGN AND DETAILING OF IRRIGATION STRUCTURES

Subject Code: 20CEL309

L	T	P	C
0	0	3	1.5

Course Objectives:

The objective of this course is to enable the students to

1. explain design and detailing of Surplus weir
2. explain design and detailing of Canal drop-Notch type
3. explain design and detailing of Canal Regulator
4. explain design and detailing of Under Tunnel
5. explain design and detailing of Syphon aqueduct type III
6. explain design and detailing of Syphon Well Drop

Course Outcomes:

After the completion of the course, students will be able to

1. analyze, design and detailing of Surplus weir
2. analyze, design and detailing of Canal drop-Notch type
3. analyze, design and detailing of Canal Regulator
4. analyze, design and detailing of Under Tunnel
5. analyze, design and detailing of Syphon aqueduct type III
6. analyze, design and detailing of Syphon Well Drop

Exercises:

1. Surplus weir
2. Canal drop-Notch type
3. Canal Regulator
4. under Tunnel
5. syphon aqueduct type III
6. syphon Well Drop

Text Books:

1. Water Resources Engineering - Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.

Reference:

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Standard Book House.
2. Irrigation and Water Power Engineering, B. C Punmia& Lal, Lakshmi Publications Pvt. Ltd, New Delhi.

SMART WATER & WASTE MANAGEMENT SYSTEMS

(Honors/Minor Course)

Subject Code: 20SCT303

L	T	P	C
4	0	0	4

Course Objectives:

- Apply knowledge of basic science and engineering to achieve waste management and its significance in the socio-economic development
- To make the students understand design aspects of Various techniques available for the treatment of different wastes
- Introduction to working biological system and its importance in waste management
- Apply best waste management practices for securing ecologically sustainable development
- To understand the sources of solid and hazardous wastes.
- To understand basics of waste disposal cycle and various disposal methods.

Course Outcomes:

Upon successful completion of this course, students will be able to

1. Demonstrate various Smart water management techniques in solving current water related problems.
2. Analyse and predict waste management parameters /variables to ensure effective delivery of waste management services
3. To evaluate the significance of solid and hazardous waste management in today life
4. To analyse the processes involved in solid and hazardous waste management
5. To comprehend the techniques for various waste management
6. To appreciate the role of common/integrated waste management plants

Unit - I

Smart Water Management

Smart Water Management: The potential for SWM implementation, the role of smart technology in assisting to resolve numerous water challenges- water access and quality; efficient irrigation ; reduced demand ; flood and drought management-storm water management – Detention and Retention ponds; planning and inclusive governance ; data management.

Unit - II

Municipal solid waste, Collection and Transfer

Definition - Sources and types of solid waste- composition and its determinants of Solid waste-factors influencing generation.

Collection: Collection of Solid waste –collection system, equipment’s – time and frequency of collection – labour requirement – factors affecting collection.

Transfer and Transport: Need for transfer operation – types – transport means and methods –Manpower requirement.

Unit - III

Processing Techniques and Disposal of Solid Wastes

Processing techniques – purposes mechanical volume reduction – necessary equipment’s – chemical volume reduction – incinerators – mechanical size reduction

Refuse disposal – various methods – incinerations site selection and plant layout of an incinerator, sanitary landfill- methods of operation – advantages and disadvantages of sanitary land fill - site selection – reactions accruing in completed landfills

Unit – IV

Hazardous Waste and Nuclear wastes

Need for hazardous waste management – Sources of hazardous wastes – Effects on community – terminology and classification – Storage and collection of hazardous wastes– Protection of public health and the environment. Characteristics – Types – Nuclear waste – Uranium mining and processing – Power reactors – Management of nuclear wastes – Decommissioning of Nuclear power reactors – Health and environmental effects.

Unit – V

Management of hazardous wastes

Identifying a hazardous waste – methods – Quantities of hazardous waste generated – Hazardous waste minimization – Disposal practices in Indian Industries – Future challenges.

Unit –VI

Biomedical and chemical wastes

Biomedical wastes – Types – Management and handling – control of biomedical wastes Chemical wastes – Sources – Domestic and Industrial - Inorganic pollutants – Environmental effects – Need for control – Treatment and disposal techniques – Physical, chemical and biological processes – Health and environmental effects.

Textbooks:

1) George Techobanoglous et al,"Integrated Solid Waste Management" McGraw - Hill, 1993.
2) J. Glynn Henry and Gary. W. Heinke, "Environmental Science and Engineering", Pretice Hall of India, 2004.

References:

1) R.E.Landrefh and P.A.Rebers," Municipal Solid Wastes-Problems & Solutions" ,Lewis, 1997.
2) Biomedical waste (Management and Handling) Rules, 1998.
3) Ministry of Urban Developmen t Manual on Municipal 1 Solid waste Management, CPHEEO Ministry of Urban Development, Govt. Of. India, New Delhi, 2000

MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE

Subject Code: 20HST403

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce the economic concepts
- To familiarize with the students the importance of economic approaches in managerial decisionmaking To understand the applications of economic theories in business decisions

Course Outcomes:

After completion of this course, the students will be able to:

1. Recognize managerial Economics skills to the solution of engineering problems
2. Explain the cost and production theories in engineering problems
3. Explore and develop the management qualities
4. Enhance the problem solving skills in various business areas
5. Enhance the promotional skills in various Marketing situations
6. Evaluate the future threats and application theories.

Unit – I Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its Exceptions, Elasticity of Demand, Demand Forecasting, Factors Governing Demand Forecasting ,Methods of Demand Forecasting viz. Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting.

Unit – II Theory of Production and Cost Analysis: Production Function in Isoquants and Isocosts, MRTS, Least cost Combination of Inputs, Production Function Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost Concepts, Opportunity cost, Fixed &Variable costs explicit costs &Implicit costs, Out of pocket costs & Imputed costs, Break-Even Analysis (BEA), Determination of Break- Even Point (simple problems), Managerial Significance and Limitations of BEA. .

Unit – III Introduction to Markets and Pricing Strategies: Market Structure, Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Price-Output Determination in Case of Perfect Competition and Monopoly, Concept on different Pricing Strategies.

Unit – IV Introduction to Management : Concept of Management and Organization : Nature, Importance and Functions of Management, Taylor‘s Scientific Management Theory, Fayal‘s Principles of Management, Mayo‘s Hawthorne Experiments , Maslow‘s Theory of Human Needs, Douglas McGregor‘s Theory X and Y, Hertzberg‘s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit – V Introduction to Marketing: Function of Marketing, Marketing Mix, Marketing Strategies based on Product Lifecycle, Channels of Distribution, Digital Marketing.

Unit-VI Human Resources Management (HRM): Concept of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic Functions of HR Manager; Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

Text Books:

1. Managerial Economics – Varshney and Maheswari, Sultan and Chand, New Delhi, 2003
2. Principles of Management – Ramaswamy,T, Himalaya Publishing House, Mumbai, 2008.
3. Marketing Management – Phillip Kotler and Kevin Lane Keller, PHI Learning Private Limited, 2006, 12/e.
4. Personnel and Human Resource Management: Text and Cases – P.Subba Rao, Himalaya Publishing Houses, Mumbai.

Reference Books:

1. Managerial Economics, Dwivedi, Vikas Publications, 2009, 6/e.
2. Principles of Management – Koonz, Weihrich and Aryasri, Tata McGraw Hill, 2004.
3. Marketing Management: Texts and Cases – Tapan K. Panda, Excel Books, 2008, 2/e.
4. Marketing Management – Rajan Saxena, Tata Mc Graw Hill, 2009, 4/e.
5. Human Resource Management – Aswathappa, Mc Graw Hill, 2009.
6. Personnel Management – Edwin B.Flippo, Mc Graw Hill, 2000

QUANTITY SURVEYING AND VALUATION

Subject Code: 20CET414

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
1. To identify standard specifications for detailed estimation of building.
2. To estimate earthwork excavation for roads and canals.
3. To determine the rates of various aspects of buildings.
4. To compute the cost of the various items of civil works.
5. To understand the basics of BIM
6. To recognize preparation of the tenders and Valuation of buildings.

COURSE OUTCOMES:
After the completion of the course, students will be able to
1. Prepare detailed and abstract estimate of buildings.
2. Compute earthwork excavation for roads and canals.
3. Estimate the cost of the various items of civil works.
4. Estimate reinforcement for bar bending and prepare bar bending schedules.
5. Understand the basics of BIM
6. Prepare tenders and Valuation of buildings.

UNIT – I
General items of work in Building: Standard Units, Principles of working out quantities for detailed and abstract estimates - Detailed Estimates of Buildings.

UNIT – II
Earthwork for roads and canals: Lead and Lift – Types of methods – Mid Sectional area method – Mean sectional area method – Simpson's rule method

UNIT – III
Rate Analysis: Standard specifications for different items of building construction. Working out data for Brick Masonry, R.R. Masonry, Plastering, Plain Concrete, R.C.C., and Distempering.

UNIT-IV
Reinforcement bar bending schedule: Footing, Pedestal, column, plinth beam, slab beam and slab and bar requirement schedules.

UNIT – V
Contracts – types of contracts- tenders – Tender Schedule–.BIM-Basics of BIM – Advantages and Dis advantages of BIM – Objects of BIM

UNIT – VI
Valuation - Valuation of buildings – Depreciation – Types of Depreciation of industrial building, commercial Buildings-Private Buildings.

TEXT BOOKS
1. B.N. Dutta (2016), Estimating and Costing, 28th Revised Edition, UBS publishers
2. G.S. Birdie (2014) Estimating and Costing, Sixth edition, Dhanpat Rai Publishing Company Private Limited
3. Bimal Kumar (2016), A Practical Guide to Adopting BIM in Construction Projects, Whittles Publishing

REFERENCES:
1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works.
3. M. Chakraborthi (2010), Estimation, Costing and Specifications, 24th Edition, M.K. Publishers
4. National Building Code, 2016

REFERENCE CODE BOOKS:
1. ISO 19650-1:2018
2. ISO 19650-2:2

REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM
Professional Elective– IV

Subject Code: 20CEE441

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
The Students will have
1. To demonstrate the basic concepts of spatial data acquisition techniques
2. To illustrate the different data acquisition platforms and digital image data formats of spatial data
3. To utilize different visual interpretation and digital image processing techniques to extract meaningful information from spatial data
4. To explain the geographic information system and its related concepts
5. To analyze the spatial data for different applications
6. To apply different analysis techniques on a varied range of applications in civil engineering.

COURSE OUTCOMES:
On completion of the course, the students will be able to:
1. Demonstrate the basic concepts of spatial data acquisition techniques
2. Illustrate the different data acquisition platforms and digital image data formats of spatial data
3. Utilize different visual interpretation and digital image processing techniques to extract meaningful information from spatial data
4. Explain the geographic information system and its related concepts
5. Analyze the spatial data for different applications
6. Apply different analysis techniques on a varied range of applications in civil engineering

UNIT I
Basics of Remote Sensing: Components of remote sensing - Electromagnetic radiation, electromagnetic spectrum - EMR interaction with atmosphere - EMR interaction with Earth Surface Materials - Atmospheric Windows and its Significance.

UNIT II
Platforms Sensors and Resolutions : Types of platforms- ground, airborne, and space born platforms, Types and classification of sensors - Sensor resolution-spectral, radiometric and temporal - Image data characteristics - Digital image data formats- band interleaved by pixel, band interleaved by line, band sequential.

UNIT III
Image Analysis: Introduction, elements of visual interpretations, digital image processing, image enhancement, image classification, supervised classification, unsupervised classification

UNIT IV
Geographic Information System: Introduction, key components, map projections, Data – Spatial and Non-Spatial, spatial data input, raster data models, vector data models, raster versus vector.

UNIT V
Spatial data analysis: Introduction overlay function-vector overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table

UNIT VI

RS and GIS Applications: Land use and Land cover, agriculture, forestry, geology, geomorphology, urban applications, flood zone delineation and mapping.

TEXT BOOKS:

1. Remote Sensing and its Applications by LRA Narayan, Universities Press (India) Private Limited, 2018
2. Principles of Geographical Information Systems – Peter A Burrough, Rachael A. Mc Donnell and Christopher D. Lloyd, Oxford University Press, 2016.

REFERENCES:

1. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications, 2016.
2. Concepts & Techniques of GIS by Chor Pang Lo and Albert K.W. Yeung, Pearson Education, 2016
3. GIS by Kang – Tsung Chang, McGraw-Hill Education, 2006
4. Text Book of Remote Sensing and Geographical Information systems by M.Anji Reddy, BS Publications/BSP Books, 2012

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
Professional Elective– IV

Subject Code: 20CEE442

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
Students will have

1. to study about introduction to earthquake engineering, Effects of earthquake on the structure, soil properties and various terminology related to earthquake and Devices to measure intensity of ground motion.
2. to study about concepts of structural dynamics for determination of modal frequencies and and mode shapes of structure using analytical modelling.
3. to study about SDOF and MDOF systems with damped and undamped vibrations.
4. to study about application of IS codes related to the earthquake analysis as per various zones in Indian Subcontinent.
5. to study about detailing of RCC structures for critical combination of Static and Dynamic loads. Detailing of structure for earthquake vibrations.
6. to Apply knowledge related to earthquake dynamics in real structural engineering field by solving simple 2D Bay frames.

COURSE OUTCOMES:

1. On completion of the course, the students will be able to:
2. to understand about types of Earthquakes, Factors effecting earthquake, terminology related to earthquake, Effects of earthquake and IS codes related to earthquake engineering.
3. to learn aboutconcepts of structural dynamics for determination of modal frequencies and and mode shapes of structure using analytical modelling.
4. to learn formulation of equation of motionsfor SDOF and MDOF systems with damped and undamped vibrations and response spectrum.
5. to learn about Philosophy of earthquake design and Application of IS codes related to earthquake analysis.
6. to understand about ductile detailing provisions which include review of the latest Indian seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C structures.
7. to understand about realistic analysis of 2D bay frames for static and dynamic loadings. Ductile design of RC structures with examples.

UNIT – I Introduction to Earthquake Engineering: - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source, Focus, Epicentre etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes – Seismic waves – Seismic zones – Seismic Zoning Map of India as per IS1893:2016 – Seismograms and Accelerometer.

UNIT – II Introduction to Structural Dynamics (Part 1): – Theory of vibrations – Lumped mass and continuous mass systems –- Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of modes – Mode superposition method of obtaining response - Free vibration – Forced vibration.

UNIT – IIIIntroduction to Structural Dynamics (Part 2):– Degrees of freedom - Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Damping - Undamped and damped vibration — Response to harmonic excitation – Concept of response spectrum. Multi-Degree of Freedom (MDOF) Systems - Formulation of equations of motion.

UNIT – IV-Provisions related to Earthquake Analysis of Buildings: Review of the latest Indian seismic code IS:1893 – 2016 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods –Displacements and drift requirements – Provisions for torsion.

UNIT – V Provisions related to Ductile design: - Review of the latest Indian Seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings – Beam, column and Beam to column joints.

UNIT-VI Earth quake design of Building frames: Analysis of frames for various load combinations as per IS1893:2016. Design of building frame for critical load combination including provisions related to Ductile detailing as per IS456, SP-16 and IS 13920.

Text Books:

1. Dynamics of Structures – Clough & Penzien, McGraw Hill – International Edition.
2. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Printice Hall of India, New Delhi

Reference Books:

1. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch, Delhi.
2. Earthquake Tips by C.V.R.Murty, I.I.T. Kanpur.
3. Structural Dynamics by Mario Paaz. IS Codes: IS:1893-2002, IS:4326 -1993 and IS:13920-1993 etc.

FINITE ELEMENT METHODS
Professional Elective– IV

Subject Code: 20CEE443

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
1. To study the concept FEM which includes merits and demerits, energy principles, Rayleigh-Ritz method of functional approximation and principles of elasticity, equilibrium equations, strain displacement relationships.
2. To study one dimensional element-stiffness matrix for bar elements, shape function for one dimensional elements, and problems.
3. To explain two dimensional elements which includes different types of elements for plane stress and plane strain analysis, displacement formulation, shape functions.
4. To study the two dimensional elements which includes truss element and beam element in both local and global coordinates
5. To study finite element formulation for beams which includes stiffness matrix, load vector, comparison of FE solution to exact solution and isometric formulation which includes concept of isometric elements for 2D analysis, formulation of CST element.
6. To study Axi-symmetric analysis, basic principles, formulation of 4noded iso-parametric axi-symmetric element.

COURSE OUTCOMES:
On completion of the course, the students will be able to:
1. understand concept FEM which includes merits and demerits, energy principles, Rayleigh-Ritz method of functional approximation and principles of elasticity, equilibrium equations, strain displacement relationships.
2. analyze one dimensional element-stiffness matrix for bar elements, shape function for one dimensional elements, and problems.
3. analyze two dimensional elements which includes different types of elements for plane stress and plane strain analysis, displacement formulation, shape functions.
4. analyze two dimensional elements which includes truss element and beam element in both local and global coordinates
5. analyze finite element formulation for beams which includes stiffness matrix, load vector, comparison of FE solution to exact solution and isometric formulation which includes concept of isometric elements for 2D analysis, formulation of CST element.
6. analyze Axi-symmetric analysis, basic principles, formulation of 4noded iso-parametric axi-symmetric element.

UNIT -I
Introduction: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation.
Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain.

UNIT -II
One Dimensional FEM: Stiffness matrix for bar element - shape functions for one dimensional element – one dimensional problems.
Two Dimensional FEM : Different types of elements for plane stress and plane strain analysis – Displacement models –generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system.

UNIT –III

Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements.

UNIT –IV

Two dimensional analysis –Stiffness Matrix for a two noded Truss Element ,Three noded Truss element and Two noded Beam element in Local and Global (2D).

UNIT-V

Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis -formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

UNIT-VI

Axi-symmetric analysis- Basic principles-Formulation of 4-node iso-parametric axi-symmetric element Solution Techniques: Numerical Integration, Static condensation, assembly of elements and solution techniques for static loads.

TEXT BOOK:

1. Finite Elements Methods in Engineering by Tirupati.R. Chandrepatla and Ashok D. Belegundu - Pearson Education Publications.
2. Finite element analysis by S.S. Bhavakatti-New age international publishers
3. .Finite element analysis by David V Hutton, Tata Mcgraw Hill, New Delhi

REFERENCES:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India.

PRESTRESSED CONCRETE
Professional Elective– V

Subject Code: 20CEE451

L	T	P	C
3	0	0	3

Course Objectives:
Students will have

1. To introduce basic concepts of prestressed concrete with analysis of sections.
2. To explain calculation of various losses of prestressed concrete.
3. To explain estimation of flexural strength of prestressed concrete members.
4. To explain estimation of shear strength of prestressed concrete members.
5. To explain measurement of short term and long term deflections in prestressed concrete members
6. To explain the analysis of continuous beams.

Course Outcomes:
On successful completion of this course, students will be able to:

1. understand basic concepts of prestressed concrete with analysis of sections.
2. calculate of various losses of prestressed concrete.
3. estimate of flexural strength of prestressed concrete members.
4. estimate of shear strength of prestressed concrete members.
5. measure of short term and long term deflections in prestressed concrete members
6. analyze of continuous beams.

UNIT I
Introduction – theory and behavior basic concepts – advantages and disadvantages – materials required – high strength concrete-high strength steel- systems and methods of prestressing – pre tension – post tension members - analysis of sections – stress concept – strength concept – load balancing concept – effect of loading on the tensile stresses in tendons – effect of tendon profile on deflections.

UNIT II
Losses in pre stress: Types losses in pre tension and post tension members; loss due to elastic deformation – loss due to shrinkage and creep of concrete – loss due to relaxation of stress in steel – loss due to anchorage slip – loss due to friction – total allowed losses for design.

UNIT III
Design for flexure: Flexural strength of pre tensioned concrete member – time of flexural failure - fracture of steel and tension – failure of under and over reinforced section – strain compatibility method – calculation of flexural strength as per IS: 1343 – 2012.

UNIT IV
Shear and Torsion:
Shear and Torsional resistance of pre stressed concrete members – principal stresses – time of shear cracks – web shear cracks – flexural cracks. Design of shear reinforcement as per IS: 1343 – 2012 shear and principal stresses due to torsion.

UNIT V
Deflection:
Deflection and design of anchorage zone factors influencing deflections – short term deflections of un cracked members – prediction of long term deflections due to creep and shrinkage – check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement – check for transfer bond length in pre-tensioned beams.

UNIT VI

Indeterminate Structures:

Composite beams and continuous beams analysis and design of composite beams – methods of achieving continuity in continuous beams – analysis for secondary moments – concordant cable and linear transformation – calculation of stresses – principles of design.

TEXTBOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012

REFERENCES:

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
3. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
4. IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012
5. IS 3370- Part 4 (2008) Indian standard Code of practice for concrete structures for the storage of liquid- Design tables, code of practice, bureau of Indian standards, new Delhi.

PAVEMENT ANALYSIS AND DESIGN
Professional Elective– V

Subject Code: 20CEE452

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
1. to understand different factors affecting pavement design.
2. enable students to understand stresses in flexible pavement, layers system concept and soil stabilization.
3. The student will learn the importance of evaluation of stresses in rigid pavements.
4. The student will learn the different methods of Flexible pavement and Rigid pavement designs.
5. This explain the structural and functional requirements of pavements along with its failures
6. This explains how overlay designs are carried with BBD and FWD

COURSE OUTCOMES:
After the completion of the course, students will be able to
1. Explain different factors affecting pavement design.
2. Explain stresses in flexible pavement, layers system concept and soil stabilization.
3. Explain evaluation of stresses in rigid pavements.
4. Explain methods of Flexible pavement and Rigid pavement designs.
5. Explain structural and functional requirements of pavements along with its failures
6. Explains the overlay designs are carried with BBD

UNIT I
Factors affecting Pavement Design: Types of pavement - wheel loads - ESWL Concept- tyre pressure - contact pressure. Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions Material characteristics – Environmental and other factors.

UNIT II
Stresses in flexible pavement – layered systems concept – one layer system – Boussinesq Two layer system – Burmister Theory for Pavement Design. Soil Stabilization – Methods and Objectives- Soil-cement Stabilization and Soil-lime Stabilization

UNIT III
Stresses in rigid pavements – Relative stiffness of slab, modulus of sub-grade reaction – stresses due to warping, stresses due to loads, stresses due to friction**.**

UNIT IV
Pavement design: CBR Method of Flexible Pavement Design- IRC method of flexible pavement design.- AASHO Method of Flexible Pavement design. IRC method of Rigid pavement design- Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars.

UNIT –V
strengthening of existing pavements objectives – types of overlay – design of overlay – flexible overlay over flexible pavement – Types and causes- Pavement Evaluation -overlay design by benkelman beam deflection studies – Strengthening of Existing Pavements -rigid overlay over rigid pavement – flexible overlay over rigid pavement – rigid overlay over flexible pavement.

UNIT – VI
Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements-Types and Causes- Rigid Pavement Failures- Types and causes- Routine maintenance – periodic maintenance – special repairs

TEXT BOOKS:

1. Highway Engineering – S.K.Khanna & C.J.Justo, Nemchand & Bros., 7th Edition (2000).
2. Principles and Practices of Highway Engineering – Dr.L.R.Kadiyali & Dr.N.B.Lal – Khanna publishers – (2003).
3. 1. Yang H. Huang (2008), Pavement Analysis & Design, 2nd edition, Pearson Education

REFERENCES:

1. Principles of pavement design – Yoder & wit zorac – Jhonwilley & Sons.

CODES:

1. IRC Code for flexible pavement – IRC – 37 -2001.
2. IRC Code for Rigid pavement – IRC – 58 – 2002.

CONSTRUCTION AND PROJECT MANAGEMENT
Professional Elective– V

Subject Code: 20CEE453

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
1. To explain the basics of scientific management and project planning, clearance and procedures
2. To explain project scheduling CPM PERT
3. To explain project monitoring and controlling and reporting techniques
4. To explain work study and work measurement
5. To explain safety engineering, safety policies and practices
6. To explain administration of incentive schemes

COURSE OUTCOMES:
After the completion of the course, students will be able to
1. illustrate the basics of scientific management and project planning, clearance and procedures
2. demonstrate project scheduling CPM PERT
3. illustrate project monitoring and controlling and reporting techniques
4. appreciate work study and work measurement
5. sensitize safety engineering, safety policies and practices
6. illustrate administration of incentive schemes

Unit–1
Basics of Management: Modern scientific management, Management Functions, Management Styles, SWOT Analysis in construction
Project Management: Basic forms of organization with emphasis on Project and matrix structures; project life cycle, planning for achieving time, cost, quality, project feasibility reports based on socio-techno-economic environmental impact analysis, project clearance procedures and necessary documentation for major works like dams, multistoried structures, ports, tunnels, Qualities, role and responsibilities of project manager, Role of Project Management Consultants, Enterprise Resource Planning (ERP)

Unit 2
Project Scheduling: Construction Scheduling, Work break down structure, activity cost and time estimation in CPM, PERT,RPM (Repetitive Project Modeling) techniques. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).

Unit 3
Project Controlling: Monitoring and Control, Crashing, Resource Leveling, Updating. Site mobilization – demobilization aspects, various Resources management based on funds availability, coordinating, communicating & reporting Techniques, Application of MIS to construction, Training forConstruction Managers ,Engineers , Supervisors

Unit -4
Work Study: Definition, Objectives, basic procedure, method study and work measurement, Work study applications in Civil Engineering.
Method study – Definition, Objective, Procedure for selecting the work, recording facts, symbols, flow process charts, multiple activity charts, string diagrams.
Work measurement – Time and motion studies, Concept of standard time and various allowances, time study, equipment performance rating. Activity sampling, time-lapse , photography technique, Analytical production studies

Unit -5

Safety Engineering: Causes of Accidents on various sites, safety measures and safety policies to be adopted, determination of safety parameters, personal protective equipment. Workmen Compensation Act, Minimum wages act.

Safety Organization –Safety Policy, Safety Record Keeping, Safety Culture, Safety and First Line Supervisors, Middle Managers, Top Management Practices, Sub contractual obligation, Project Coordination and Safety Procedure

Unit – 6

Administration of Incentive Schemes: Necessity, Merit rating, job evaluation, installation, modification and maintaining of incentive schemes based on implementation experience.

Text Books

1. Construction Project planning & Scheduling By Charles Patrick, Pearson, 2012
2.Chitkara,K.K., Construction Project Management, Tata McGraw Hill Publishing Co, Ltd., New Delhi, 1998.
3.Punmia,B,C., Project Planning and Control with PERT and CPM, Laxmi Publications, new delhi,1987.

Reference books

1. Construction Planning & management By P S Gahlot& B M Dhir , New Age InternationalLimited Publishers
2. Construction Project planning & Scheduling By Charles Patrick, Pearson, 2012
3. Construction Project Management Theory & practice --- Kumar Neeraj Jha,Pearson,2012
4. Construction management Fundamantals by Knutson,Schexnayder, Fiori, Mayo, TataMcGraw Hill, 2ndEdition, 201

HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOR
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET411

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

CO1: To co-create a comprehensive view of Human Resource Development (HRD) through assessment of theories and practices of HRD

CO2: To familiarize the students with the components of individual and group behavior in organizational setting

CO3: To help them learn behavioral skills in managing people at work.

CO4: To provide basic insight into select contemporary management practices and Strategic Management.

CO5: To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.

CO6: To understand about organizations groups that affect the climate of an entire organizationthis helps employees in stress management.

COURSE OUTCOMES:

CO1: To build an understanding and perspective of Human Resource Development as discipline appreciating learning.

CO2: To learn the skills of developing a detailed plan for need and implementation of HRD program in the organization.

CO3: To learn role of learning in action as an individual, group and an organization in order to develop creative strategies to organizational problems.

CO4: To develop a perspective of HRD beyond organizational realities including national HRD

CO5: To develop positive attitude through personality development and can equip with motivational theories.

CO6: To attain the group performance and grievance handling in managing the organizational culture.

UNIT-1

HRD-Macro Perspective: HRD Concept, Origin and Need, HRD as a Total System; Approaches to HRD; Human Development and HRD; HRD at Macro and Micro Climate.

UNIT-2

HRD–Micro Perspective: Areas of HRD; HRD Interventions Performance Appraisal, Potential Appraisal, Feedback and Performance Coaching, Training, Career Planning, OD or Systems Development, Rewards

UNIT-3

Employee Welfare and Quality of Work Life and Human Resource Information; Staffing for HRD: Roles of HR Developer; Physical and Financial Resources for HRD; HR Accounting; HRD Audit, Strategic HRD

UNIT-4

Human Resource Training and Development: Concept and Importance; Assessing Training Needs; Designing and Evaluating T&D Programmes; Role, Responsibilities and challenges to Training Managers

UNIT-5

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation.

UNIT-6

Group Dynamics: Types of Groups, Stages of Group Development, Group Behavior and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

TEXT BOOKS:

1. Nadler, Leonard :Corporat Human Resource Development, Van NostrandReinhold, ASTD, New York .
2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems,Oxford IBH Pub. Pvt.Ltd., New Delhi , 2005.
3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2004.
4. Subba Rao P., Organizational Behaviour, Himalaya Publishing House.Mumbai.
5. Fred Luthans Organizational Behaviour, TMH, NewDelhi.
6. Robins, Stephen P., Fundamentals of Management, Pearson,India.

REFERENCE BOOKS

1. Viramani, B.R and Seth, Parmila: Evaluating Management Development, VisionBooks, New Delhi.
2. Werner &DeSimone (2006). Human Resource Development. Thomson Press, Network.
3. Mankin, David (2009). Human Resource Development. Delhi: Oxford University Press.
4. Hersey, Paul, Dewey E. Johnson & Kenneth H. Blanchard (2013). Management of Organisational Behaviour. PHI.

PROJECT MANAGEMENT
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET412

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To develop an understanding of Project Planning and formation.
2. To make students gaining the knowledge and skills related to Project Analysis.
3. To make student better understand on Selection Criteria and select the best Project.
4. To develop understanding the concepts of Project Financing and Contracts.
5. To familiarize the students with implementation and execution of the project.
6. To make students understanding complete and close the project.

COURSE OUTCOMES:

1. To understand the concept of Project Planning and formation.
2. To understand the key issues in Project Analysis.
3. To understand Selection Criteria and select the best Project.
4. To understand the concepts of Project Financing and Contracts.
5. To understand how to implement and execute the project.
6. To understand how to complete and close the project.

UNIT – 1

Project Planning and Formation: Project meaning and concepts – Overview of total Project Management Cycle – Classification of Projects and Project Formation –Strategic Planning and Capital budgeting – Generation and Screening of Project Ideas – Generation of Ideas – Monitoring the Environment – Corporate Appraisal – Tools for Identify Investment opportunities – Scouting for Project Ideas – Preliminary Screening – Project Rating Index.

UNIT - 2

Project analysis: Issues in Project Analysis - Market and Demand Analysis–conduct of Market Survey,Demand forecasting.Technical analysis – Manufacturing Process Technology, Material Inputs and Utilities, Plant Capacity, Location and Site –Machineries and Equipment, Structures and Civil Works, Environment Aspects.Financial Estimations and projections – Cost of Projects, Means of Finance – Estimates of sales and Productions, Working capital Requirement and its financing, Profitability Projections, Projected Cash flow Statement, Projected Balance Sheet –Time Value of Money

UNIT-3

Project Selection: Selection Criteria– Net Present Value, Benefit Cost Ratio, Internal Rate of return, Urgency, Payback Period, Accounting Rate of Return, Assessment of Various Methods, Investment Evaluation in Practice. Project Selection Under Risk – Risk Analysis in Practice, How Financial Institutions Analyse Risk. Social Cost Benefit Analysis,Rationale for SCBA – UNIDO Approach.

UNIT – 4

Project FinancingandContracts: Financing of Projects – Capital Structure, Working Capital**,** Financing Infrastructure Projects, Public Private Partnership, Venture Capital **-** Private Equity, Credit Risk Management.Contracts - Definitions of contract and Contractor.Elements of contracts, offer acceptance and consideration, Valid Contracts, Department execution of work – Master Roll Form 21 – Piece work Agreement form – Work order. Types of Contracts – Lump sum Contract, Lump sum and Schedule contract, Item rate Contract, Sub Contracts, Joint ventures, Arbitration Disputes and claim Settlement.Tender -

Contract system with tenders, Quotation, Earnest Money, Security Money – Tender Notice, Tender Form, Bidding – Procedure – Irregularities in Bidding – award

UNIT – 5

Project Implementation: Forms of Project organisation – Human Aspects – of project Management – Pre requisites for successful project implementation –Project Monitoring and Controlling – Parameters for monitoring and Control – Process of Monitoring –Network Techniques for Project Management– Developmentof Project Network -Time Estimation –Determination of Critical path– Scheduling when Resources are Limited - PERT Model **–** CPM Model **–** Network Cost System.

UNIT – 6

Project Completion: Completion of project and Managing Transition Period – Closure of Contracts – Completion of Assets of Projects – Post Project Evaluation and CompletionAudit Report.Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personal Department, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

TEXT BOOKS:

1. Narendra Singh, Project management and Control, Himalaya Publishing House, Mumbai 5th Edition
2. Prasanna Chandra: Projects, TMH, New Delhi,2014, 8th Edition.
3. K.Nagarajan: Project Management, New Age International, New Delhi,2010
4. PERT and CPM – L.S Srikanth
5. PERT and CPM – Punmia
6. Construction Management and Planning – Guna and Sen Gupta, B.

REFERENCES:

1. Gray, Larson: Project Management-Tata McGraw Hill-2015
2. Jeffery K.Pinto: Project Management-Pearson Education-2015
3. Enzo Frigenti: Project Management-Kogan, 2015
4. R. Panneerselvam, P. Senthilkumar: Project Management, PHI, 2015
5. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute,USA.

ENTREPRENEURIAL DEVELOPMENT
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET413

L	T	P	C
3	0	0	3

OBJECTIVE:

1. To develop an understanding on entrepreneur and entrepreneurship.
2. To have an understanding on nature and development of entrepreneurship in India
3. To provide insight into the startups and project preparation.
4. To make Students gaining the knowledge in governmental support regarding formalities of startups and enterprises.
5. To make the students familiar with e-entrepreneurship.
6. To provide concepts on management of ventures, Problems and prospects MSME in India.

OUTCOME:

1. Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
2. Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
3. Create appropriate business model and develop well presented business plan that is feasible for the student.
4. Understanding how to manage effectively the selected business.
5. Understanding how to create e-Entrepreneurship.
6. Explain how various disciplines of the venture can be managed.

UNIT 1:

Entrepreneur and Entrepreneurship: Nature and Scope of Business. Concept of Entrepreneur & Entrepreneurship, characteristics of an Entrepreneur, types of Entrepreneurs, Entrepreneur. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

UNIT 2:

Entrepreneurship Development in India: Emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, Concept of women entrepreneurship and rural entrepreneurship. Development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and objectives of EDPs, Designing Appropriate training programme for existing and new entrepreneurs. Institutions supporting for EDP

UNIT 3:

Creating and starting the venture: Steps to start an MSME. Meaning of a project. Project Identification-Sources of new Ideas, methods of generating ideas, creative problem solving, and opportunity recognition. Project selection - meaning of project report (Business Plan) & Formulation of a project report, Preparation of sample project report of any one product and service.

UNIT 4 :

Government and Institutional support to Entrepreneurs: MSME Development Act-2006. Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, Institutional finance – sources of short term and long term capital including Venture capital. Role of SIDBI, NSIC, EXIM Bank and commercial Banks, APSFC, AP Industrial policy (2020-23) - incentives and subsides, industrial estates, AP Skill Development Corporation.

UNIT 5:

E-Entrepreneurship: Concept of e-Entrepreneurship, Difference between Entrepreneurship and e-Entrepreneurship, Purpose of Creating e-Entrepreneur, Essence of e-Entrepreneurship, e-Business Ventures in different sectors, Role of information technology in MSME, Problems and prospectus of e-Entrepreneurs in INDIA.

UNIT 6:

Managing the venture: Types of Ownership. Concepts of working capital management, Marketing management, Human Resource management and TQM. Problems and prospects of MSME in India. Profile of Entrepreneurs.

Text Books:

1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. S.S.Khanka: Entrepreneurial Development, S.Chand & Company Ltd New Delhi 2009
3. Dr.C.B.Gupta and Dr.S.S.Khanka Entrepreneurship and Small Business Management: Sultan Chand & Sons:,2010
4. Narayana Reddy: Entrepreneurship, Cengage learning, New Delhi, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New delhi,2010
6. Vasat Desai: The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2011

References:

1. Robert D Hisrich, Michel P Peters, Dean A Sheperd: Entrepreneurship, Tata Mc Graw Hill Education Private ltd, 2009
2. Hisrich: Entrepreneurship, TMH, New Delhi,2009
3. Prasanna Chandra: Projects, TMH, New Delhi,2012
4. K.Nagarajan: Project Management, New Age International, New Delhi,2010

DIGITAL MARKETING
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

L	T	P	C
3	0	0	3

Subject Code: 20OET414

COURSE OBJECTIVES:

1. To develop an understanding on the digital marketing.
2. To make students gaining the knowledge and skills related to the area of search engine optimization (SEO).
3. To make student better understand on Social Media Optimization (SMO).
4. To develop understanding on SME (Search Engine Marketing) through AdWords.
5. To familiarize the students with the Lead Management & Digital Marketing.
6. To understand the contemporary concepts on digital innovation and trends.

COURSE OUTCOMES:

After completion of the course the student will be able to

1. Understand the concept on digital marketing.
2. Define the concept on search engine optimization (SEO).
3. Describe the concept on Social Media Optimization (SMO).
4. Explain the idea on SME (Search Engine Marketing) through AdWords.
5. Justify the concepts and developments on lead management & digital marketing.
6. Comprehend the contemporary concepts on digital innovation and trends.

UNIT -I:

Introduction to Digital Marketing: Digital Marketing- Importance -Digital Marketing Platforms-Difference between Traditional Marketing and digital Marketing- Advantages of Digital Marketing. Role and functions of a Digital Marketing Manager

UNIT - II:

Search Engine Optimisation: Definition, scope of SEO, on-page optimisation and Off Page Optimisation, Report Preparation- Keywords, Titles, Meta Tags

UNIT –III:

Social Media Optimization (SMO): Meaning and scope of SMO. Social Media Optimization of Facebook-Twitter- LinkedIn- Pinterest: Social media services optimization.

UNIT – IV:

Search Engine Marketing (SME): SME through AdWords, Keyword Selection, Create Text Ads- CPC Bidding- Navigate Ad Words- SEM Metrics & Optimization.

UNIT – V:

Lead Management & Digital Marketing: Web to lead forms- Web to case forms- Lead generation techniques- Social media and lead gen Inbuilt tools for Digital Marketing

UNIT – VI:

Digital Innovation and Trends: The contemporary digital revolution- Digital Transformation framework-Security and Privatization Issues with Digital Marketing- Trends in Digital Marketing

TEXT BOOKS:

1. Chaffey, D. (2019). Digital marketing. Pearson UK.
2. Chaffey, D., & Smith, P. R. (2017). Digital marketing excellence: planning, optimizing and integrating online marketing. Taylor & Francis.
3. Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.

REFERENCES:

1. Kaufman, I., & Horton, C. (2014). Digital marketing: Integrating strategy and tactics with values, a guidebook for executives, managers, and students. Routledge.
2. Stokes, R. (2011). E-Marketing: The essential guide to digital marketing. Quirk eMarketing.
3. Kamalesh K.Bajaj: Debjani Nag: E-commerce - The cutting edge of business, Tata Mc-Graw Hill.

ENVIRONMENTAL IMPACT ASSESSMENT
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET415

L	T	P	C
3	0	0	3

Course Objectives:
This Course is intended to build the following objectives:

1. To understand basic concepts of EIA
2. To study different methodologies of EIA
3. To appreciate the significance of ecosystem and environmental protection
4. To prepare environmental audit reports
5. To understand the legal and regulatory compliance
6. To prepare EIA reports for different developmental and industrial establishments

Course Outcomes:
After studying the course, the student:

1. Determine and demonstrate the environment and developmental issues to the public effectively.
2. Assess and evaluate the key EIA methodologies and generate the data.
3. Assess and diagnose the impact of developmental activities on ecosystems.
4. Demonstrate environmental audit protocols to conduct on-site audit for the generation of reports.
5. Demonstrate the environmental and legal compliance suitable for the developmental activities.
6. Examine and generate comprehensive EIA reports to different developmental activities.

Unit-1
Basic Concepts of EIA: History and guiding principles of EIA-EIA Process-types of EIA-Initial Environmental Evaluation (IEE)-elements of EIA-factors affecting EIA during impact evaluation and analysis-preparation of environmental base maps and importance-classification of environmental parameters.

Unit-2
EIA Methodologies: Introduction-criteria for the selection of EIA methodology-EIA Methods: Ad-hoc method-matrix method-networks Method-Environmental Media Quality Index method (EMQIM)-overlay method-cost/benefit analysis.

Unit-3
Ecosystems Assessment: Assessment of Ecosystems-Assessment of impact of development activities on vegetation and wildlife, mitigation-causes and effects of deforestation-environmental impacts of deforestation.

Unit-4
Environmental Auditing: Environmental audit definition-objectives of environmental audit-types of environmental audit-audit protocol-stages of environmental audit-onsite audit activities-post audit activities-evaluation of audit data and preparation of audit report.

Unit-5
Environmental Legislations: Environmental Legislations introduction-The Environmental (Protection) Act-1986-The Water (Prevention and Control of Pollution) Act-1974-The Air (Prevention and Control of Pollution) Act-1981-The Motor Vehicles Act-1988-The Wildlife (Protection) Act-1972.

Unit-6

EIA Report Writing: Introduction - Case studies and preparation of Environmental Impact Assessment (EIA) statement report for coal mining activities – chemical industries – Thermal power plants.

Text Books:

1. Environmental Science and Engineering by Suresh K. Dhameja, S. K. Kataria& Sons Publications (Recent addition), New Delhi.
2. Environmental Impact Assessment Methodologies by Y. Anjaneyulu, B. S. Publications (Recent addition), Sultan Bazar, Kakinada.

Reference Books:

1. Environmental Pollution and Control by Dr. H. S. Bhatia, Galgotia Publications (P) Ltd., New Delhi (Recent addition).
2. Environmental Science and Engineering by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers (Recent addition).

ENERGY AUDIT CONSERVATION AND MANAGEMENT
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET416

L	T	P	C
3	0	0	3

Course Objective:
To introduce basic principles of energy auditing and to know something about energy management. Also it provides immense knowledge about energy efficient motors, power factor improvement, lighting and energy instruments. Finally economic aspects are analyzed.

Course Outcomes:
Students will be able to:
CO1: Apply principles of energy auditing and propose energy conservation schemes.
CO2: Demonstrate principle and organizing energy management program.
CO3: Demonstrate the operating principle of energy efficient motors.
CO4: Analyze power factor improvement methods,
CO5: Illumination methods and demonstrate the operation of various energy instruments.
CO6: Analyze and compute the economic aspects of energy consumption.

UNIT-I
Basic principles of energy audit
Energy audit- definitions, concept, types of audit, energy index, cost index,pie charts, Sankey diagrams, load profiles, Energy conservation schemes.

UNIT-II
Energy management
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

UNIT-III
Energy efficient motors
Energy efficient motors , factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

UNIT-IV
Power factor improvement
Power factor – Need of power factor -methods of improvement of power factor, location of capacitors.

UNIT-V
Lighting and energy instruments
Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT-VI
Economic aspects and analysis
Economics Analysis-Depreciation Methods, time value of money, rate of return, present worthmethod , replacement analysis, life cycle costing analysis.

TEXT BOOKS:

1. Energy Management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy Efficient Electric Motors by John. C. Andres, Marcel Dekker Inc. Ltd – 2nd Edition, 1995
3. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing CompanyLtd, New Delhi.

REFERENCE BOOKS:

1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.

OPTIMIZATION TECHNIQUES
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET417

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Learn classical optimization techniques and numerical methods of optimization.
- Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.

COURSE OUTCOMES

On completion of this course, students should be able to

CO 1 : Solve linear programming problems using simplex method and to use duality principle
CO 2 : Analyze the simplex solutions for the changes in cost coefficients constraint coefficients
CO 3 : Identify the queuing model and to solve them
CO 4 : Enumerate fundamentals of non-linear programming
CO 5 : Solve different dynamic programming problems
CO 6 : Solve problems of decision making under certainity, uncertainity and risk

UNIT I

Introduction to optimization techniques: Linear programming problem, simplex method, duality principle , Big-M method, Two phase simplex method.

UNIT II

Sensivity analysis: Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints.

UNIT III

Queuing Theory: Characteristics of Queuing models, Classification, (M/M/1:FCFS/∞/∞), (M/M/1:FCFS/N/∞), (M/M/C:FCFS/∞/∞) models.

UNIT IV

Introduction to Non linear programming: Single variable optimization with and without constraints, multi-variable optimization without constraints, multi-variable optimization with constraints, method of Lagrange multipliers, Kuhn-Tucker condition.

UNIT V

Dynamic Programming: Introduction, Terminology, Bellman"s Principle of optimality, Applications of dynamic programming, shortest path problem, linear programming problem, Product allocation problem, Cargo load problem.

UNIT VI

Decision Theory: Introduction, Classification of decisions, decision making under certainty, decision making under risk, decision making under uncertainty.

TEXT BOOKS:

1. Operations Research by P. Rama Murthy, New Age Pub
2. Operations Research, S.D.Sharma, Kedarnath Ramanadh Publications.
3. Operations Research by D.S. Hira and Prem Kumar gupta, S.Chand.

REFERENCES BOOKS:

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
3. Optimization theory & Applications / S.S .Rao / New Age International

BLOCKCHAIN TECHNOLOGIES
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET418

L	T	P	C
3	0	0	3

Course Objectives

- To give students the understanding of emerging abstract models for Blockchain Technology and to familiarize with the functional/operational aspects of crypto currency eco-system, this course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using Ethereum.

Course Outcomes

After successful completion of the course, the students will be able to:

1. Understand block chain technology.
2. Understand Crypto currency
3. Understand Smart contract
4. Use Remix IDE
5. Develop block chain based solutions and write smart contract using Ethereum Framework.
6. Deploy Open source Hyper ledger Architecture.

Unit – I

Introduction: Overview of Block chain, History of Blockchain, Peer to Peer Network, Smart Contract, Wallet, Digital Currency, Ledgers, Types of Block chain Platform, Consensus algorithms and their scalability problems, digital cash etc.

Unit – II

Consensus Mechanism &Crypto primitives: Atomic Broad cast, Consensus, Permission Block chain, Permission less Block chain, Hash functions, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems.

Unit – III

Bitcoin basics: Bit coin block chain, Challenges and solutions, Different Consensus Mechanism- Proof of Work, Proof of Stake, Proof of Activity, Proof of Burn, Proof of Elapsed Time, Proof of Authority, Proof of Importance, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.

Unit – IV

Crypto currency and Wallet: Types of Wallet, Desktop Wallet, App based Wallet, Browser based wallet, Metamask, Creating a account in Metamask, Use of faucet to fund wallet, transfer of crypto currency in metamask.

Unit – V

Contract and Ethereum: Overview of Ethereum, Writing Smart Contract in Solidity, Remix IDE , Different networks of ethereum, understanding blocks practically at blockhcain.com, how to compile and deploy smart contract in remix.

Unit – VI

Understanding Hyperledger Fabric: Overview of Open source Hyperledger project, Hyperledger Fabric-Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

Text Books:

1. Blockchain: Blueprint for a New Economy by Melanie Swan
2. Narayanan, Bonneau, Felten, Millerand Goldfeder, "Bitcoin and Cryptocurrency Technologies- A Comprehensive Introduction", Princeton University Press.

Reference Books:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashier.
2. Mastering Ethereum: Building Smart Contracts and DApps by Andrews
3. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "*Blockchain Architecture Design And Use Cases*"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

Reference Links:

1. Dr.Mayank Agarwal, "*BlockChain*"[MOOC], NPTEL:
https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

IT SYSTEMS MANAGEMENT
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET419

L	T	P	C
3	0	0	3

Course Objectives:

- Provides extensive theoretical knowledge of IT infrastructure.
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for a business environment.
- Builds upon the essential core Network Security and storage management with greater emphasis.

Course Outcomes:

1. Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario.
2. Analyze and evaluate the impact of new and current ICT services to an organization.
3. Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.
4. Characteristics of the network Security that affect user operations.
5. Define, track, and maintain data and data resources and recent trends in IT.
6. Describe E-Commerce and Global System for Mobile Communication.

Unit – I

IT Infrastructure: Overview: Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit – II

Software Management : SDLC, The Waterfall Model, Advantages, Disadvantages, Conventional Software Management performance, Software Economics.

Unit – III

Current computing environment : Complexity of current computing, multiple technologies.

IT system Management: Common tasks in IT system management, approaches for organization IT management systems context diagram, patterns for IT system Management, Service level management, Financial Management, Capacity Management, availability management.

Unit – IV

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access control System, Intrusion Detection.

Unit – V

Storage Management : Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery. Space management, Hierarchical storage management.

Unit – VI

Emerging Trends in IT : Introduction, E-Commerce, Electronic Data Interchange , Global System for Mobile Communication.

Text Books:

1. IT Infrastructure & Its Management, By Phalguni Gupta, Tata McGraw-Hill Education. (Unit 1,3,4,5).2009
2. Software Project Management , Walker Royce: pearson Education,2021.(Unit 2).

Reference Books:

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

API AND MICRO SERVICES
(Common to CSE/ECE/EEE/IT/MECH/CIVIL)

Subject Code: 20OET41A

L	T	P	C
3	0	0	3

Course Outcomes:

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

- Understand the Spring framework concepts.
- Develop the Spring boot application
- Develop a Spring Data JPA application with Spring Boot
- Implement query methods for querying the database using Spring Data JPA
- Write RESTful services using Spring REST that consumes and produces data in different formats
- Handle exceptions and errors in Spring REST endpoints

Unit I:

Spring 5 Basics : Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is AutoScanning

Unit II:

Spring Boot: Creating a Spring Boot Application, Spring Boot Application Annotation, What is Autowiring, Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices : Spring Boot Application

Unit III:

Spring Data JPA with Boot: Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting.

Unit IV:

Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices - Spring Data JPA Unit V: Web Services: Why Web services, SOA - Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, How to create RESTful Services

Unit VI:

Spring REST: Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints.

Hardware and software configuration

- 4 or 8 GB RAM/126 GB ROM
- Swagger tool suite(opensource)
- OpenJDK 17 or Java 11,Maven 3.2 or above and MySQL 8.0 or above,Spring Tool suite, Postman

Text Books:

1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

Web Links [Courses mapped to Infosys Springboard platform]:
Infosys Springboard courses:

1. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview [Spring 5 Basics with Spring Boot]

2. https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/ov erview [Spring Data JPA with Boot]

3. https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview [Spring REST]

STRUCTURAL DESIGN LAB USING SOFTWARE TOOLS

Subject Code: 20CEL410

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:
Students will have

1. to design 2-D frame analysis and 2-D frame design
2. to design steel tabular truss analysis and steel tabular truss design
3. to design 3-D frame analysis and 3-D frame design
4. to design retaining wall analysis and retaining wall design
5. to design tower analysis and simple tower design
6. to design culvert analysis and simple culvert design

COURSE OUTCOMES:
After the completion of the course, students will be able to

1. Design 2-D frame analysis and 2-D frame design
2. Design steel tabular truss analysis and steel tabular truss design
3. Design3-D frame analysis and 3-D frame design
4. Design retaining wall analysis and retaining wall design
5. Design tower analysis and simple tower design
6. Design culvert analysis and simple culvert design

EXCERCISIES:

1. 2-D Frame Analysis
2. 2-D Frame Design
3. Steel Tabular Truss Analysis
4. Steel Tabular Truss Design
5. 3-D Frame Analysis
6. 3-D Frame Design
7. Retaining Wall Analysis
8. Retaining Wall Design
9. Simple Tower Analysis
10. Simple tower Design
11. Simple slab culvert Analysis
12. Simple slab culvert Design

SOFTWARE:

1. STAAD Pro. or EQUIVALENT

GEOGRAPHIC INFORMATION SYSTEM LAB

Subject Code: 20CEL411

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:
The Students will have
1. To know how to apply the techniques/tools for pre-process the input data
2. To know the process of topology and evaluate the areas & lengths of entities
3. To know how to create thematic maps and layout preparation
4. To know process for developing the DEM and calculation of surface volume
5. To know the process for road network analysis data base creation and delineation process of Watershed boundary
6. To know how to apply the techniques/tools for process of data mosaic and the data subset

COURSE OUTCOMES:
After the completion of the course, students will be able to
1. Apply the techniques/tools for pre-process the input data
2. Demonstrate the process of topology and evaluate the areas & lengths of entities digitize the features
3. Create thematic maps and layouts for the analyzed data
4. Generate Digital Elevation Model and calculate the volume for hills/tanks
5. Create data base for road network and create watershed boundary.
6. Apply the techniques/tools for process of data mosaic and the data subset

EXCERCISES:
1. Preprocess of image / toposheet (which includes Georeferencing, Projection and Subset) (CO1)
2. Digitization of Features from the Toposheet (CO1)
3. Topology of digitized of features (CO2)
4. Study of features estimation (CO2)
5. Creation of Thematic maps (CO3)
6. Layout Preparation (CO3)
7. Digital Elevation Model (CO4)
8. Calculation of volumes for Hills and Tanks (CO4)
9. Database creation for Road Network analysis (CO5)
10. Delineation of watershed boundary (CO5)
11. Mosaic of dataset (CO6)
12. Clip/Subset of dataset (CO6)

Software Tool:-
1. Quantum GIS/ArcGIS 10x
2. ERDAS Imagine 10.4.1 or any one or Equivalent.

TEXT BOOK:
1 Concepts & Techniques of GIS by Chor Pang Lo and Albert K.W. Yeung, Pearson Education, 2016

ESSENTIAL COMPONENTS OF SMART CITIES
Honors/Minor Course

Subject Code: 20SCT404

L	T	P	C
4	0	0	4

Course Objectives:
Students will have
1. to explain attributes, components and objectives of smart buildings
2. to explain smart water management system, objectives and scope of smart waste management system
3. to explain smart economy services and its promotion
4. to explain smart governance and its implementations stages
5. to explain smart environment and its realization
6. to explain role of ICT in smart cities with new technologies

Course Outcomes:
On successful completion of this course, students will be able to:
1. understand attributes, components and objectives of smart buildings
2. illustrate smart water management system, objectives and scope of smart waste management system
3. illustrate smart economy services and its promotion
4. justify smart governance and its implementations stages
5. choose smart environment and its realization
6. appreciate role of ICT in smart cities with new technologies

UNIT I: **Smart Buildings**: Attributes of smart buildings. Essential components of intelligent and smart buildings. Objective of smart buildings – energy centric view – lighting – Heating – ventilation and air conditioning (HVAC). Systems for communication – monitoring and surveillance. Fires safety and emergency warning. Barriers and challenges in implementing smart cities.

UNIT II: **Smart Water and waste management:** Introduction – possible approaches – concept of water security – multi level perspective of urban water system. Functions and objectives of smart water management system and its benefits. Objective and scope of smart waste management system. IOT and ICT based systems for waste collecting and management – Auto meted waste collection system (AWCS)

UNIT III: Smart economy and Governess: Objectives of smart economy – Smart economy transformation – Entrepreneurship – Critical public infrastructure and services – promoting innovation - facility for training and skill enhancement.

UNIT IV: **Smart governance – ICT** dependence of smart governance. Smart governance implementation stages – computerzitation – Net working – commissioning internet based interactions – improving public service delivery – stake holder participation and collaboration. Implementing GIS/GPS – mapping and land information system

UNIT V: **Smart environment:** Basic environmental challenges – Climate change and pollution control – Impact on bio diversity and ecosystem. Measures to realize smart environment – Mixed land use –**.**
sustainable food production and consumption patterns – Avoiding heat island formation – Monitoring and management of urban noise – Monitoring pollution levels for effective interventions. ICT frame work for environmental management – benefits – challenges.

UNIT VI: **ICT for Smart Cities**: Taxonomy of layers of ICT architecture – access layer – application layer – data layer – communication layer – instrumentation layer – security layer – IOT / M2M layer. ICT major technology areas – Network technology – Storage technologies – Computing technologies – sensor technologies – information security technologies – new devices and technologies in ICT.

TEXTBOOKS:

1. P.P Anil Kumar “Introduction smart cities” Pearson India Eduction services Pvt. Ltd. 2020.
2. George Techobanoglous et al,”Integrated Solid Waste Management” McGraw - Hill, 1993.
3. J. Glynn Henry and Gary. W. Heinke, “Environmental Science and Engineering”, Pretice Hall of India, 2004.

REFERENCES:

1) R.E.Landrefh and P.A.Rebers,” Municipal Solid Wastes-Problems & Solutions” ,Lewis, 1997.
2) Biomedical waste (Management and Handling) Rules, 1998.
3) Ministry of Urban Developmen t Manual on Municipal 1 Solid waste Management, CPHEEO Ministry of Urban Development, Govt. Of. India, New Delhi, 2000