AR - 20

COURSE STRUCTURE
AND
DETAILED SYLLABUS
(I-I, I-II, II-I & II-II Semesters Syllabus)
&
Academic Regulations

CIVIL ENGINEERING

For

B. TECH. FOUR YEARS 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 JNTUK, Kakinada.
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

1. Provide quality knowledge and advance skills to the students in order to expertise theoretically and practically in the areas of civil engineering.
2. Improve the professional potentiality of the students and staff through educational programs to expand the knowledge in the field of civil engineering
3. Inculcate healthy competitive spirit towards the higher education and successful career in the field of civil engineering to serve the nation ethically.
4. 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

1. PEO1. Be employed as a practicing civil engineer in construction, design, testing and allied fields.
2. PEO2. Engage in self-directed learning research or to undertake higher studies in the rapidly
   changing civil engineering environment.
3. PEO3. Create new methods / processes to meet the needs of the society with their civil engineering knowledge.
4. 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

1. Analyze, design and execute the civil engineering structures with good knowledge in engineering, mathematics & basic sciences
2. Survey, map, plan & layout of infrastructures viz. canals, roads, etc. and apply knowledge of environmental & geotechnical engineering
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.

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K. Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh, India

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-CSE (AI&ML)	CSE (Artificial Intelligence and Machine Learning)

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 is one interdisciplinary elective in III year II 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. 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:

Category	Marks	Assessment
Internal	20	Internal assessment of Laboratory carried out for 40 marks will be scaled down to 20 marks.
	20	Internal assessment of Theory carried out for 40 marks will be scaled down to 20 marks.
End examination	40	End examination of Laboratory carried out for 60 marks will be scaled down to 40 marks.
	20	End examination of Theory carried out for 60 marks will be scaled down to 20 marks.

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):

Soft skills shall be evaluated for **100** marks: **40** marks for day-to-day evaluation and **60** marks on the basis of end examination and the valuation is purely internal.

7.7 Internship (100 marks):

All the students shall undergo internship for a period minimum of **6** weeks after II year II Semester and III year II Semester. Students have an option of choosing their own industry related to their respective branches.

Self study report for the internship of II year II Semester shall be submitted and evaluated during the III year I Semester and Self study report for the internship of 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 the internship supervisor in the industry.

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:

Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

Students who are desirous of pursing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in Minor specialization groups offered by a department other than their parent department. Student can also opt for Industry-relevant tracks of any branch to obtain the Minor.

A Student shall be permitted to register for Honors/Minor program at the beginning of II year II semester provided that the student must have acquired a minimum of 8.0 CGPA upto the end of II year I semester without any backlogs. In case of the declaration of the semester results after the commencement of the II year II semester and if a student fails to score the required minimum of 8.0 CGPA, his/her registration for Honors/Minor program stands cancelled and he/she shall continue with the regular programme.

A CGPA of 8.0 has to be maintained in the subsequent semesters without any backlog in order to keep the Honors/Minors registration active.

In addition to fulfilling all the requisites of a regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award for B.Tech (Honors/Minor) program.

20 additional credits acquired are excluded from CGPA requirement for the award of B.Tech degree and CGPA requirement for the degree with Honors/Minor.

Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pool, with four courses, and each carrying 4 credits. The remaining 4 credits

must be acquired through two MOOC courses, which shall be domain specific, each with a minimum duration of 8 weeks as recommended by the Board of Studies. If no grade is given to any MOOCS course by the evaluator, then grade will be decided by the Department committee and ratified by Board of Studies and Academic Council.

The Committee constituted by the Principal will decide on the minimum enrolments for offering Honors/Minor program. If the minimum enrolment criterion is not met, then the students will be permitted to register for the equivalent MOOC courses as approved by the concerned Board of Studies.

A student shall be permitted to choose only courses as a part of Honors/Minor degree program that he/she has not studied in any form during the regular B.Tech program.

If a student drops or is terminated from the Honors/Minor program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate.).

In case a student fails to meet the CGPA requirement for Degree with Honors/Minor at any point of registration, he/she will be dropped from the list of students eligible for Degree with Honors/Minor and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet with a mention of the additional courses completed by them.

Honors/Minor must be completed simultaneously with a major degree program. A student cannot earn Honors/Minor after he/she has already earned bachelor's degree.

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 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.

Shortage of Attendance below **65%** in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled. A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

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:

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

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:

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

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 – 0.50) x 10

9.5 Award of Divisions:

Class Awarded	CGPA Secured
First Class with distinction	≥ 7.5
First Class	≥ 6.5 and < 7.5
Second Class	≥ 5.5 and <6.5
Pass Class	≥ 5.0 and <5.5

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.

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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)

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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 examinationhall 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 an Management, Tekkali
R20 – COURSE STRUCTURE (1st & 2nd B.Tech.)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (1st Sem)	MC	20MCT101	Induction Program	3 weeks			0.0
	HSSC	20HST101	English	3	0	0	3.0
	BSC	20BST101	Linear Algebra and Calculus	2	1	0	3.0
	BSC	20BST106	Engineering Physics	3	0	0	3.0
	ESC	20EST101	Basic Electrical Engineering	3	0	0	3.0
	ESC	20ESL102	Workshop and Manufacturing practice	1	0	4	3.0
	HSSC	20HSL101	Language Proficiency Lab	0	0	3	1.5
	BSC	20BSL101	Physics Lab	0	0	3	1.5
	ESC	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
	BSC	20BST102	Differential Equations	2	1	0	3.0
	BSC	20BST107	Chemistry	3	0	0	3.0
	PC	20CET101	Surveying and Geomatics	3	0	0	3.0
	ESC	20ESI102	Programming for Problem Solving	3	0	3	4.5
	ESC	20ESL103	Engineering Graphics & Design	1	0	4	3.0
	BSC	20BSL102	Chemistry Lab	0	0	3	1.5
	PC	20CEL101	Surveying Lab – 1	0	0	3	1.5
Total				**14**	**1**	**13**	**19.5**

Category	Subjects (T/L)	Credits
Mandatory Courses	2/0	0.0
Humanities and Social Science Courses	1/1	4.5
Basic Science Courses	4/2	15.0
Engineering Science Courses	2/4	15.0
Professional Core Course	1/1	4.5
Total	**10/8**	**39.0**

I: Integrated theory

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B. Tech. (1st Sem)	MC	20MCT203	Constitution of India	2	0	0	**0**
	ESC	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. (2nd Sem)	MC	20MCS204	NCC/NSS	2	0	0	**0**
	BSC	20BST203	Complex Variables and Statistical Methods	3	0	0	**3**
	ESC	20ESI204	Python Programming	3	0	3	**4.5**
	PC	20CET206	Structural Analysis	2	1	0	**3**
	PC	20CET207	Geotechnical Engineering	3	0	0	**3**
	IE	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 Simulation and Modeling	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**
6 weeks mandatory internship during summer vacation						

Category	Subjects (T/L)	Credits
Mandatory Courses	1/0	0
Basic Science Courses	1/0	3
Engineering Science Courses	2/1	7.5
Professional Core Course	6/5	25.5
Interdisciplinary Elective	1/0	3
Skill Course	2/0	4
Total	**13/6**	**43**

I: Integrated theory

Aditya Institute of Technology an Management, Tekkali
R20 – COURSE STRUCTURE

Category	Subjects (T/L)		Credits
Mandatory Courses	4/0		0.0
Humanities and Social Science Courses	2/2		9.0
Basic Science Courses	5/2		18.0
Engineering Science Courses	6/3		22.5
Professional Core Course	14/12		60.0
Professional Core Elective	5/0		15.0
Interdisciplinary Elective/Open Elective	3/0		9.0
Skill Course	5/0		10.0
Internship/Project	3/0		16.5
Total	**47/19**		**160.0**

NOTE: **L: Lecture** **T: Tutorial** **P: Practical** **C: Credits**

HSMC: **Humanities and Social Sciences including Management courses**
BS: **Basic Science courses**
ES: **Engineering Science courses**
PC: **Professional core courses**
PE: **Professional Elective**
IE: **Interdisciplinary Electives**
PCL: **Professional core Lab**
Project: **Project work, Seminar, Internship etc**

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

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.

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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.

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

AR-20 – B.Tech – Civil **I year II Sem**

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, 16th 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

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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:
• Determine area, chaining across obstacles and prepare outline of residential building using chain survey
• Determine distance between two inaccessible points and area of closed traverse by using prismatic compass
• Compute the measurement of horizontal and vertical angle by Theodolite
• Determine reduced levels for L.S and C.S of road profiles using dumpy or auto level
• 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.

II YEAR - I Semester

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B. Tech. (1st Sem)	MC	20MCT203	Constitution of India	2	0	0	**0**
	ESC	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**

Engineering Mechanics

Course Code: 20EST203

L	T	P	C
2	1	0	3

COURSEOBJECTIVES:
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

- Determine the resultant of a planar force system using resolution of force and principle of moments.
- 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.
- 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.
- Calculate centroid and moment of inertia of plane figures of triangular, rectangular and circular cross sections.
- Predict the motion parameters of bodies under rectilinear, curve linear and general plane motion.
- 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

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

- Determine tensile, compressive, bending and shear strength of the construction materials using UTM.
- Determine deflection and modulus of elasticity of simply supported, cantilever & continuous beams made up of steel & wood
- Examine hardness of mild steel using Brinel and Rockwell hardness testing machine
- Calculate torsional rigidity of mild steel using torsion testing machine
- Compute stiffness of the spring by spring testing machine
- 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.

Skill Oriented Course – I

Course Code: 20CES201

L	T	P	C
1	0	2	2

II Year- II Semester

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B. Tech. (2nd Sem)	MC	20MCS204	NCC/NSS	2	0	0	**0**
	BSC	20BST203	Complex Variables and Statistical Methods	3	0	0	**3**
	ESC	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 Simulation and Modeling	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**
6 weeks mandatory internship during summer vacation						

Category	Subjects (T/L)	Credits
Mandatory Courses	1/0	0
Basic Science Courses	1/0	3
Engineering Science Courses	2/1	7.5
Professional Core Course	6/5	25.5
Interdisciplinary Elective	1/0	3
Skill Course	2/0	4
Total	13/6	43

I: Integrated theory

NCC/NSS

Subject Code: 20MCS204

L	T	P	C
2	0	0	0

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

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

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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

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

- Draw SFD & BMD of propped cantilever for various loads.
- Evaluate SFD & BMD of fixed beams for various loads.
- Apply the strain energy methods
- Determine two hinged and three hinged arches for various loads.
- Analyse continuous beams by Clapeyron's theorem for different support and loading conditions.
- 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

- Determine the index properties of soils, classify them and establish their inter-relationships.
- Illustrate seepage of water through soils and determine the discharge of water through soils
- Analyze the stress below the soils under different conditions
- Determine the magnitude and the rate of consolidation settlement
- Calculate the effective stress of soils at different depths
- 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

- Interpret building bye laws and regulations
- Draw sign conventions and bonds
- Draw doors, windows, ventilators and roofs
- Explain the principles of planning and orientation of the building
- Distinguish residential buildings and its standard dimensions.
- 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
- Evaluate Atterberg's limits and Differential free swell for clayey soils.
- Examine relative density, dry density & moisture contents in the field and laboratory by core cutter, sand replacement and compaction tests.
- Determine permeability of soils
- Analyze coarse and fine grain sizes in laboratory.
- Determine shear strength and shear strength parameters by vane shear, tri-axial, direct shear & unconfined compression tests in laboratory.
- 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:

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

UNIT-I

Laplace Transforms: Laplace Transform for elementary functions – Properties- 1st shift and 2nd 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 Simulation and Modeling

(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:

- Translate mathematical methods to MATLAB code.
- Generalize results and represent data visually.
- Apply computer methods for solving a wide range of engineering problems.
- Utilize computer skills to enhance learning and performance in other engineering and science courses.
- Demonstrate professionalism in interactions with industry.
- 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

- Classify engineering materials and their structures.
- Illustrate plastic deformation in single crystal engineering materials.
- Explain hot and cold working phenomenon
- Select materials for a particular application based on mechanical properties.
- Describe toughness, creep and fatigue in materials
- 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:

- Define various performance characteristics and classify static errors of Instruments.
- Calculate the resistance values for construction of DC voltmeter, Ammeter and Ohmmeters.
- Explain the working of various signal generators and analyzers for distortion measurements.
- Describe the working and use of CRO and special oscilloscopes.
- Determine the value of unknown resistance, inductance, capacitance and frequency of excitation.
- Classify transducers and identify suitable transducer for measuring various non-electrical quantities.

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

- Describe UNIX Architecture and Functions of OS
- Demonstrate the basic set of commands and utilities in UNIX system
- Design and Implement of UNIX file system
- Familiar with various shell commands
- Develop shell scripts to automate various tasks
- 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

- Solve problems using programming
- Design solution using OOP principles
- Analyze time and space Complexity of a Solution.
- Select appropriate container to organize data for problem solving.
- Design a Relational Database schema for a subject of interest
- 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

Skill Oriented Course – II

Course Code: 20CES202

L	T	P	C
1	0	2	2

Urban Planning and Essentials of Smart Cities

(Honors /Minor Courses: 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

- Interpret and illustrate trends of urbanisation.
- Explain various urban development plans.
- Illustrate design and development of urban development projects.
- Comprehend essential aspects of smart and sustainable cities.
- Infer policy planning and development of smart cities.
- 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