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Academic Regulations

Program structure & Detailed Syllabus

2017

For

Under Graduate Programme (B.Tech)

CIVIL ENGINEERING

(Applicable For Batches Admitted From 2017 – 2018)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY
(AUTONOMOUS)

DUVVADA - VISAKHAPATNAM – 530 049

(An Autonomous Institute, accredited by NAAC, Affiliated to JNTUK, Kakinada, AP)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY

(AUTONOMOUS)

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ACADEMIC REGULATIONS

(VR 17)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS)
VISAKHAPATNAM

ACADEMIC REGULATIONS for B. Tech. (Regular)
(Applicable for the batches admitted 2017-18 onwards)

The Admission of students into B. Tech. course shall be as per the Govt. of Andhra Pradesh rules.

1. Award of B. Tech. Degree

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

a. Pursue a program of study for not less than four academic years and not more than eight academic years.
b. For lateral entry scheme admission: Pursue a program of study for not less than three academic years and not more than six academic years.
c. For the award of a degree, regular candidate has to register for 189 credits and shall secure 189 credits.
d. Lateral entry candidate has to register for all the courses from second year onwards and secure all the credits registered for.

2. Courses of Study

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

S. No.	Course Code	Programme & Abbreviation
01	01	Civil Engineering (CE)
02	02	Electrical and Electronics Engineering (EEE)
03	03	Mechanical Engineering (ME)
04	04	Electronics and Communication Engineering (ECE)
05	05	Computer Science and Engineering (CSE)
06	12	Information Technology (IT)
07	19	Electronics and Computer Engineering (E.Com E)

And any other Course as approved by the authorities of the Institute from time to time.

3. Registration: A student shall register for courses in each semester as per the courses offered by the concerned department.

4. Curricular Program

The Curriculum of the four-year B. Tech Course has been designed to achieve a healthy balance between theory & lab hours, industry experience and to develop technical skills required for a career in the industry or a career in research.

5. Distribution and Weightage of Marks

i. The performance of a student in each semester shall be evaluated Subject-wise with a maximum of 100 marks for theory courses and 100 marks for practical course. The project work shall be evaluated for 200 marks.

ii. For theory course the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End Semester Examinations.

Distribution of marks for theory course, practical course and Design/Drawing is detailed below:

5.1. Internal 40 marks for theory course shall be awarded as follows:

i) 25 marks for MID exams
ii) 10 marks for continuous assessment
iii) 5 marks for Attendance

MID marks shall be calculated with 80% weightage for best of the two MIDs and 20% weightage for other MID exam.

5.2. For practical courses (Laboratory): There shall be continuous evaluation during the semester. Each Lab exam is evaluated for 100 marks. 50 marks shall be awarded for internal examination and 50 marks shall be awarded for external examinations.

5.2.1. Internal marks shall be awarded as follows

i) Day to day assessment– 20 Marks
ii) Record – 10 Marks
iii) Internal laboratory exam– 20 Marks

5.2.2.The semester end examinations shall be conducted by the teacher concerned and external examiner

5.3. For the courses having design and/or drawing, (Such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 40 marks for internal evaluation.

5.3.1. Internal marks shall be awarded as follows:

i) 20 marks for Day-to-day assessment
ii) 15 marks for internal exam
iii) 5 marks for Attendance

There shall be two internal examinations in a semester and the internal marks shall be calculated with 80% weightage for best of the two internals and 20% weightage for other internal exam.
5.3.2. External examination shall be conducted for 60 marks.

5.4. Industrial Visit: The industrial visit shall be carried out in their domain during the summer vacation after the second year second semester. A student has to submit a report which will be evaluated for 100 marks and will be submitted to an internal evaluation committee comprising Head of the Department or his / her nominee and two senior faculty of the department including the industrial visits coordinator/ supervisor.

5.5. Industry- Oriented Mini Project: The Industry oriented mini project is carried out during the third year second semester vacation. The students have an option to choose their own area of

interest which may be related to the course work. Mini project report is evaluated for 100 marks in fourth year first semester before the first mid-term exam. Assessment is done by the supervisor /guide for 40 marks based on the work and mini project report. The remaining 60 marks are allocated for presentation by the student to a committee comprising of the project supervisor and senior faculties members nominated by Head of the Department.

5.6. MOOCs: It is an online course (Minimum of 12 weeks) to promote advanced knowledge suitable for placement and research.

To award credits, the student should get certificate after they have registered for written exam and successfully passed

(Or)

College will conduct the written examination/Viva-voce and award the credits and grades.

In case a student fails in any online course, he/she may be permitted to register for the same course or an alternate course decided by the department committee. The internal marks secured earlier will be nullified if the course is changed. The assessment procedure of MOOCs course remains same as general theory course.

Note: The registered course must not be same as any of the courses listed in the program structure of their regulation till final year including electives.

5.7. Technical Seminar: For Technical seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his/her understanding over the topic, and submit to the department, which shall be evaluated by the Departmental Committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

5.8. Comprehensive Viva: The Comprehensive Viva aims to assess the students' understanding in various subjects he / she studied during the B.Tech course of study. Comprehensive Viva is conducted for a total of 50 marks. It shall be conducted in IV Year II Semester. The Comprehensive Viva–Voce will be conducted by a Committee consisting of Head of the Department, & senior faculty members of the Department..

5.9. Internship: Internships help students to acquire in depth knowledge about a particular topic related to the program of study. Such extensive work is expected to create a platform for a job or further research in the chosen area. Interested students may opt for a full semester Internship during the fourth year second semester. Such students shall be exempted for equivalent theory course credits during that semester and the corresponding credits are awarded through the Internship. A self-study report, duly authorized by the industry supervisor / guide, shall be submitted at the end of the fourth year second semester. Internship report is evaluated for 400 marks in total. Internal assessment is done by the academic supervisor/guide for 100 marks based on the work and presentation of the internship report. The assessment for 300 marks is evaluated and awarded by a panel of members consisting of Head of the Department, Senior Faculty and Industry Expert.

5.10. Main Project: Out of total 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the external assessment. The Internal Evaluation shall be on the basis of two mid-term project reviews conducted during the progress of the project. The End Semester Examination (Viva-Voce) shall be conducted by the committee consists of an External

Examiner, Head of the Department (internal examiner) and a senior faculty of the Department. The evaluation of project work shall be conducted at the end of the IV year.

5.11. Audit courses: All audit courses will be "Pass/Fail" type with no credit points allotted. The result of the student in the audit course will be notified in the marks memo. A student must pass all the audit courses registered to be eligible for the award of B. Tech. degree.

List of audit courses will be notified from time to time. An indicative list of courses is as shown below.

a) Professional Ethics & Human Values b) Any Foreign Language c) Journalism d) Finance e) Legal Sciences f) Social Sciences g) English for Special Purposes h) Fine Arts i) Clinical Psychology j) Intellectual Property Rights & Patents etc.

6. Attendance Requirements:

6.1. It is desirable for a candidate to have 100% attendance in the class in all the courses. However, a candidate shall be permitted to appear for the end semester examination if he/she has a minimum of 75% aggregate attendance in the semester. Student will not be permitted to write Mid examination if the attendance percentage is less than 75 % during the stipulated instruction duration. However, Academic Monitoring Committee shall review the situation and take appropriate decision.
Note: Special cases for students having extraordinary performance at National and International level will be considered by the Academic monitoring committee.

6.2. Condonation of shortage of attendance may be considered on Medical grounds maximum up to 10%, if the student provides the medical certificate to the HOD immediately after he / she recovers from the illness. Medical Certificate submitted afterwards shall not be permitted. Shortage of attendance equal to or above 65% and below 75%will be condoned on payment of fee as fixed by the competent authority and the student concerned will be permitted to take the end semester examination. ***This privilege is given only three times for regular student and only two times for lateral entry student during the entire program of study***.

6.3. Shortage of attendance may be considered for the students who participate in prestigious sports, co and extra-curricular activities if their attendance is in the minimum prescribed limit.

6.4. A student will be promoted to the next semester if satisfies attendance and credits requirement.

7. Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements.

For any course, student is considered to be passed upon securing minimum 35% marks in the external examination alone and minimum 50% marks from both internal and external examination put together

8. Promotion Policy:

To promote to III year, a student has to secure minimum 50% of total credits from I & II-year courses
To promote to IV year, a student has to secure minimum 50% of total credits from I, II & III-year courses

In case of Lateral entry students, to promote to IV year, a student has to secure minimum 50% of total credits from II & III-year courses

9. Supplementary examinations: Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even semester and vice versa. In case a student fails in online courses/ industrial lecture(s), he/she may be permitted to register for another course/lecture(s).

10. Examinations and Evaluation

10.1. General guidelines

i. All the semester end examinations are conducted for duration of three hours
ii. External examination shall be conducted for 60 marks consist of five questions of internal choice carrying 12 marks each.
iii. For laboratory examinations, the evaluation is done by internal examiner and one external examiner.

10.2. Revaluation

There is a provision for revaluation of theory courses if student fulfils the following norms.

The request for revaluation must be made in the prescribed format duly recommended by the Chief Superintendent of Examinations through Additional Controller along with the prescribed revaluation fee.

11. Grading System:
CGPA

Marks Range (in %)	Letter Grade	Level	Grade Point
≥ 90	O	Outstanding	10
≥80 to <90	A	Excellent	9
≥70 to <80	B	Very Good	8
≥60 to <70	C	Good	7
≥50 to <60	D	Satisfactory	6
<50	F	Fail	0
		Absent	-1
		Withheld	-2
		Malpractice	-3

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average. (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = Σ(Ci x Gi) / ΣCi

Where Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th}course.

Computation of CGPA

- The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$CGPA = \Sigma(Ci \times Si) / \Sigma Ci$$

Where Si is the SGPA of the i^{th} semester and Ci is the total number of credits in that semester.

- Equivalent Percentage = (CGPA – 0.75) X 10

12. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following three classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75 without course failures during entire duration of study	**CGPA secured from 189 Credits.**
First Class	≥ 6.75 to <7.75	
Second Class	≥ 5.75 to < 6.75	

13. General Instructions

i. Where the words 'he', 'him', 'his', occur, they imply 'she', 'her', 'hers', also.

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

iii. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council is final.

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

14. Transitory Regulations

i. The student has to continue the course work along with the regular students of the respective semester in which the student gets re-admission.

ii. The student has to register for Substitute / Compulsory courses offered in place of courses studied earlier.

iii. The mode of internal evaluation and end-semester examinations shall be on par with the regular students, i.e., the student has to follow the mode of internal evaluation and the then question paper model for the end-semester examinations along with the regular students of the respective semester in which the student gets re-admission. The marks secured in the internal and end-semester examinations will be pro-rated in accordance with the regulations under which the student was first admitted.

iv. For the courses studied under earlier regulations but failed, the student has to appear, pass and acquire credits from the supplementary examinations as and when conducted. The question paper model shall remain same as the one in which the student took examination during previous regulations.

v. The promotion criteria based on attendance as well as credits shall be in accordance with the regulations under which the student was first admitted.

vi. All other academic requirements shall be in accordance with the regulations under which the student was first admitted.

vii. The decision of the Principal is final on any other clarification in this regard.

viii. Transcripts: After successful completion of the entire program of study, a transcript containing performance of all academic years will be issued as a final record. Partial transcript will also be issued up to any point of study to a student on request, after payment of requisite fee.

15. Minimum Instruction Days

The minimum instruction days for each semester shall be 16 weeks

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

16. Withholding of Results

If the student has not paid the dues, if any, to the Institute or in any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

Note: All other regulations including attendance requirements related to four year B. Tech Regular program will be applicable for B.Tech. Lateral Entry Scheme.

17. Malpractices Rules

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/ Improper conduct	Punishment
1 (a)	If the candidate 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 course 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 candidate which can be used as an aid in the course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate

	or any other form of material relevant to the course of the examination (theory or practical) in which the candidate is appearing.	has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of 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 candidate smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that course.
6	If the candidate refuses to obey the orders of the Chief Superintendent/Assistant - Superintendent / any officer on duty or misbehaves or creates disturbance of	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s)

	any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either 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 relations, or indulges in any other act of misconduct or mischief which result in damage to 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.	has (have) already appeared and shall not be permitted to appear for the remaining examinations of the courses of that semester/year. The candidates 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 candidate leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the candidate possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate 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 clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses 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 candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses 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 course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic committee of the Institute for further action to award suitable punishment.	

18. UGC RECOMMENDED PUNISHMENT FOR RAGGING

i. Suspension from attending classes and academic privileges
ii. Withholding/withdrawing scholarships/fellowship and other benefits.
iii. Debarring from appearing in any test/examination or other evaluation process
iv. Withholding results
v. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.
vi. Suspension/expulsion from the hostel
vii. Cancellation of admission
viii. Rustication from the institution for period ranging from 1 to 4 semesters.
ix. Expulsion from the institution and consequent debarring from admission to any other institution for a specified period.
x. Fine may extend up to Rs. 2.5 lakh.

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DEPARTMENT OF CIVIL ENGINEERING
PROGRAM STRUCTURE

I B.Tech **I Semester**

S.No	Course Code	Course Title	L	T	P	Credits
1.	1000171101	English- I	3	1	0	3
2.	1000171102	Engineering Mathematics-I	3	1	0	3
3.	1000171104	Engineering Chemistry	3	1	0	3
4.	1000171105	Computer Programming using C	3	1	0	3
5.	1000171112	Environmental Studies	3	1	0	3
6.	1000171116	Engineering Mechanics	3	1	0	3
7.	1000171121	English - Communication Skills Laboratory-I	0	0	3	2
8.	1000171127	Engineering Chemistry Laboratory	0	0	3	2
9.	1000171128	Computer Programming Laboratory	0	0	3	2
					Total Credits	**24**

I B.Tech **II Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1.	1000171201	English- II	3	1	0	3
2.	1000171202	Engineering Mathematics-II	3	1	0	3
3.	1000171203	Engineering Mathematics-III	3	1	0	3
4.	1000171204	Engineering Physics	3	1	0	3
5.	1000171205	Basic Electrical and Electronics Engineering	3	1	0	3
6.	1000171206	Engineering Drawing	3	1	0	3
7.	1000171221	English Communication Skills Lab-2	0	0	3	2
8.	1000171222	Engineering Physics Laboratory	0	0	3	2
9.	1000171224	Engineering Workshop	0	0	3	2
					Total Credits	**24**

II B.Tech **I Semester**

S.No	Course Code	Course Title	L	T	P	Credits
1	1000172101	Probability & Statistics	3	1	0	3
2	1001172102	Concrete Technology	3	1	0	3
3	1001172103	Strength of Materials –I	3	1	0	3
4	1001172104	Building Materials and Construction	3	1	0	3
5	1001172105	Surveying –I	3	1	0	3
6	1001172106	Fluid Mechanics	3	1	0	3
7	1001172121	Surveying Field Work -1 Lab	0	0	3	2
8	1001172122	Concrete Technology Lab	0	0	3	2
9	1099172103	Professional Ethics & Human Values	2	1	0	0
Total Credits						22

II B.Tech **II Semester**

S.No	Course Code	Course Title	L	T	P	Credits
1	1001172201	Building Planning and Drawing	3	1	0	3
2	1001172202	Strength of Materials – II	3	1	0	3
3	1099172203	Management Science	2	1	0	0
4	1001172204	Hydraulics & Hydraulics Machinery	3	1	0	3
5	1001172205	Surveying-II	3	1	0	3
6	1001172206	Structural Analysis – I	3	1	0	3
7	1001172207	Transportation Engineering – I	3	1	0	3
8	1001172221	Fluid Mechanics & Hydraulics Machinery Lab	0	0	3	2
9	1001172222	Strength of Materials Lab	0	0	3	2
10	1001172231	Industrial visit	0	0	3	2
Total Credits						24

III B.Tech **I Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1.	1099172206	Managerial Economics & Financial Analysis	3	1	0	3
2.	1001173101	Engineering Geology	3	1	0	3
3.	1001173102	Structural Analysis –II	3	1	0	3
4.	1001173103	Design of Reinforced Concrete Structures	3	1	0	3
5.	1001173104	Transportation Engineering – II	3	1	0	3
6.	1001173121	Surveying Field Work-II	3	1	0	3
7.	1001173122	Engineering Geology Lab	0	0	3	2
8.	1001173123	Transportation Engineering Lab	0	0	3	2
					Total Credits	**21**

III B.Tech **II Semester**

S.No	Course Code	Course Title	L	T	P	Credits
1	1001173201	Design of Steel Structures	3	1	0	3
2	1001173202	Geotechnical Engineering – I	3	1	0	3
3	1001173203	Environmental Engineering – I	3	1	0	3
4	1001173204	Water Resources Engineering -I	3	1	0	3
5	**Elective-I:**					
	1001173205	a. Advanced Surveying using GPS	3	1	0	3
	1001173206	b. Groundwater development and Management				
	1001173207	c. Waste Water Management				
	1001173208	d. Advanced Concrete Technology				
	1001173209	**e.** Traffic Engineering				
6	**Open Elective-I:**					
	1004173209	a. Electronic Instrumentation	3	1	0	3
	1005173206	b. Introduction to Data Base Management Systems				
	1003173206	c. Alternative Energy Sources				
	1003173205	d. Heating, Ventilation and Air Conditioning				
	1001173291	e. Massive Open Online Course (MOOCs) *Any available online course approved by department committee at the time of semester commencement.				
7	1001173221	Geotechnical Engineering Lab	0	0	3	2

8	1001173222	Environmental Engineering Lab	0	0	3	2
9	1001173223	Computer Aided Engineering Lab	0	0	3	2
Total Credits:						**24**

S. No	Course Code	Course Title	L	T	P	Credits
1	1001173241	Industry Oriented Mini Project	0	0	0	2

IV B.Tech **I Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1	1001174101	Estimation and Contracts	3	1	0	3
2	1001174102	Water Resource Engineering-II	3	1	0	3
3	1001174103	Geotechnical Engineering – II	3	1	0	3
4	1001174104	Environmental Engineering-II	3	1	0	3
5	**Elective – II**					
	1001174105	A) Advanced Structural Engineering	3	1	0	3
	1001174106	B) Urban Hydrology				
	1001174107	C) Ground Improvement Techniques				
	1001174108	D) Pavement Analysis and Design				
	1001174109	E) Remote Sensing & GIS Applications				
	1001174110	F) Industry orientated course (BIM/TEKLA/REVIT/E-TAB/CYCLONE)				
6	**Open Elective-II**					
	1005172104	A) Java Programming	3	1	0	3
	1003173201	B) Finite Element Methods				
	1004173207	C) Digital Image Processing				
	1005172105	D) Data Structures through C				
	1099174101	E) Entrepreneurship Development				
7	1099173101	IPR & Patents (Audit Course)	2	0	0	0
8	1001174121	GIS & CAD Lab	0	0	3	2
9	1001174122	Design & Drawing of Hydraulic Structures	0	0	3	2
Total Credits :						22

IVB.Tech **II Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1	1001174201	Soil Dynamics and Foundations	3	0	0	3
2	1001174202	Construction Technology and Management	3	0	0	3
3	1001174203	Prestressed Concrete	3	0	0	3
4	**Elective – III**					
	1001174204	A. Bridge Engineering	3	0	0	3
	1001174205	B. Environmental Impact Assessment and Management				
	1001174206	C. Solid and Hazardous Waste Management				
	1001174207	D. Water Resources Systems Planning and Management				
	1001174208	E. Transportation Planning				
Or						
	1001174281	Internship	0	0	0	12
5	1001174251	Technical Seminar	0	3	0	2
6	1001174261	Comprehensive Viva	0	0	0	2
7	1001174231	Main Project	0	0	0	10
					Total Credits :	**26**

GRAND TOTAL CREDITS: 24+24+22+24+21+26+22+26=189

PROGRAM STRUCTURE

FOR

I-B.Tech

I & II SEMESTERS

DEPARTMENT OF CIVIL ENGINEERING
PROGRAM STRUCTURE

I B.Tech I Semester

S. No	Course Code	Course Title	L	T	P	Credits
1.	1000171101	English- I	3	1	0	3
2.	1000171102	Engineering Mathematics-I	3	1	0	3
3.	1000171104	Engineering Chemistry	3	1	0	3
4.	1000171105	Computer Programming using C	3	1	0	3
5.	1000171112	Environmental Studies	3	1	0	3
6.	1000171116	Engineering Mechanics	3	1	0	3
7.	1000171121	English - Communication Skills Laboratory-I	0	0	3	2
8.	1000171127	Engineering Chemistry Laboratory	0	0	3	2
9.	1000171128	Computer Programming Laboratory	0	0	3	2
					Total Credits	**24**

I B.Tech II Semester

S. No	Course Code	Course Title	L	T	P	Credits
1.	1000171201	English- II	3	1	0	3
2.	1000171202	Engineering Mathematics-II	3	1	0	3
3.	1000171203	Engineering Mathematics-III	3	1	0	3
4.	1000171204	Engineering Physics	3	1	0	3
5.	1000171205	Basic Electrical and Electronics Engineering	3	1	0	3
6.	1000171206	Engineering Drawing	3	1	0	3
7.	1000171221	English Communication Skills Lab-2	0	0	3	2
8.	1000171222	Engineering Physics Laboratory	0	0	3	2
9.	1000171224	Engineering Workshop	0	0	3	2
					Total Credits	**24**

DETAILED SYLLABUS

FOR

I-B.Tech

I-SEMESTER

Course Code		L	T	P	Credits
1000171101	**ENGLISH – I**	3	1	0	3

Course Objectives

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To enable the students to study and comprehend the prescribed lessons and subjects more effectively related to their theoretical and practical components.
- To develop the communication skills of the students in both formal and informal situations.
- Practice critical thinking to develop innovative and well-founded perspectives related to the students' emphasis. Build and maintain healthy and effective relationships.
- To convey a credible message and create concise messages using a structured writing process.
- To develop effective interpersonal communication skills.

Course Outcomes

After completing this Course, the student should be able to:

- Use English language, both written and spoken, competently and correctly.
- Improve comprehension and fluency of speech.
- Gain confidence in using English in verbal situations.
- Display competence in oral, written, and visual communication.
- Communicate ethically.
- Demonstrate positive group communication exchanges.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Enhance English Language by relating the ideas of eminent personalities.	Understanding	PO6,PO9, PO10, PO12
CO2	Articulate the technological advancements fluently.	Applying	PO10, PO12
CO3	Inculcate the art of thinking and writing clearly and logically.	Applying	PO10, PO12
CO4	Enact various themes through team work and learn the usage of vocabulary through humorous texts.	Analyzing	PO10, PO12

Detailed Text: English Essentials

1. In London-M. K.Gandhi
2. The Knowledge Society - A. P. J. Abdul Kalam
3. Principles of Good Writing - L. A.Hill
4. Man's Peril –Bertrand Russell
5. Luck –MarkTwain

Non-Detailed Text: Panorama

1. War – Luigi Pirandello
2. The Verger – Somerset Maugham

PRESCRIBED TEXTBOOKS:

1. English Essentials by Ravindra Publishing House
2. Panorama by Oxford University Press

SUGGESTED TEXT BOOKS:

1. **You Can Win** by ShivKhera
2. **English for Engineers and Technologists** by Orient Black Swan
3. **Objective English** by R. S. Agarwal, S.Chand.co

REFERENCE BOOKS:

1. "Practical English Usage" by Michael Swan, 3rdEdition,OUP.
2. "Intermediate English Grammar" by Raymond Murphy, CUP.
3. "Study: Reading" by Eric H .Glendinning, 2ndEditionCUP.
4. "Business Correspondence and Report writing" by R.C Sharma, Tata McGrawhill

Course Code		L	T	P	Credits
1000171102	**ENGINEERING MATHEMATICS – I**	3	1	0	3

Course Overview:

This course deals with differential equations and its application with more focus on advanced Engineering Mathematics. This course helps the students to learn relevant mathematical tools which are required in the analysis of problems in engineering and scientific professions. Topics included in this course are differential equations of first order and their applications, higher order linear differential equations and their applications, functions of single variable and their applications and multiple integrals, Laplace transforms and their applications. The mathematical skills derived from this course form a necessary base for analytical and design concepts encountered in the program.

Course Objectives:

1. To explain mathematical modeling with the knowledge of differential equations.
2. To discuss higher order differential equations and its applications to solve engineering problems.
3. To evaluate maxima and minima of function of several variables.

Course Outcomes:

1. Solve basic engineering problems described by first order differential equations.
2. Determine solutions to higher order linear homogeneous and non homogeneous differential equations with constant coefficients.
3. Apply the techniques of multivariable differential calculus to determine extreme and series expansions etc. of functions of several variables.
4. Extend the concept of integration to two and three dimensions and support it through applications in engineering mechanics.
5. Appraise the Laplace transform technique and use it to solve various engineering problems.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Solve linear differential equations of first and higher order.	Understanding	PO1,PO2, PO3, PO12
CO2	Determine extrema and series expansions of functions of several variables.	Applying	PO1, PO2,PO4, PO12
CO3	Determine double integral, triple integral to find area and volume..	Applying	PO1, PO2, PO3, PO12
CO4	Appraise Laplace transform to solve various engineering problems.	Analyzing	PO1, PO2, PO12

UNIT-I : MEAN VALUE THEOREMS:

Mean Value Theorems - Rolle's Theorem - Lagrange's mean value theorem – Cauchy's mean value theorem (without proofs)

ORDINARY DIFFERENTIAL EQUATIONS:

Exact equations and equations reducible to exact form- Linear equations- Bernoulli's equation.

Applications: Orthogonal trajectories ,Simple Electric Circuits

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER:

Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of the type $Q(x) = e^{ax}$, sin ax, cos ax, x^n, $e^{ax}V(x)$, $x^nV(x)$ – Method of variation of parameters.

Applications: LCR Circuits

UNIT-III: FUNCTIONS OF SEVERAL VARIABLES:

Functions of several variables – Partial Differentiation –Euler's Theorem-Total Derivative – Change of variables - Jacobian -Functional dependence – Taylors theorem for functions of two variables.

Applications: Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers

UNIT-IV: MULTIPLE INTEGRALS:

Introduction: Review of Coordinate Systems (Cartesian, Polar, Parametric, Spherical, Cylindrical) -multiple integrals - double and triple integrals – change of variables – Change of order of Integration.

Applications: Areas and Volumes of Simple curves (Cartesian

UNIT-V: LAPLACE TRANSFORMS:

Introduction - Laplace transforms of standard functions – Shifting Theorems - Transforms of derivatives and integrals - multiplication by t^n - division by t – Unit step function –Dirac delta function. Laplace transform of Periodic functions.

Introduction - Inverse Laplace transforms–Properties- Convolution theorem (without proof).

TEXT BOOKS:

1. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.
2. Engineering Mathematics, Greenburg, 2nd Ed, Pearsoneducation.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications (P)Ltd.
4. Advanced Engineering Mathematics, B. V. Ramana, TataMcGrawHill Publishing Co. Ltd.
5. Engineering Mathematics, P.Sivaramakrishna Das, C.Vijayakumari , 2017 Pearson Education Services Pvt.Ltd

Course Code	ENGINEERING CHEMISTRY	L	T	P	Credits
1000171104		3	1	0	3

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace and automotive industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- To know the mechanism of Corrosion for its control and prevention.
- Water is a basic material in almost all the industries, more so where steam is generated and also where it is supplied for drinking purposes.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.

Outcomes:

The student

1. Gains basic knowledge of polymer materials and their engineering applications.
2. Understands fuels which are used commonly and their advantages and limitations.
3. Extends the principles involved in corrosion to predict and prevent the corrosion in real life system
4. Able to analyze the water quality and understand various methods of treatment of water.
5. Recalls the principles, working and design of energy storage devices an

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Categorize various types of polymeric materials, fuels, lubricants, Refractories and establish their applications.	Understanding	PO1,PO2, PO6, PO8, PO12
CO2	analyze hardness of water and describe various softening methods	Applying	PO1, PO2, PO7, PO12
CO3	Illustrate the principles of green chemistry, corrosion and its prevention and demonstrate the construction and working of batteries	Applying	PO1, PO2, PO7, PO12
CO4	Emphasize on various engineering materials like nanomaterials, solar cells and their applications.	Analyzing	PO1, PO4

UNIT I: POLYMER TECHNOLOGY:

Polymerization: Introduction - Types of polymerization (Addition, Condensation & Co-polymerizstion) – Physical and mechanical properties – advantages and limitations – **Plastics**: Thermoplastics and Thermosetting plastics – Compounding, Moulding techniques (Compression, Injection & Blow film moulding) - Preparation, properties and applications of polyethene, PVC, Bakelite and Teflon. **Elastomers** – Natural rubber- compounding and vulcanization – Synthetic rubbers - Buna S, Buna N and Thiokol – Applications. Composite materials & Fiber reinforced plastics (CFRP & GFRP) – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Introduction – Classification – Calorific value - Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis and its Significance – Liquid fuels – Petroleum - Refining – Cracking – knocking - Octane and Cetane numbers - Natural gas - LPG and CNG – Combustion – Flue gas analysis – Orsat apparatus – Numerical problems on combustion. Energy scenario in India – working of thermal power plant – Advantages and disadvantages – Renewable energy – Solar energy – Harnessing of solar energy – solar heaters – photo voltaic cells – Bio energy – Bio diesel.

UNIT III: ELECTROCHEMICAL CELLS & CORROSION

Galvanic cells - Reversible and irreversible cells, Electrode potential – Standard electrodes (Hydrogen and Calomel electrodes). Electro chemical series and its applications,

Batteries-: Dry Cell, lead acid battery and Ni-Cd battery - H_2-O_2 fuel cell & H_3PO_4 fuel cells.
Corrosion: Introduction – Theories of Corrosion (dry and wet) – Types of corrosion – galvanic, pitting, stress, differential aeration and waterline corrosion – Factorsinfluencingcorrosion–controllingmethods–Designandmaterialselection – Cathodic protection - inhibitors - Protective coatings – Metallic coatings (cathodic and anodic) - Methods of application on metals (Galvanizing, Tinning & Electroplating) .

UNIT IV: WATER TECHNOLOGY

Hardness of water: Reasons, units - determination of hardness by EDTA method, Problems on hardness - Boiler troubles – Scale & sludge formation, Boiler

corrosion, Caustic embrittlement - Priming and Foaming – Internal treatment methods - Softening of Hard water – Lime - Soda process, Zeolite process and numerical problems based on these processes and Ion Exchange process – Municipal water treatment - Break point chlorination - desalination of brackish water Reverse osmosis and Electro dialysismethods.

UNIT V: CHEMISTRY OF ADVANCED ENGINEERING MATERIALS

Nano materials: Introduction – Preparation, Properties and engineering applications of Carbon nano tubes and fullerenes. **Green Chemistry:** Principles, any three methods of synthesis – engineering applications. **Refractories:** Definition, classification, properties (Refractoriness, R.U.L, Porosity, Dimensional stability & Thermal spalling) failure of refractories. **Lubricants:** Introduction, functions, mechanism of lubrication and properties (cloud & pour point, volatility, carbon residue & Aniline point).
C**ement:** Constituents, manufacturing of Portland cement, setting and hardening, decay of cement.

Prescribed books:

1. Engineering Chemistry (16^{th}edn.) by Jain and Jain; DhanpatRaiPu.Co.
2. A text book of Engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition

Reference Books:

1. Chemistry for Engineers by TehFu Yen, Imperial college press,London.
2. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014, 2^{nd} edition
3. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015edition.
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press,IIM

Course Code	COMPUTER	L	T	P	Credits
1000171105	PROGRAMMING USING C	3	1	0	3

Course Objectives:

- Understanding the basics of the computers and background.
- Drawing flowcharts and Formulating algorithmic solutions to problems and implementing in C language.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation. Understanding pointers and dynamic memory allocation.

Course Prerequisites: Students should have knowledge of

- Basics of Computer Components.
- Distinction between software and hardware.

Course Outcomes: Students will be able to:

- Understand the fundamentals of computers, solving the problems using flow charts, algorithms and pseudo code.
- Write, compile and execute simple programs in C language.
- Use different data types and operators in C language.
- Design programs involving decision structures, loops, functions and passing parameters to functions.
- Develop programs using arrays, structures and pointers.
- Understand the dynamic memory allocation functions using pointers.
- Understand the basics of file operations, reading, writing and updating the files.

	Course outcome	Skill	PO
CO1	Write compile and debug Programs in C language	Understand	PO1,PO2, PO3
CO2	Use operators, data types and write programs	Understand	PO1,PO2
CO3	Select the best loop construct for a given problem	Analyzing	PO3,PO5
CO4	Design and implement C programs	Analyzing	PO1,PO2 PO3,PO4, PO12

UNIT-I

Computer Basics – What is a computer, History of computers, Characteristics of computers, Classification of computers, Applications of computers, Components and functions of a Computer System: hardware and software concept, input/output devices, memory concept and secondary memories, Number System, Computer languages, Flow Charts, algorithms and pseudo code.

Introduction to C programming- Background and characteristics of C, Structure of a C Program, Input / Output Statements in C, writing C programs, compiling and executing C programs.

UNIT-II

Programming Style – Tokens of C, Keywords, Variables, Constants and rules to form variables and constants, Data Types, Declaration of Variables and initialization, Operators, Expression Types, Operator Precedence and Associativity. Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

Flow of Control:

Selection: if and if-else Statements, if-else if statement and switch case, nested if, examples.

Repetition and Unconditional Control Statements: Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, while Statement, do while statement, for Statement, Nested Loops. Break, continue and go to statements.

UNIT-III

Modular Programming:

Function and Parameter Declarations: Function definition, types of functions, declaration and definition of user defined functions, its prototypes and parameters, calling a function. Function stubs and Functions with and without Parameters. Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable Storage Classes.

Parameter passing Techniques: Pass by Value, recursive functions.

UNIT-IV

Arrays and Strings

Arrays: One-Dimensional Arrays, Declaration, Array Initialization, Input and Output of Array Values, Arrays as Function Arguments, Two-Dimensional Arrays, linear search, and bubble sort.

Strings: String Fundamentals, String Input and Output, String manipulation functions, String Processing, String manipulation operations without Library Functions.

UNIT-V

Pointers, Structures and Unions, Data Files

Pointers: Concept of a Pointer, Initialization of pointer variables, pointers as function arguments, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Pointers and arrays, Pointers and strings, Array of Pointers, Dynamic memory management functions, parameter passing by address, command line arguments.

Structures and Unions: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, type def, bit- fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access.

Text Books:

- ANSI C Programming, Gary J. Bronson, C engage Learning.
- Programming in C, Reema Thareja, Oxford.
- Programming in C, Bl Juneja Anita Seth, C engage Learning.

Reference Books:

- C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
- Programming with C, Bichkar, Universities Press.
- The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
- C by Example, Noel Kalicharan, Cambridge

Course Code	ENVIRONMENTAL STUDIES	L	T	P	Credits
1000171102		3	1	0	3

Course Overview: The course gives a broad view on the importance of environment and its conservation. It deals with distribution of biotic and a biotic components on the Earth, their over exploitation and its associated problems. It provides knowledge on different types of environmental pollutions and their control aspects. It develops practical orientation towards environmental concerns.

Course Objectives: The objectives of the course are:

- Classify, describe and explains the concept of Ecosystems and Environmental Engineering.
- Overall understanding of different types of natural resources and its conservation.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- An understanding of the environmental impacts of developmental activities and the importance of Environmental Management.
- Awareness on the social issues, environmental legislations and global treaties.

Course Outcomes: Give an outline of the natural resources and their importance for the sustenance of life and recognize the need to conserve the natural resources.

- Explain the concepts of the ecosystem and its function in the environment; explains the need for protecting the producers and consumers in various ecosystems and their role in the food web
- Elucidate the biodiversity of India and threats to biodiversity and conservation practices to protect the biodiversity
- Give a broad view on various attributes of pollution and their impacts and measures to reduce or control the pollution along with waste management practices.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Elucidate the natural resource & their importance for the sustenance of life and recognises the need to conserve natural resource	Understanding	PO2,PO5, PO6, PO7, PO12
CO2	Gives the broad view on the various attributes of pollution & and their impact & measure to reduce he pollution along with waste management	Applying	PO2,PO3, PO5, PO6, PO7, PO12

CO3	Debates on social issues both rural and urban environment possible means to combat the challenges and trace the legislation of India towards sustainability	Applying	PO1, PO2,PO5, PO6, PO7, PO12
CO4	Educates about Environmental Impact Assessment, Environmental Impact Statement & Environmental Audit	Analyzing	PO1, PO2, PO4, PO5, PO6, PO7, PO12

UNIT – I: **Multidisciplinary nature of Environmental Studies & Natural Resource**

Definition, Scope and Importance of Environmental Engineering – Sustainability: Stockholm and Rio Summit–Global

Forest resources– Use and over– exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources– Use and over utilization of surface and ground water– Floods, drought, conflict over water, dams– benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources

Food resources: World food problems, changes caused by non-agriculture activities- effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – II : Environmental Pollution

Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.

Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

UNIT – III: Social Issues and the Environment

Urban problems related to energy -Water conservation, rain water harvesting- Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Environmental Protection Act – Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

UNIT – IV : Ecosystems, Biodiversity & Conservation Ecosystems:

Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. -Energy flow in the ecosystem –Ecological succession.
- Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

Biodiversity and its conservation : Definition: Levels of Biodiversity, Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity -Threats to biodiversity: habitat loss, man-wildlife conflicts. -Endangered and endemic species of India – Conservation of biodiversity.

UNIT – V: Environmental Management and Field Studies

Impact Assessment and its significance various stages of EIA, Preparation of EMP and EIS, Environmental audit. Eco-tourism, Environmental Economics & Study of a Ecotourism spot in a local area, Visit to some Polluted site. Environmental diary.

Text Books:

1. Environmental Studies by R. Rajagopalan, 2nd Edition, 2011, Oxford UniversityPress.

2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, NewDelhi

3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education,Chennai

References:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.

2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers,Vijayawada

3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, NewDelhi

4. Environmental Studies by PiyushMalaviya, Pratibha Singh, Anoopsingh: Acme Learning, NewDelhi.

Course Code		L	T	P	Credits
1000171116	**ENGINEERING MECHANICS**	3	1	0	3

Objectives: The students completing this course are expected to understand the concepts of forces and its resolution in different planes, resultant of force system, forces acting on a body, their free body diagrams using graphical methods. They are required to understand the concepts of centre of gravity and moments of inertia and their application, analysis of frames and trusses, different types of motion, friction and application of work – energy method.

- The students are to be exposed to the concepts of force and friction, direction and its application.
- The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
- The students are to be exposed to concepts of centre of gravity
- The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.
- The students are to be exposed to motion in straight line and in curvilinear paths, its velocity and acceleration computation and methods of representing plane motion.
- The students are to be exposed to concepts of work, energy and particle motion

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Analyze the force systems for equilibrium conditions and able to draw free body diagram.	Analyzing	PO1,PO2,PO3
CO2	Evaluate the frictional forces between contact surfaces.	Applying	PO1,PO2,PO3
CO3	Able to differentiate between centroid and centre of gravity and determine Centroid, centre of gravity and second moment of area for composite sections.	Applying	PO1,PO2,PO3
CO4	Analyse the motion and calculate trajectory characteristics.	Analyzing	PO1,PO2,PO3

UNIT-I:

Introduction to Engg. Mechanics, Basic Concepts.

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

Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. LamisTheorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

UNIT –II Friction:

Introduction - limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT – III Centroid :

Centroids of simple figures (from basic principles) – Centroids of Composite Figures **Centre of Gravity :**Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, pappustheorem.

UNIT IV

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. **Mass Moment of Inertia:** Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

UNIT – V

Kinematics: Rectilinear and Curve linear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion.

Kinetics: Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

TEXTBOOKS:

1. Engineering Mechanics - S. Timoshenko & D. H. Young., 4th Edn , Mc Graw Hill, publications.

2. Engineering Mechanics: Statics and Dynamics 3rd edition, Andrew Pytel and Jaan Kiusalaas, C engage Learning publishers.

REFERENCES:

1. Engineering Mechanics statics and dynamics – R. C. Hibbeler, 11th Edn – Pearson Publ.

2. Engineering Mechanics, statics, J. L. Meriam, 6th Edn – Wiley India PvtLtd.

3. Engineering Mechanics, dynamics, J. L. Meriam, 6th Edn – Wiley India PvtLtd.

4. Engineering Mechanics, statics and dynamics – I. H. Shames, – PearsonPub.

5. Mechanics For Engineers, statics - F. P. Beer & E. R. Johnston – 5th Edn Mc Graw Hill,Publ.

6. Mechanics For Engineers, dynamics - F. P. Beer & E. R. Johnston – 5th Edn Mc Graw, HillPubl.

7. Theory & Problems of engineering mechanics, statics & dynamics – E. W. Nelson, C. L. Best & W.G. McLean, 5th Edn – Schaum's outline series - Mc Graw HillPubl.

8. Engineering Mechanics, Ferdinand. L. Singer, Harper –Collins.

9. Engineering Mechanics statics and dynamics, A Nelson, Mc Graw Hill publications

10. Engineering Mechanics, Tayal. UmeshPublications

Course Code		L	T	P	Credits
1000171121	COMMUNICATION SKILLS LABORATORY-I	0	0	3	2

Objectives: The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency in spoken English and neutralize mother tongue influence. To train students to use language appropriately to enhance Oratory Skills.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Demonstrate the usage of phonemes while referring to the dictionary	Understanding	PO5,PO9, PO10, PO12
CO2	Articulate with others by using proper functions.	Applying	PO5,PO9, PO10, PO12
CO3	Enact the roles with proper body language.	Applying	PO5,PO9, PO10, PO12
CO4	Communicate fluently with proper pronunciation	Analyzing	PO5,PO9, PO10, PO12

Unit -1: Letters and Sounds

Unit-2: Interaction 1

Unit-3: The Sounds of English

Unit-4: Interaction 2

PRESCRIBED LAB MANUAL:

Speak Well - Orient Black Swan Publishers

SUGGESTED BOOKS/ MANUALS AND SOFTWARES:

1. Interact - Orient Black Swan
2. Strengthen your Communication Skills by Maruthi Publishers
3. Personality Development and Soft Skills(Oxford University Press, New Delhi)
4. GRE-Barons-12thEdition
5. Objective English- R. S. Agarwal - S. Chand Publishers
6. The Rosetta stone Language Learning.
7. English in Mind Software

Course Code		L	T	P	Credits
1000171127	ENGINEERING CHEMISTRY LABORATORY	0	0	3	2

List of Experiments

Outcomes:

The student is able to acquire principles of various analytical techniques and their applications.

1. Determination of hardness of water using standard EDTA solution
2. Determination of Total alkalinity of a water sample.
3. Determination of Ferrous iron using standard $K_2Cr_2O_7$solution.
4. Determination of Copper using standard EDTA solution.
5. Determination of Iron in cement by Colorimetric method
6. Determination of Zinc by ferro cyanide method.
7. Determination of strong acid by Conductometrictitration
8. Determination of Acetic acid by Conductometrictitration
9. Determination of iron by Potentiometric method using$K_2Cr_2O_7$
10. Preparation of Phenol formaldehyde resin
11. Determination of Vitamin –C
12 Determination of flash and fire point of a lubricant oil.
13 Determination of viscosity of a lubricant by Red-wood viscometer.
14 Advanced design experiment - Preparation of Bio diesel.
15. Additional design experiment - Construction of Galvaniccell

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Learn and apply basic techniques used in Chemistry laboratory for small/medium scale water analysis.	Understanding	PO1,PO2, PO9
CO2	Estimate the metal ions present in a domestic/industry sample solutions.	Applying	PO1, PO2, PO7, PO12
CO3	Utilize the fundamental laboratory techniques for titrations and synthetic procedures.	Applying	PO1, PO2, PO9
CO4	Analyze data and gain experimental skills through instrumentation	Analyzing	PO1, PO2, PO5, PO9, PO12

***The student should carry out a minimum of 12 experiments. Reference**

Books:

1. A Textbook of Quantitative Analysis, Arthur J.Vogel.
2. Dr. Jyotsna Cherukuris (2012) Laboratory Manual of engineering chemistry-II, VGS TechnoSeries
3. Chemistry Practical Manual, LorvenPublications
4. K. Mukkanti (2009) Practical Engineering Chemistry, B.S.Publication

Course Code	COMPUTER PROGRAMMING	L	T	P	Credits
1000171128	LABORATORY	0	0	3	2

Learning Objectives:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concepts of writing a program in C language.
- Demonstrate Role of constants, variables, identifiers, operators, type conversion and other building blocks of CLanguage.
- Demonstrate Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Demonstrate Role of Functions involving the idea of modularity.

Outcomes:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and
- executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then
- convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

Exercise - 1 Basics

a) What is an OS Command, Familiarization of Editors - vi,Emacs.

b) Using commands like mkdir, ls, cp, mv, cat, pwd, andman.

c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Commandline.

Exercise - 2 Basic Math

a) Write a C Program to Simulate 3 Laws at Motion

b) Write a C Program to convert Celsius to Fahrenheit and viceversa

Exercise - 3 Control Flow - I

a) Write a C Program to Find Whether the Given Year is a Leap Year ornot.
b) Write a C Program to Add Digits & Multiplication of anumber

Exercise – 4 Control Flow - II

a) Write a C Program to Find Whether the Given Numberis
i) Prime Number
ii) Armstrong Number
b) Write a C program to print Floyd Triangle
c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

a) Write a C Program demonstrating of parameter passing in Functions and returning values.
b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch…case
b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of sin x and cos x and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays Demonstration of
arrays

a) Search-Linear.
b) Sorting-Bubble, Selection.
c) Operations on Matrix.

Exercises - 9 Structures

a) Write a C Program to Store Information of a Movie Using Structure
b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

a) Write a C Program to Access Elements of an Array Using Pointer
b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc ()function.
b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs

Exercise – 12 Strings

a) Implementation of string manipulation operations **with** libraryfunction.
   i) copy
   ii) concatenate
   iii) length
   iv) compare
b) Implementation of string manipulation operations **without** library function.
   i) copy
   ii) concatenate
   iii) length
   iv) compare

Exercise -13 Files

a) Write a C programming code to open a file and to print it contents onscreen.
b) Write a C program to copy files

Exercise - 14 Files (Continued)

a) Write a C program merges two files and stores their contents in another file.
b) Write a C program to delete a file

DETAILED SYLLABUS FOR

I-B.Tech

II-SEMESTER

Course Code		L	T	P	Credits
1000171201	**ENGLISH-II**	3	1	0	3

Course Objectives

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To enable the students to study and comprehend the prescribed lessons and subjects more effectively related to their theoretical and practical components.
- To develop the communication skills of the students in both formal and informal situations.
- Practice critical thinking to develop innovative and well-founded perspectives related to the students' emphases. Build and maintain healthy and effective relationships.
- How to convey a credible message and create concise messages using a structured writing process.
- Develop effective interpersonal communications kills.

Course Outcomes

After completing this Course, the student should be able to:

- Use English language, both written and spoken, competently and correctly.
- Improve comprehension and fluency of speech.
- Gain confidence in using English in verbal situations.
- Display competence in oral, written, and visual communication.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Enhance English Language skills through the concept of Technological advancements.	Understanding	PO6,PO9, PO10, PO12
CO2	Illustrate the life of eminent personalities for developing the skills of vocabulary and grammar	Applying	PO10, PO12

CO3	Emphasize the relevance of cultures and traditions for enhancing writing skills through literature	Applying	PO10, PO12
CO4	Correlate the importance of Environment and sustainability with an emphasis on language skills	Analyzing	PO10, PO12

Detailed Text: English Encounters

1. A Dilemma- A Layman looks at Science
2. Culture Shock
3. Lottery
4. Health Threats of Climate Change
5. A Chief Architect of Microsoft

Non-Detailed Text: Panorama

1. A Scarecrow - SatyajitRay
2. A Village Lost to the Nation - Krishna Chandra Pujari

Prescribed Books:

1. English Encounters, Maruthi Publications
2. Panorama, Oxford University Press

Course Code	ENGINEERING MATHEMATICS-II	L	T	P	Credits
1000171202		3	1	0	3

Course Overview:

The entire course material is divided into 5 modules covering duly recognized areas of theory and study. This course includes the topics of advanced Engineering Mathematics with more focus on the mathematical tools required to analyze the problems of Engineering & Scientific Professions. Some important topics of this course are Solutions of Algebraic and Transcendental Equations, Interpolation, Numerical integration and Numerical solution of ordinary differential equations, Fourier series and Fourier transforms. The main aim of this course is to provide a platform to the students to think, design, formulate and derive any problem encountered in real life situation.

Course Objectives:

1. To formulate and apply numerical techniques for root finding, interpolation.
2. To estimate definite integrals using Newton-Cotes quadrature formula.
3. To compute numerical solution of ordinary differential equations.
4. To determine the Fourier coefficients of a given function.
5. To analyze the characteristics and properties of Fourier transforms.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Determine numerical solution of non Linear equation
2. Compute Interpolating polynomial for the given data
3. Explain Numerical Solution of ODE and Numerical Integration.
4. Construct Fourier series expansion of periodic functions
5. Determine Fourier transform, Fourier sine and cosine transform of function

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Determine numerical solution of non Linear equation	Understanding	PO1,PO2, PO12
CO2	Compute Interpolating polynomial for the given data	Applying	PO1, PO2,PO12
CO3	Explain Numerical Solution of ODE and Numerical Integration.	Applying	PO1, PO2, PO4, PO12
CO4	Construct Fourier series and Fourier transforms for functions	Analyzing	PO1, PO2, PO3, PO5, PO6, PO12

UNIT-I: SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS & INTRODUCTION TO FINITEDIFFERENCES:

Bisection method - Regula-falsi method - Iteration method - Newton-Raphson method. Finite differences: Forward, Backward and Central differences - Other difference operators and relations between them - Differences of a polynomial – To find missing terms.

UNIT-II: INTERPOLATION

Newton's forward interpolation, Newton's backward interpolation, Gauss Forward and Backward interpolation, Interpolation with unequal intervals – Newton's divided difference - Lagrange's interpolation.

UNIT-III: **NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS AND NUMERICALINTEGRATION**:

Single step methods: Taylor's series method –Picard's Method - Euler's and modified Euler's Methods - Fourth order Runge-Kutta method for solving first order equations. Numerical Integration: Trapezoidal Rule, Simpson's 1/3rdRule, Simpson's 3/8thRule

UNIT-IV: FOURIER SERIES:

Introduction- Determination of Fourier coefficients – Even and Odd functions – Change of interval– Half-range sine and cosine series-Practical Harmonic Analysis.

UNIT-V : FOURIER TRANSFORMS:

Fourier integral theorem (only statement) – Fourier sine and cosine integrals – Fourier transforms-Fourier Sine and Cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

TEXT BOOKS:

1. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Edition.
2. Engineering Mathematics, B.V.Ramana, Tata McGrawHill.
3. Mathematical Methods – Dr.Ravindranath & Dr.P. Vijaya Lakshmi, HimalayaPub.
4. Engineering Mathematics, P.Sivaramakrishna Das, C.Vijayakumari , 2017Pearson Education Services Pvt. Ltd

Course Code	ENGINEERING MATHEMATICS-III	L	T	P	Credits
1000171203		3	1	0	3

Course Overview:

This course focuses on basic theoretical concepts and advanced Engineering Mathematics. This course helps the students to understand mathematical tools required in the analysis of problems in Engineering and Scientific Professions. The topics included are Solution for linear systems, Eigen values & Eigen vectors, linear transformations, partial differential equations, Vector integral theorems(Green's, Stoke's and Gauss's divergence theorems). Thus mathematical skills derived from this course enables the students to design and solve the problems.

Course Objectives:

1. To explain the concepts of matrix algebra and methods of solving system of linear equations.
2. To compute Eigen values and Eigen vectors of real and complex matrices.
3. To apply properties of partial differential equations to obtain solution for science and engineering problems.
4. Classify and Solve partial differential equations
5. Generalize calculus to vector functions and to compute line, surface and volume integrals.

Course Outcomes:

Up on successful completion of this course, student will be able to:

1. Apply elementary transformations to reduce matrices to echelon form, normal form and hence find their rank.
2. Solve the system of linear equations and compute Eigen values and Eigen vectors of a square matrix.
3. Compute directional derivative and the gradient of functions of several variables.
4. Infer vector integral theorems to evaluate line, surface and volume integrals.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Solve simultaneous linear equations numerically using rank of a matrix and compute Eigen values and Eigen vectors of a square matrix.	Understaing	PO1,PO2, PO3, PO12
CO2	Identify/classify and solve partial differential equations.	Applying	PO1, PO2, PO3, PO6, PO8
CO3	Calculate gradient of a scalar function, divergence and curl of a vector function.	Applying	PO1, PO2, PO3, PO12
CO4	Determine line, surface and volume integrals using appropriate integral theorems.	Analyzing	PO1, PO2, PO6, PO12

UNIT-I: LINEAR SYSTEMS OF EQUATIONS:

Introduction-Rank-Echelon form-Normal form-Solution of Linear systems - Gauss elimination- Gauss Seidel methods-Applications of matrix methods to finding current in the circuits.

UNIT-II: EIGEN VALUES-EIGEN VECTORS AND QUADRATIC FORMS:

Introduction-Eigen values-Eigen vectors-Properties(without proofs)-Cayley Hamilton theorem (without proof) - Inverse and power of a matrix by using Cayley Hamilton theorem, Diagonalisation of matrix-Quadratic forms-Reduction of Quadratic form to Canonical form-Rank-Index-Signature-Nature-Applications of Eigen value and Eigen vectors to Free Vibrations of two mass system.

UNIT-III: PARTIAL DIFFERENTIAL EQUATIONS:

Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions- Solutions of first order linear (Lagrange's) equation and nonlinear (standard type) equations- Equations reducible to standard forms.

UNIT-IV: VECTOR DIFFERENTIATION:

Differentiation of vectors-Scalar and Vector point functions- Gradient of a scalar field and directional derivatives- Divergence and Curl of a vector field and its physical interpretation-Solenoidal and Irrotational of a vector- Vector identities.

UNIT-V: VECTOR INTEGRATION:

Line integral- Circulation, Work done, Surface and Volume integrals-Vector integral theorems: Green's, Stoke's and Gauss's Divergence theorems(without proofs) and related problems.

TEXT BOOKS:

1. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, NewDelhi.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley StudentEdition.
2. Advanced Engineering Mathematics, Greenburg, 2ndEd, Pearsoneducation.
3. Engineering Mathematics, N.P.Bali, Laxmi Publications (P)Ltd.
4. Engineering Mathematics, B. V. Ramana, TataMcGrawHill Publishing Co.Ltd.
5. Engineering Mathematics, P.Sivaramakrishna Das, C.Vijayakumari , 2017 Pearson India Education Services Pvt.Ltd
6. Advanced Engineering Mathematics, Cengage India , by Peter V O'Neil

Course Code	ENGINEERING PHYSICS	L	T	P	Credits
1000171204		3	1	0	3

Course Objective:

To introduce physics of all the core subjects of engineering for better understanding.

Learning Objectives:

- Impart concepts of Optical Interference, Diffraction and Polarization required to design instruments with higher resolution - Concepts of coherent sources, its realization and utility optical instrumentation.
- Study the Structure-property relationship exhibited by solid crystal materials for their utility.
- Tap the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.
- To explore the Nuclear Power as a reliable source required to run industries
- To impart the knowledge of materials with characteristic utility in appliances.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Describe the wave phenomena and working principle of optical instruments.	Understanding	PO1,PO2, PO3, PO9, PO12
CO2	Apply the knowledge of acoustics and ultrasonics for characterization of acoustics design and non-destructive testing.	Applying	PO1, PO2, PO9, PO12
CO3	Understand the concepts of nuclear reactions for construction and working of nuclear reactors.	Applying	PO1, PO2, PO9, PO12
CO4	Discuss the structural, magnetic and electrical properties of materials.	Analyzing	PO1, PO2, PO9

UNIT-I.INTERFERENCE:

Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – construction and basic principle of Interferometers.

UNIT-II.DIFFRACTION:

Fraunhofer diffraction at single slit cases - Circular Aperture (Qualitative treatment only) - Grating equation - Resolving power of a grating, Telescope and Microscopes. **POLARIZATION:** Types of Polarization – Double refraction - Quarter wave plate and Half

Wave plate – Working principle of Polarimeter (Sacharimeter)

UNIT-III. **ACOUSTICS:** Reverberation time - Sabine's formula – Acoustics of concert-hall. **ULTRASONICS:** Production - Ultrasonic transducers- Non- Destructive Testing Applications.

UNIT-IV CRYSTALLOGRAPHY & X-RAYDIFFRACTION:

Basis and lattice – Bravais systems- Symmetry elements- Unit cell- packing fraction – coordination number- Miller indices – Separation between successive (h k l) planes – Bragg'slaw.

NUCLEAR ENERGY – SOURCE OF POWER:

Mass defect & Binding Energy – Fusion and Fission as sources – Fast breeder Reactors.

UNIT-V MAGNETISM: Classification based on Field, Temperature and order/disorder – atomic origin – Ferromagnetism- Hysteresis- applications of magnetic materials (Para and Ferro)

DIELECTRICS: Electric Polarization – Dielectrics in DC and AC fields – Internal field – Clausius Mossoti Equation - Loss, Breakdown and strength of dielectric materials – Ferroelectric Hysteresis and applications.

Outcome:

Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study Acoustics, crystallography magnetic and dielectric materials enhances the utility aspects of materials.

Text Books:

1. A Text book of Engineering Physics – by Dr.M.N.Avadhanulu and Dr.P.G.Kshirasagar, S.Chand& Company Ltd.,(2014)
2. VK Mehta, Principles of electronics,s.chand.

Reference Books:

1. Searls and Zemansky. University Physics,2009.
2. Mani P. Engineering Physics I. Dhanam Publications,2011.
3. MarikaniA. Engineering Physics. PHI Learning Pvt., India,2009.
4. Palanisamy P.K. Engineering Physics. SCITECH Publications,2011.
5. Rajagopal K. Engineering Physics. PHI, New Delhi,2011.
6. Senthilkumar G. Engineering Physics I. VRB Publishers, 2011.
7. Robert L. Boylestad. Electronic Devices And Circuit Theory PRENTICE HALL, 7thEd.
8. Mani Naidu S. Engineering Physics, Second Edition, PEARSON Publishing,2011.
9. Arumugam M. Engineering Physics. Anuradha publishers, 2010
10. Gaur R.K. and Gupta S.L. Engineering Physics. Dhanpat Rai publishers,2009.

Course Code	BASIC ELECTRICAL AND ELECTRONICS ENGINEERING	L	T	P	Credits
1000171205		3	1	0	3

Preamble: This course covers the topics related to analysis of various electrical circuits, operation of various electrical machines, various electronic components to perform well in their respective fields.

Learning Objectives:

- To learn the basic principles of electrical law's and analysis of networks.
- To understand the principle of operation and construction details of DC machines.
- To understand the principle of operation and construction details of transformer.
- To understand the principle of operation and construction details of alternator and3-
- Phase induction motor.
- To study the operation of PN junction diode, half wave, full wave rectifiers and OPAMPs.
- To learn the operation of PNP and NPN transistors and various samplifiers.

Outcomes:

- Able to analyse the various electrical networks.
- Able to understand the operation of DC generators,3-point starter and conduct the Swinburne's Test.
- Able to analyse the performance of transformer.
- Able to explain the operation of 3-phase alternator and 3-phase induction motors.
- Able to analyse the operation of half wave, full wave rectifier's and OP-AMPs.
- Able to explain the single stage CE amplifier and concept of feedback amplifier.

UNIT–I: ELECTRICAL CIRCUITS:

Basic definitions, Types of network elements, Ohm's Law, Kirchhoff's Laws, Inductive networks, Capacitive networks, series, parallel circuits and star-delta and delta-star transformations.

UNIT–II: DC MACHINES:

Construction and Principle of operation of DC generator – EMF equation - types of DC machines –torque equation – applications – three point starter, Swinburne's Test, speed control of DC motor.(Simple Numerical Problems only)

UNIT – III: AC MACHINES:

Construction and Principle of operation of single phase transformers –e.m.f equation – losses-OC and SC Test –efficiency and regulation. Construction and Principle of operation of alternators – Construction and principle of operation of 3- Phase synchronous motor- Construction and principle of operation of 3-Phase induction motor – slip-torque characteristics - efficiency – applications.(Simple numerical problems only)

UNIT – IV: ELECTRICAL AND ELECTRONIC MEASURING INSTRUMENTS:

Classification of measuring instruments- Operating principle of moving coil and moving iron instruments (Ammeter, Voltmeter, Wattmeter, Energy meter) - Electronic Voltmeters (AC &DC), Multimeters.(Only Basic TheoreticalConcepts)

UNIT – V: SEMICONDUCTOR DEVICES ANDAPPLICATIONS:

PN junction diode, VI Characteristics, Diode applications (Half wave & bridge rectifiers), Bipolar Junction transistor - NPN and PNP- construction, operation, characteristics (CB and CE configurations) - transistor as an amplifier-concept of feedback- Introduction to SCR, UJT, IGBT and MO SFET. (Basic symbols and V-I characteristics)

TEXT BOOKS:

1. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI2006.
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor & Francis Group

REFERENCES:

1. Basic Electrical Engineering, M. S. Naidu and S. Kamakshiah, TMH Publications
2. Fundamentals of Electrical Engineering, Rajendra Prasad, PHI Publications, 2nd edition
3. Basic Electrical Engineering, Nagsarkar, Sukhija, Oxford Publications, 2nd edition
4. Industrial Electronics, G. K. Mittal,PHI

Course Code	ENGINEERING DRAWING	L	T	P	Credits
1000171206		3	1	0	3

Objective: Engineering drawing being the principle method of communication for engineers, the objective to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

- To introduce the use and the application of drawing instruments and to make the students construct the polygons, curves and various types of scales. The student will be able to understand the need to enlarge or reduce the size of objects in representing them.
- To introduce orthographic projections and to project the points and lines parallel to one plane and inclined to other.
- To make the students draw the projections of the lines inclined to both the planes.
- To make the students draw the projections of the plane inclined to both the planes.
- To make the students draw the projections of the various types of solids in different Positions inclined to one of the planes.
- To represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Understand the use of drawing instruments to construct the polygons and curves	Understanding	PO1,PO2,PO3
CO2	Learn the principle of orthographic projections. Draw Orthographic projections of points, lines.	Analyzing	PO1,PO2,PO3,PO12
CO3	Draw the various types of planes and solids its views in different Positions	Analyzing	PO1,PO2,PO3,PO12
CO4	Draw isometric views of simple objects	Analyzing	PO1,PO2,PO3,PO12

UNIT I: Polygons, Construction of regular polygons using given length of a side; Ellipse, arcs of circles and Oblong methods; Scales – Vernier and Diagonal scales.

UNIT II: Introduction to orthographic projections; projections of points; projections of straight lines

Parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane.

UNIT III: Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

UNIT IV: Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT V: Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes. Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

Text Books:

1. Engineering Drawing, N. D. Butt, Chariot Publications
2. Engineering Drawing, K. L. Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Graphics, P.I. Varghese, McGraw Hill Publishers

Reference Books:

1. Engineering Graphics for Degree, K. C. John, PHI Publishers
2. Engineering Drawing, Agarwal & Agarwal, Tata McGraw Hill Publishers
3. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, NewAge

Course Code	ENGLISH COMMUNICATION SKILLS LAB-2	L	T	P	Credits
1000171221		0	0	3	2

Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets: To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts. Further, they would be required to communicate their ideas relevantly and coherently in writing. **Course outcomes**: The proposed course to enable students to use 'good' English and perform the following: Gather ideas and information, to organize ideas relevantly and coherently.

Engage in debates. Participate in group discussions. Face interviews. Write project/research reports/technical reports. Make oral presentations.

Writing formal letters and to take part in social and professional communication.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Demonstrate the usage of phonemes while referring to the dictionary	Understanding	PO5,PO9, PO10, PO12
CO2	Articulate with others by using proper functions.	Applying	PO5,PO9, PO10, PO12
CO3	Enact the roles with proper body language.	Applying	PO5,PO9, PO10, PO12
CO4	Communicate fluently with proper pronunciation	Analyzing	PO5,PO9, PO10, PO12

Unit-1: Pronouncing Words

Unit-2: Interaction 3

Unit-3: Stress & Intonation

Unit-4: Interaction 4

PRESCRIBED LAB MANUAL:

Speak Well - Orient Black Swan Publishers

SUGGESTED BOOKS/ MANUALS AND SOFTWARES:

1. Interact - Orient Black Swan
2. The Rosetta Stone English Library
3. Language in Use
4. English in Mind

Course Code	ENGINEERING PHYSICS LABORATORY	L	T	P	Credits
1000171222		0	0	3	2

(Any 8 of the following listed experiments)

Course Objectives:

- The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
- Design of circuits using new technology and latest components and to develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

Outcome:

- Hands on experience for all the instruments and better understanding of theory.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Experimentation of laws of vibrations in strenteched string	Understanding	PO1,PO2, PO9, PO12
CO2	Determination of velocity of sound, rigidity modulus of a wire, acceleration due to gravity, radius of gyration and Planck's constant.	Applying	PO1, PO2, PO9, PO12
CO3	Analyze the voltage vs. current characteristics of Zener diode and temperature vs. resistance characteristics of a thermistor	Applying	PO1, PO2, PO9
CO4	Demonstration of formation Newton's rings, diffraction pattern using grating and induced magnetic field in a cirucuclar coil.	Analyzing	PO1, PO2, PO9

List of Experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence
2. Newton's rings –Radius of Curvature of Plano_Convex Lens.
3. Determination of Rigidity modulus of a material- Torsional Pendulum.
4. Determination of Acceleration due to Gravity and Radius of Gyration-Compound Pendulum.
5. Melde's experiment – Transverse and Longitudinal modes.
6. Verification of laws of stretched string –Sonometer.
7. Determination of velocity of sound – Volume resonator.
8. L C R Senes Resonance Circuit
9. Study of I/V Characteristics of Semi conductordiode
10. I/V characteristics of Zenerdiode
11. Thermistor characteristics – Temperature Coefficient
12. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
13. Determination of wavelength of laser source using dirreractiongrating
14. Determination of Planck's constant using photocell

Course Code		L	T	P	Credits
1000171224	**ENGINEERING WORKSHOP**	0	0	3	2

Course Objective:

To impart hands-on practice on basic engineering trades and skills.

Note: At least two exercises to be done from each trade.

Trade:

Carpentry	1. T-Lap Joint 2. Cross Lap Joint 3. Dovetail Joint 4. Mortise and Tenon Joint
Fitting	1. Vee Fit 2. Square Fit 3. Half Round Fit 4. Dovetail Fit
BlackSmithy	1. Round rod to Square 2. S-Hook 3. Round Rod to Flat Ring 4. Round Rod to Square headed bolt
HouseWiring	1. Parallel / Series Connection of three bulbs 2. Stair Case wiring 3. Florescent Lamp Fitting 4. Measurement of Earth Resistance
TinSmithy	1. Taper Tray 2. Square Box without lid 3. Open Scoop 4. Funnel

PROGRAM STRUCTURE

FOR

II-B.Tech

I & II SEMESTERS

DEPARTMENT OF CIVIL ENGINEERRING
PROGRAM STRUCTURE

II B.Tech **I Semester**

S.No	Course Code	Course Title	L	T	P	Credits
1	1000172101	Probability & Statistics	3	1	0	3
2	1001172102	Concrete Technology	3	1	0	3
3	1001172103	Strength of Materials –I	3	1	0	3
4	1001172104	Building Materials and Construction	3	1	0	3
5	1001172105	Surveying –I	3	1	0	3
6	1001172106	Fluid Mechanics	3	1	0	3
7	1001172121	Surveying Field Work -1 Lab	0	0	3	2
8	1001172122	Concrete Technology Lab	0	0	3	2
9	1099172103	Professional Ethics & Human Values	2	**1**	0	**0**
Total Credits						**22**

II B.Tech **II Semester**

S.No	Course Code	Course Title	L	T	P	Credits
1	1001172201	Building Planning and Drawing	3	1	0	3
2	1001172202	Strength of Materials – II	3	1	0	3
3	1099172203	Management Science	2	1	0	0
4	1001172204	Hydraulics & Hydraulics Machinery	3	1	0	3
5	1001172205	Surveying-II	3	1	0	3
6	1001172206	Structural Analysis – I	3	1	0	3
7	1001172207	Transportation Engineering – I	3	1	0	3
8	1001172221	Fluid Mechanics & Hydraulics Machinery Lab	0	0	3	2
9	1001172222	Strength of Materials Lab	0	0	3	2
10	1001172231	Industrial visit	0	0	3	2
Total Credits						**24**

DETAILED SYLLABUS FOR

II-B.Tech

I-SEMESTER

Course Code	PROBABILITY AND STATISTICS	L	T	P	Credits
1000172101		3	1	0	3

Course Overview:

Thecoursematterisdividedinto5 chapters covering duly-recognized area soft theory and study. This Course deals with more advanced Statistics topics which provide students with the relevant statistical tools required in the analysis of problems in engineering and scientific professions. The topics covered include Probability and Random variables, Distributions, Sampling theory, Estimation, Test of Hypothesis, Correlation and Curve fitting. The mathematical skills derived from this course forma necessary base to analytical and design concepts encountered in the programme.

Course Objectives:

1. To explain fundamental concepts of probability theory.
2. To develop an understanding of the role of discrete and continuous probability distributions in science and engineering.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Recall the basics of permutations and combinations in probability.	Remembering	2
CO2	Classify discrete and continuous distribution functions.	Understanding	2
CO3	Determine the cumulative distribution function, mean and variance of discrete and continuous random variables.	Understanding	2
CO4	Calculate probabilities using normal distribution and describe sampling distribution of means.	Applying	2
CO5	Describe and compute confidence intervals for the mean of a population. Prepare null and alternative hypothesis concerning single mean and test its validity based on random samples.	Understanding	2
CO6	Prepare null and alternative hypothesis concerning two mean, proportions and variances and test its validity based on random samples. Determine Linear and non linear regression for the given data.	Understanding	2
CO7	Calculate correlation coefficient for the given bi variate data.	Applying	2

Unit-I:

Random Variables: Review on Probability, Random experiment, sample space, events, Random variable, Discrete and Continuous Distributions, mathematical expectation and properties, Moment generating Functions.

Outcome:

- Able to recall the basics of permutations and combinations in probability.

Activity/Event:

A Case Study on distributions

Unit-II:

Distributions: Binomial, Poisson distributions (MGF, Mean and Variance), Normal distribution (MGF, area and symmetric properties) -related properties, Gamma and Weibull distributions.

Outcome:

- Able to classify discrete and continuous distribution functions.
- Able to determine the cumulative distribution function, mean and variance of discrete and continuous random variables.

Activity/Event:

A Case Study on Normal distribution

Unit-III:

Introduction, Population and samples, Sampling distribution of mean for large and small samples (with known and unknown variance), proportion - Sampling distribution of sums and differences of means and differences. Point and interval estimators for means and proportions (for large and small samples), Maximum error.

Outcome:

- Able to compute confidence intervals for the mean of a population.

Activity/Event:

A Case study on sampling distributions and sampling techniques

Unit-IV:

Introduction, Null and alternative hypothesis, Type I and Type II errors, one tail, two-tail tests. Tests concerning means, proportions and their differences using Z-test. Student's t-test, F-test and χ^2 test of goodness of fit and independence of attributes, ANOVA one way and two way classifications.

Outcome:

- Able to prepare null and alternative hypothesis concerning two mean, proportions and variances and test its validity based on random samples

Activity/Event:

A case study on testing of proportions and means

Unit-V:

Introduction, simple correlation, regression, applications, fitting of straight line, second degree curves, exponential and power curves by method of least squares.

Outcome:

- Able to determine linear regression for the given data.
- Able to calculate correlation coefficient and predicting the values for the given bi variate data.

Activity/Event:

A Case study on predicting the relation and future values of bi-variate data

Text Book

1. Probability & Statistics for Engineers by Miller& John E. Freund, Prentice Hall of India.
2. Higher Engineering Mathematics by B.S.Grewal,42nd edition, Khanna publishers

Reference Books:

1. Probability & statistics for Engineers and Scientists by R.E.Walpole&S.L.Myeres Pearson
2. Fundamentals of Applied Statisitics byS.C.Gupta&V.K.Kapoor ,S.Chand& Sons

Course Code	CONCRETE TECHNOLOGY	L	T	P	Credits
1001172102		3	1	0	3

Course Overview:

Concrete Technology is the art and science of proportioning economical and ecological concrete with available raw materials meeting the strength and durability criteria and workability constraints including detailed study of durability, fracture mechanics and elastic properties of concrete and its ingredients under various conditions and combinations

Course Objectives:

The students will be taught

1. The types and classification of aggregates, cement and admixtures & manufacturing process of cement
2. The different tests on fresh concrete and factors effecting workability
3. The different tests on Hardened Concrete and Elasticity, Creep & Shrinkage of concrete
4. The Indian standard concrete mix design, its proportions and factors influencing
5. The special concretes include ready mixed concrete, shotcrete, light weight concrete etc.

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe types and classification of aggregates, cement and admixtures & manufacturing process of cement	Understanding	1,2
CO2	Describe different tests on fresh concrete and factors effecting workability	Understanding	1,2
CO3	Describe different tests on Hardened Concrete and Elasticity, Creep & Shrinkage of concrete	Understanding	1,2
CO4	Describe the Indian standard concrete mix design, its proportions and factors influencing	Applying	1,2
CO5	Describe special concretes include ready mixed concrete, shotcrete, light weight concrete etc	Applying	1,2

Unit-I:

Cement: Manufacture of Portland cement by dry process- approximate oxide composition limits of OPC- Bogue's compounds- Hydration of cement-heat of hydration- structure of hydrated cement. Test`s on physical properties of cement- Different grades and Types of cement.

Chemical And Mineral Admixtures : Functions of admixtures- accelerators- retarders-air entraining admixtures- plasticizers and super plasticizers- water proofers- fly ash- silica fume-ground granulated blast furnace slag.

Aggregates: Classification of aggregate – Particle shape & texture – strength &other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

Outcome:

- Able to perform various tests on different grades and types of cement for finding their physical properties
- Able to know functionaries of various chemical and mineral admixtures
- Able to perform aggregate classification and find mechanical properties of aggregates by conducting tests

Activity/Event:

Collect the different grades of cement, different admixtures and mix it separately. Then test their strengths and compare to indicate/suggest their suitability for different constructions

Unit-II:

Fresh Concrete: Workability – Factors affecting workability – Measurement of work ability 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.

Outcome:

- Able to perform different tests for measurement of workability
- Able to perform mixing, vibration and manufacturing of concrete

Activity/Event:

Collect the materials include different grades of cement, fine aggregate and coarse aggregate and prepare cubes for different concrete mixes. Then after 48 hours test the strength of all cubes and compare them to indicate/suggest their suitability to various constructions.

Unit-III:

Hardened Concrete: Water/Cement ratio – Abram's Law – Gel space ratio – Maturity concept – Relation between compressive & tensile strength - Curing.

Testing Of Hardened Concrete: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests- Pull-out test, Non-destructive testing methods – codal provisions for NDT

Elasticity, Creep & Shrinkage: Modulus of elasticity–Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage

Outcome:

- Able to perform the different tests of hardened concrete
- Able to differentiate the Elasticity, Creep and Shrinkage

Activity/Event:

Collect the materials include different grades of cement, fine aggregate and coarse aggregate and prepare cubes for different concrete mixes. Then after 28 days moist curing test the strength of all the cubes and compare them to indicate/suggest their suitability to various constructions.

Unit-IV:

Mix Design: Basic considerations for concrete mix design-factors influencing the choice of mix proportions- Indian standard method of concrete mix design, Nominal mix design as per IS 456

Outcome:

- Able to design the concrete mix proportion as per Indian Standard method and Normal mix design as per IS 456

Activity/Event:

Choose any Standard Mix, Example M25 and collect the material include cement, fine aggregate and coarse aggregate. Test the required properties of the materials for calculating volume of water content, cement, fine aggregate and coarse aggregates for the standard Mix. Then calculate the mix proportion and based on the mix proportions cast cubes for calculating compressive strengths. Finally validate the compressive strength values with characteristic strength of the M25.

Unit-V:

Special Concretes: Ready mixed concrete- Shotcrete -Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete.

Outcome:

- Able to differentiate the special concretes like Ready mixed concrete, Shot crete, Cellular concrete and so on

Activity/Event:

Collect the materials include various types of cement, fine aggregate and coarse aggregates as per requirements of special concrete. Then the cast the cubes for special concrete to find the compressive strengths. Validate the compressive strength values with the standard values of corresponding special concrete

Text Books:

1. Concrete technology by A.R.Santhakumar, Oxford University Press.
2. Concrete technology by M.S.Shetty, S.Chandlkuo& Company Pvt. Ltd., New Delhi.

Reference Books:

1. Properties of Concrete by A.M.Neville,Pearson,4th edition.
2. Concrete technology by M.L.Gambhir, Tata McGraw-Hill Publishing company Ltd., New Delhi.

Course Code	STRENGTH OF MATERIALS-I	L	T	P	Credits
1001172103		3	1	0	3

Course Overview:

This course covers the simple stresses and strains of steel bars, strain energy, analysis of shear force bending moments of beams, analysis of the beams subjected to flexural and shear stresses, calculation of deflection of beams by various methods and design & analysis of thin and thick cylinders.

Course Objectives:

The students will be taught

1. The simple stresses and strains of steel bars and strain energy
2. The shear force and bending moment of beams
3. The flexural stresses and shear stresses in beams
4. The deflection of beams by various methods
5. The thin and thick cylinder of simple and compound

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Determine the simple stresses and strains of steel bars and strain energy	Remembering	1
CO2	Compute the shear force and bending moment of beams	Remembering	1
CO3	Determine theflexural stresses and shear stresses in beams	Understanding	1
CO4	Compute the deflection of beams by various methods	Understanding	1,6
CO5	Analyze and design of thin and thick cylinders of simple and compound	Understanding	1

Unit-I:

Simple Stresses And Strains:

Introduction-Materials-Elasticity and Plasticity-Definitions of Stress and Strains –Types of Stresses and Strains-Elastic limit-Hooke's Law-Stress Strain Relationship-Stress Strain diagram for mild steel-Working Stress-Factor of Safety-Lateral Strain- Poisson's Ratio-Volumetric Strain-E, C, K and their relationships-Bars of Varying Cross Section-Self weight deformation-Composite bars-Temperature Stresses.
Strain Energy-Resilience-Toughness- Gradual, Sudden, Impact and Shock Loadings-Simple Applications

Outcome:

- Able to differentiate Elasticity and Plasticity, Stresses and Strains
- Able to differentiate Young's Modulus, Modulus of Rigidity and Bulk Modulus
- Able to compute the simple stresses and strains of steel bars in uniform and Varying cross sections
- Able to derive strain energy equations for gradual, Impact and shock loadings

Activity/Event :

The test specimens with different sizes and different materials are to be prepared to test those in UTM testing machine to find their tensile strengths. Analyze also the stress-strain relationships for each specimen. Based on their strengths and analysis choose the suitable specimens for the various construction elements.

Unit-II:

Shear Force And Bending Moment:

Definition of beams- Different Types of beams-Different Types of Loadings-Concept of Shear Force and Bending Moment-S.F and B.M diagrams for Cantilevers, Simply Supported and Overhanging beams subjected to Point Load, UDL , UVL, Couples and combination of these loads-Points of contra flexure-Relation between S.F,B.M and Rate of loading at a section of beam

Outcome:

- Able to compute the shear force and bending moment for different beams with different loading

Activity/Event:

Seminar on Advanced topics related to various inclined loads on various beams in finding shear force and bending moments followed by their drawing.

Unit-III:

Flexural Stresses in Beams:

Definitions –Simple or Pure Bending-Theory of Simple Bending-Assumptions-Neutral Axis-Bending Stress-Bending Stress Distribution-Derivation of Bending Equation: M/I=F/Y=E/R-Determination of Bending Stress-Section Modulus of Rectangular and Circular Sections(Solid and Hallow),I,T, Angle and channel Sections-Design of Simple Beam Equations-Beams of Uniform Strength

Shear Stresses: Derivation of formula-Shear Stress Distribution across various beams sections like Circular, Triangular, I ,T, angle Sections

Outcome:

- Able to derive bending equation i.e., M/I=F/Y=E/R
- Able to compute the flexural stresses and shear stresses in beams of various cross sections

Activity/Event:

The test specimens with different sizes and different materials are to be prepared to test those in UTM testing machine to find their bending. Based on their strengths and analysis choose the suitable specimens for the various construction elements.

Unit-IV:

Deflection Of Beams:

Member bending in to Circular arc-Slope , Deflection and Radius of Curvature-Differential Equations for elastic line of a beam-Double Integration Method and Macaulays Method-Determination of Slope and deflection for cantilever and simply supported beam subjected to point loads-UDL,UVL-Mohrs theorem-Moment area method-application simple cases including overhang beams-Conjugate beam method

Outcome:

- Able to derive the slope, deflection and radius of curvature equation
- Able to compute the Slope and deflection of various beams by Double integration method, Macaulays Method and Moment Area Method

Activity/Event

The simply supported, cantilever and overhang beams are to be made to find the deflections at various locations for different loading conditions and followed by determination of slopes from the deflection values. Finally validate the deflection and slope values with theoretical values

Unit-V:

Thin Cylinders: Thin Seamless Cylindrical Shells-Derivation of Formula for Longitudinal and Circumferential Stresses-Hoop, Longitudinal and Volumetrical Strain –Change in diameter and volume of thin cylinders-Thin Spherical shells

Thick Cylinders: Introduction Lames theory for thick cylinders –Derivation of Lames formulae-Distribution of Hoop and Radial Stress across Thickness-Design of thick cylinders-Compound cylinders

Outcome:

- Able to derive formula for Longitudinal and Circumferential Stresses in thin cylinders and Lames formulae in thick cylinders
- Able to analyze the Hoop and Longitudinal stresses in thin cylinders, Hoop and Radial stresses in thick cylinders
- Able to design the thin cylinders and thick cylinders

Activity/Event:

Seminar on advanced topics related to wire winding in thin cylinders and shrinkage in thick cylinders.

Text Books:

1. Introduction to text book of Strength of materials by R.K.Bansal, Laxmi publications Pvt. Ltd., New Delhi.
2. Introduction to text book of Strength of Material by U.C. Jindal, Galgotia publications.
3. Strength of materials by R. Subramanian, Oxford university press, New Delhi
4. Strength of materials by S.Ramamrutam, Dhanpat Rai Publishing Company, New Delhi

Reference Books:

1. Mechanics of Solid, by Ferdinandp Beer and others, Tata Mc.Grawhill Publications 2000.
2. Strength of Materials by Schaum'sout line series, Mc. Grawhill International Editions.
3. Strength of Materials by S. Ramakrishna and R.Narayan, Dhanpat Rai publications.
4. Strength of materials by R.K.Rajput, S.Chand& Co, New Delhi.
5. Strength of Materials by A.R.Basu, Dhanpat Rai & Co, Nai Sarah, New Delhi.
6. Strength of Materials by L.S.Srinath et al., Macmillan India Ltd., Delhi.
7. Strength of Materials by BhaviKatti.

Course Code	BUILDING MATERIALS AND CONSTRUCTION	L	T	P	Credits
1001172104		3	1	0	3

Course Overview:

This subject gives a description about different types of materials used in building construction for members like foundation, masonry, arches, lintels, balcony, roof, floor, doors, windows, stairs, plastering, painting and other general topics. Properties of various construction materials, their uses and different applications are discussed in this subject. It provides information about all the building materials generally used, its types, properties and uses. Thus, this subject becomes necessary for civil engineers to learn about basic construction materials.

Course Objectives:

The students will be taught

1. The properties, characteristics, uses and classification of stones, bricks and tiles
2. The types of masonry and the properties, types, defects and alternatives of wood
3. The ingredients, constituents, properties, types, methods of manufacturing of lime and cement
4. The building components include lintels, staircases, floors, roofs along with trusses
5. The Finishings include proofing, plastering, pointing, washing, paints along with formwork and scaffolding

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe the properties, characteristics, uses, classification and manufacturing processes of stones, bricks & tiles	Understanding	1
CO2	Describe the types of masonry and the properties, types, defects and alternatives of wood	Understanding	1
CO3	Describe the ingredients, constituents, properties, types, methods of manufacturing of lime and cement	Understanding	1
CO4	Distinguish and Describe the building components include lintels, staircases, floors, roofs and trusses	Applying	1
CO5	Distinguish the finishings include proofing, plastering, pointing, washing, paints and describe formwork and scaffolding	Understanding	1

Unit-I:

Stones, Bricks and Tiles: Properties of building stones, relation to their structural requirements, classification of stones , stone quarrying , precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacturing of bricks. Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminum, Gypsum, Glass and Bituminous materials

Outcome:

- Able to test the Stones, Bricks and Tiles to find the strengths

Activity/Event

Collect the different types of bricks, stones and tiles for testing their corresponding strengths in the laboratory. Then analyze their strengths to choose their suitability for various constructions

Unit-II:

Masonry: Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls.
Wood: Structure, Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. alternative materials for wood, Galvanized Iron, Fibre Reinforced Plastics, Steel, Aluminum

Outcome:

- Able to identify the alternative materials for wood like Galvanized Iron, Fibre Reinforced Plastics, Steel, Aluminum
- Able to draw English& Flemish bonds of brick walls
- Able to perform seasoning of wood

Activity/Event:
Collect the bricks and build the English and Flemish bond model walls and test them for different loads in the laboratory. Collect the wood and prepare the specimens for testing of compressive strength. Then analyze their strengths to choose their suitability for various constructions

Unit-III:

Lime: Various ingredients of lime, Constituents of lime stone, classification of lime, various methods of manufacture of lime.

Cement: Portland cement- Chemical Composition, Hydration, setting and fineness of cement. Various types of cement and their properties. Various field and laboratory tests for Cement. Various ingredients of cement concrete and their importance, various tests for concrete

Outcome:

- Able to perform various laboratory tests on cement and concrete

Activity/Event:

Collect the various types of cements and prepare the test specimens for determining the compressive strength in the laboratory. Then analyze their strengths to choose their suitability for various constructions

Unit-IV:

Building Components: Lintels, arches, vaults, stair cases, types. Different types of floors, Concrete, Mosaic, Terrazzo floors, Pitched, flat roofs. Lean to roof, Coupled Roofs. Trussed roofs, King and Queen post Trusses. R.C.C Roofs, Madras Terrace and Pre fabricated roofs

Outcome:

- Able to identify the various types of building components like lintels, arches, vaults, stair cases and so on
- Able to distinguish the various types of building components like lintels, arches, vaults, stair cases and so on

Activity/Event:

A seminar on advanced topics related to building components of multi storey buildings

Unit-V:

Finishing's: Damp Proofing and water proofing materials and uses , Plastering, Pointing, white washing and distempering. Paints: Constituents of a paint , Types of paints , Painting of new/old wood- Varnish. Form Works and Scaffoldings

Outcome:

- Able to distinguish the finishings include proofing, plastering, pointing, washing, paints
- Able to guide installation procedure of the formworks and scaffoldings

Activity/Event:

Collect the wood or steel bars to make model scaffoldings for various structures and test their strengths for various loadings in the laboratory/field.

Text Books:

1. Engineering Materials byS.CRangwala,Charotar publishing Houseprivate ltd.
2. Building Construction by S.S. Bhavikatti, Vices publications House private ltd.
3. Building Materials by B.C. Punmia, Laxmi Publications private ltd.
4. Building construction by Sushil Kumar, Standard Publishers Distributors New Delhi

Reference Books:

1. Building Materials by S.K.Duggal, New Age International Publications.
2. Building Materials by P.C.Verghese, PHI learning (P) ltd.
3. Building Materials by M.L.Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
4. Building construction by P.C.Verghese, PHI Learning (P) Ltd

Course Code	SURVEYING-I	L	T	P	Credits
1001172105		3	1	0	3

Course Overview:

The course covers a knowledge and operation of chain surveying ,compass surveying ,plane table surveying and leveling

Course Objectives:

The student should be taught

1. The basic concepts of surveying along with surveying instruments
2. The chain surveying concepts include chaining, ranging etc..
3. The compass surveying concepts include computation of angles, traversing etc..
4. The Plane table survey concepts include three point problem, two point problem etc,
5. The levelling to find elevations there by contours mapping

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe various types of surveying instruments along with understanding of basic concepts of surveying	Understanding	1
CO2	Describe the chain survey include chaining, ranging with and without obstacles on even or uneven grounds and cross staff survey for taking offsets	Understanding	1
CO3	Describe compass traversing along with understanding of basic concepts of compass surveying	Understanding	1
CO4	Describe three point problem, two point problem, mechanical and graphical methods of plane table survey	Understanding	1,2
CO5	Describe levelling survey to find elevations followed by contour mapping	Understanding	1,2

Unit-I:

Basic Concepts: Surveying – History; Definition; primary divisions, Classification, Principles of surveying, Plan and map; Basic Measurements; Instruments and Basic methods; units of measurement, Scales used for Maps and plans, Duties of a surveyor.

Outcome:

- Able to differentiate map, plan and basic methods of survey
- Able to identify the scales which are used for maps and plans
- Able to explain through figures about various types of surveying instruments

Activity/Event:

Seminar on advanced topics related to instruments of GPS and DGPS

Unit-II:

Chain Surveying: Instruments for chaining, Ranging out, chaining a line on a flat ground; Chaining on an uneven or a sloping ground; Chain & Tape corrections; Degree of accuracy. Principles of chain surveying; Basic definitions; Well-Conditioned Triangle, Field book, Field work; Offsets, Cross Staff survey; obstacles in chain survey-problems, Conventional signs

Outcome:

- Able to explain through figures about the instruments for chaining include chain, tape, ranging rods, arrows and cross staff
- Able to perform the chain survey include chaining, ranging with and without obstacles on even or uneven grounds and cross staff survey for taking offsets

Activity/Event:

With the chain or tape along with ranging rods, arrows and cross staff perform the chain survey for measuring lengths, areas and offsets in the field

Unit-III:

Compass Survey: Introduction, Meridians, Azimuths and Bearings, declination, computation of angle. Traversing-Purpose-types of traverse, Temporary adjustments of compass-Magnetic Declination, Local attraction-Related Problems-Errors in compass survey, omitted measurements

Outcome:

- Able to identify the errors in compass survey and omitted measurements
- Able to do compass traversing and solve related problems

Activity/Event :

With the compass along with chain, ranging rods, arrows perform the compass traversing for measuring areas and map the traverse by showing north direction for given location

Unit-IV:

Plane Table Surveying: Introduction, Accessories, Working operations, Methods of plane table survey, three point problem-Mechanical method -Graphical method, two point problem, Errors in plane tabling

Outcome:

- Able to perform working operations of plane table survey
- Able to explain three point problem, two point problem, mechanical and graphical methods of plane table survey

Activity/Event:

With plane table accessories perform plane table traverse survey for measuring areas by mapping at the given site it self

Unit-V:

Leveling And Contouring: Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. Characteristics and Uses of contours- methods of conducting contour surveys

Outcome:

- Able to explain through figures about the various types of levelling instruments and their adjustments
- Able to perform levelling survey to find elevations followed by contour mapping

Activity/Event:

With the dumpy level or auto level along with chain, cross staff, ranging rods and arrows perform the levelling survey for given area to find elevations and followed by contour mapping

Text Books:

1. Surveying (Volume No.1, 2 & 3) by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications Ltd, New Delhi.
2. Text book of Surveying (Vol No. 1&2) by Arora, Standard Book House, Delhi.
3. Text book of Surveying by C. Venkataramaiah, University press, India Limited

Reference Books:

1. Text book of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Higher Surveying by A.M. Chandra, New Age International Pvt ltd.
3. Fundamentals of surveying by S.K. Roy – PHI learning (P) ltd.

Course Code	FLUID MECHANICS	L	T	P	Credits
1001172106		3	1	0	3

Course Overview:

The subject Fluid Mechanics has a wide scope and is of prime importance in several fields of engineering and science. Present course emphasizes the fundamental underlying fluid mechanical principles and application of those principles to solve real life problems. Special attention is given towards deriving all the governing equations starting from the fundamental principle. There is a well balanced coverage of physical concepts, mathematical operations along with examples and exercise problems of practical importance. After completion of the course, the students will have a strong fundamental understanding of the basic principles of Fluid Mechanics and will be able to apply the basic principles to analyze fluid mechanical systems.

Course Objectives:

The students will be taught

1. The physical properties of fluids and their influences on fluid motion, hydro static forces on various Surfaces
2. The kinematics and dynamics of fluid flow
3. The boundary layer, laminar and turbulent flows
4. The closed conduit flow include laws of fluid friction
5. The measurement of flow by pitot tube, venturi meter and orifice meter, orifices, notches and weirs

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe the physical properties of fluids & their influences on fluid motion and Compute hydro static forces on various sub merged Surfaces.	Understanding	1
CO2	Describe the concepts kinematics and dynamics of fluid flow	Understanding	1
CO3	Describe the concepts of boundary layer, laminar and turbulent flows	Understanding	1
CO4	Describe and analyze the closed conduit flow	Understanding	1,2
CO5	Compute measurement of flow by pitot tube, venturi meter, orifice meter, orifices, notches and weirs	Understanding	1,2

Unit-I:

Introduction: Dimensions and units – Physical properties of fluids -specific gravity, viscosity, surface tension, 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. Pressure gauges, Manometers: differential and Micro Manometers

Hydro Static Forces on Surfaces: Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems. Buoyancy forces

Outcome:

- Able to compute the pressure of fluids in various pressure gauges and manometers
- Able to compute the hydrostatic forces on submerged surfaces include vertical, inclined and horizontal

Activity/Event:

Collect or make manometers by which measure the pressure heads in pipes at various sections for varying velocities or discharges. Finally validate them theoretical values

Unit-II:

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 irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions, flownet analysis

Fluid Dynamics: Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Momentum equation and its application – forces on pipe bend.

Outcome:

- Able to explain through figures about the various types of flows
- Able to derive Euler's and Bernoulli's equations for flow along a stream line for 3-D flow
- Able to analyze surface and body forces on pipe flow

Activity/Event:

Make a model of transparent pipe line to study the fluid properties and various types of flows. Finally validate them to theoretical values

Unit-III:

Boundary Layer flow: Approximate Solutions of Navier-Stoke's Equations – Boundary layer – concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent Boundary layers

Laminar And Turbulent Flows: Reynold's experiment – Characteristics of Laminar & Turbulent flows. Flow between parallel plates

Outcome:

- Able to derive Navier-Stoke's Equations, Prandtl contribution, Vonkarmen momentum integral equation
- Able to perform theReynold's experiment to know the characteristics of Laminar & Turbulent flows
- Able to analyze the flow between parallel plates

Activity/Event:

Make model of transparent pipe line to identify laminar and turbulent flows for various velocities. Find also Reynold's number to validate with theoretical values.

Unit-IV:

Closed Conduit Flow: Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line. Pipe network problems, variation of friction factor with Reynold's number – Moody's Chart

Outcome:

- Able to identify the variations of friction factor with Reynold's number and Moody's Chart
- Able to compute the discharge of flow in pipes by considering friction and minor losses
- Able to compute the pipe network problems using different concepts

Activity/Event:

Make model of transparent pipe line to find the discharges by considering the all major and minor losses. Finally validate with the theoretical values

Unit-V:

Measurement of Flow: Pitot-tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches - –Broad crested weirs.

Outcome:

- Able to explain through figures about the various instruments include pitot tube, venturi meter and orifice meter, orifices and notches
- Able to compute measurement of flow by pitot tube, venturi meter and orifice meter, orifices, notches and weirs

Activity/Event:

Collect or make instruments like pitot tube, Venturi meter and orifice meter to find the discharge in various pipes. Make models of rectangular, triangular and trapezoidal and stepped notches to find discharge in channels.

Text Books:

1. Fluid Mechanics by Modi and Seth, Standard book house.
2. Introduction to Fluid Machines by S.K.Som &G.Biswas ,Tata McGraw-Hill publishers Pvt. Ltd.
3. Introduction to Fluid Machines by Edward J. Shaughnessy, Jr, Ira M. Katz and James P. Schaffer, Oxford University Press, New Delhi
4. Fluid Mechanics inclusing Hydraulic machines by Dr. A. K. Jain, Khanna Publishers, New Delhi

Reference Books:

1. Fluid Mechanics by J.F.Douglas, J.M. Gaserek and J.A.Swaffirld (Longman)
2. Fluid Mechanics by Frank.M. White (Tata Mc.Grawhill Pvt. Ltd.)
3. Fluid Mehanics by A.K. Mohanty, Prentice Hall of India Pvt. Ltd., New Delhi
4. A text of Fluid mechanics and hydraulic machines by Dr. R.K. Bansal - Laxmi Publications (P) ltd., New Delhi

Course Code	SURVEYING FIELD WORK-I LAB	L	T	P	Credits
1001172121		0	0	3	2

Course Overview:

Surveying lab offers supplemental experience in fundamental land surveying measurement methods for surveying courses, including precision steel taping methods to perform horizontal measurements, dump levels, traditional transits and digital theodolites to perform angular measurements, and traditional and automatic levels for elevation measurements. In addition, students have opportunity to use total station equipment, which enables horizontal, vertical, and angular measurements to be made in one operation.

Course Objectives:

The students will be explained

1. The chain survey in the field
2. The compass survey in the field
3. The plane table survey in the field
4. The Dumpy level survey in the field
5. The GPS Survey in the field

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Determine the distance across obstacles and area of traversing using chain or tape	Understanding	1,2
CO2	Determine the distance across obstacles and area of traversing using compass.	Understanding	1,2
CO3	Determine the area of traversing by plane table survey	Applying	1,2
CO4	Determine elevations at various points across sections either longitudinal or cross section	Applying	1,2
CO5	Determine the location and elevation at required points	Applying	1,2

List of Exercises:

1. Survey in an area by chain survey (Closed circuit).
2. Chaining across obstacles
3. Determination of distance between two inaccessible points by using compass.
4. Finding the area of the given boundary using compass (Closed Traverse).
5. Plane table survey : finding the area of a given boundary by the method of Radiation.
6. Plane table survey : finding the area of a given boundary by the method of intersection.
7. Fly leveling- Height of the instrument method (differential leveling) .
8. Fly leveling- rise and fall method.
9. Fly leveling- closed circuit/ open circuit.
10. Fly leveling- Longitudinal Section and Cross sections of a given road profile.
11. GPS survey- measurement of latitudes and longitudes and elevations at a point

List of Equipment:

1. Chain, tape, arrows and ranging rods
2. Compass
3. Plane table and its accessories
4. Dumpy level
5. Auto Level

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	CONCRETE TECHNOLOGY LAB	L	T	P	Credits
1001172122		0	0	3	2

Course Overview:

Covers production, processing, and testing of aggregate, asphalt, concrete, soil and other materials in highway and commercial/industrial building projects. Includes quality assurance concepts, measurements and calculations, terminology and random sampling.

Course Objectives:

The students will be explained

1. The normal consistency, fineness, Initial setting, final setting time,. specific gravity and soundness of cement tests
2. The grading, fineness modulus, specific gravity of coarse aggregate tests
3. The grading, fineness modulus of fine aggregate and bulking of sand tests
4. The workability, compressive strength young's modulus and split tensile strength of concrete tests
5. Then on-destructive testing on concrete (for demonstration).

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Determine the normal consistency, fineness, Initial setting, final setting time, specific gravity and soundness of cement.	Applying	1,2
CO2	Determine the grading, fineness modulus, specific gravity of coarse aggregate	Applying	1,2
CO3	Determine the grading, fineness modulus of fine aggregate and bulking of sand.	Applying	1,2
CO4	Determine the workability, compressive strength young's modulus and split tensile strength of concrete.	Applying	1,2
CO5	Determine thenon-destructive testing on concrete (for demonstration).	Applying	1,2

List of Exercises:

1. Determination of (a) Normal consistency of cement (b) Fineness of cement using microns IS sieve.
2. Determination of Initial setting and final setting time of cement.
3. Determination of (a) Specific gravity of cement (b) soundness of cement.
4. Determination of grading and fineness modulus of coarse aggregate by sieve analysis.
5. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.
6. Determination of specific gravity of fine aggregate and coarse aggregate.
7. Determination of bulking of sand.
8. Determination of workability of concrete by compaction factor method.
9. Determination of workability of concrete by slump test.
10. Determination of workability of concrete by Vee-bee test.
11. Determination of compressive strength of cement concrete and its young's modulus.
12. Determination of split tensile strength of concrete.
13. Non-Destructive testing on concrete (for demonstration).
14. Flexural Test of concrete beams

List of Equipment:

1. Standard set of sieves for coarse aggregate and fine aggregate.
2. Vicat's apparatus.
3. Specific gravity bottle.
4. Lechatlier's apparatus.
5. Slump Test Apparatus.
6. Compaction Factor Test Apparatus.
7. UTM machine

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	PROFESSIONAL ETHICS & HUMAN VALUES	L	T	P	Credits
1099172103		2	1	0	0

Course Overview:

Professional Ethics and Human Values subject provides character oriented education that instills basic values and ethnic value in one's individual professionalism.

Course Objectives:

1. To encourages students to discover what they consider valuable.
2. To move from discrimination to commitment. It is to create an ability to act on any discrimination in a given situation.
3. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings
4. To appreciate the rights of others.
5. Making the students aware and sensitive to value system in real life situations. To help the students to discriminate between ephemeral and eternal values

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Recognize importance of human values, harmony and ethical behavior in real life situations	Understanding	8
CO2	Describe the core values that shape the ethical behaviour of an engineer	Understanding	8
CO3	Recall basics of professional ethics and human values.	Remembering	8
CO4	Listing sustained happiness through identifying the essentials of human values and skills.	Remembering	8
CO5	Describe the practical importance of trust, mutually satisfying human behaviour and enriching interaction with nature	Understanding	8

Unit-I:

Human Values : Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully -Caring – Sharing – Honesty – Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality-Character.

Outcome:

- Able to define different types of human values
- Able to Identify values linked to the ethical behavior
- Able to list the values important for a profession

Activity/Event:
Seminar on work ethics and integrity

Unit-II:

Engineering Ethics: The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy – Professional and Professionalism –Professional Roles to be played by an Engineer –Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics- Kohlberg's Theory – Gilligan's Argument –Heinz's Dilemma.

Outcome:

- Able to interpret on engineering ethics
- Able to list professional level ethical theories
- Able to relate utilitarianism theory

Activity/Event:
Seminar on professional ethics in Engineering

Unit-III:

Engineering as Social Experimentation: Comparison with Standard Experiments – Knowledge gained –Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering.

Outcome:

- Able to apply ethics in social experimentation
- Able to outline the different types of institute codes

Activity/Event:

Seminar on role of codes associated with civil engineers

Unit-IV:

Engineers' Responsibility for Safety and Risk:

Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk-Short term v/s Long term Consequences- Expected Probability- Reversible Effects-Threshold Levels for Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

Outcome:

- Able to define the challenge for engineers to create safety to risk
- Able to list the features for risk bearable level
- Able to summarize the different types of risk

Activity/Event:

Seminar on risk threshold and risk adaptability

Unit-V:

Engineers' Responsibilities and Rights:

Collegiality-Loyalty-Professionalism and Loyalty- Professional Rights –Professional Responsibilities – confidential and proprietary information-Conflict of Interest-Ethical egoism-Collective bargaining-Confidentiality-Acceptance of Bribes/Gifts- when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational Crimes-industrial espionage-price fixing-endangering lives- Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing. Cross-culture Issues.

Outcome:

- Able to list the parameters of engineers responsibilities
- Able to list the different types of rights of engineers
- Able to outline on the engineers accountability

Activity/Event:

Case analysis on differences between gift and bribe a situational case let for understanding the differences

Text Books:

1. Engineering Ethics and Human Values by M.Govindarajan, S.Natarajan and V.S.Senthil Kumar- PHI Learning Pvt. Ltd-2009
2. Professional Ethics and Morals by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications
3. Professional Ethics and Human Values byA.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
4. Professional Ethics and Human Values by Prof .D.R.Kiran

Reference Books:

1. Indian Culture, Values and Professional Ethics by PSR Murthy-BS Publication
2. Ethics in Engineering byMikeW.MartinandRolandSchinzinger–TataMcGraw-Hill–2003.
3. Engineering Ethics by Harris, Pritchard and Rabins,CENGAGE Learning,IndiaEdition,2009.

DETAILED SYLLABUS FOR

II-B.Tech

II-SEMESTER

Course Code	BUILDING PLANNING AND DRAWING	L	T	P	Credits
1001172201		3	1	0	3

Course Overview:

This course will give the student knowledge about building byelaws and its regulations, give the sign conventions for different building materials, and how to prepare the plannings and designs for residential and public buildings.

Course Objectives:

The student will be taught

1. The building byelaws and regulations
2. The orientation, standards, requirements, types and planning of various residential and public buildings
3. The drawing of sign conventions of various types of building materials and bonds
4. The drawing of various types doors, windows, ventilators and roofs
5. The planning and design of various residential and public buildings

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the building byelaws and regulations	Remembering	1
CO2	Describe the orientation, standards, requirements, types and planning of various residential and public buildings	Understanding	1
CO3	Draw the sign conventions of various types of building materials and bonds	Remembering	1
CO4	Draw the various types doors, windows, ventilators and roofs	Remembering	1
CO5	Design, plan and draw of various residential and public buildings	Understanding	1,6

Unit-I:

Building Byelaws and Regulations:
Introduction- terminology-objectives of building bye laws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of building – wall thickness – lightening and ventilation requirements.

Outcome:

- Able to identify the Building Byelaws and Regulations

Activity/Event:
Seminar on advanced topics related to the National Building Code (NBC) 2016 which was released by the Bureau of Indian Standards (BIS) in March, 2017.

Unit-II:

Residential and Public Buildings: Orientation of building and its different elements, Minimum standards for various parts of buildings – requirements of different rooms and their grouping – characteristics of various types of residential buildings - Selection of site for building construction. Planning of educational institutions, hospitals, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation

Outcome:

- Able to identify the various parts of building with minimum standards and requirements of different rooms
- Able to distinguish the educational institutions, hospitals, office buildings, banks, industrial buildings, hotels and motels, buildings for recreation
- Able to perform selection of sites for various building constructions

Activity/Event:

Make a model of residential/ public building by scaling measurements with the standards of the buildings

Unit-III:

Sign Conventions and Bonds : Sign conventions for brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminium alloys, lead, zinc, earth, rock, timber and marbles, English bond and Flemish bond – odd and even courses for one, one and half and two walls in thickness at the junction of a corner.

Outcome:

- Able to draw the sign conventions include brick, stone, plaster, sand filling, concrete, glass, steel and so on
- Able to draw English bond and Flemish bond with odd/even courses for one, one and half and two walls

Activity/Event:
Draw a brick wall with concepts of English and Flemish bonds in AutoCAD software

Unit-IV:

Doors, Windows, Ventilators and Roofs:
Panelled door panelled and glazed door, panelled window, glazed window, fixed ventilator, coupled roof, collar roofs, king post truss, queen post truss. Sloped and flat roof of buildings: drawing plans, elevations and cross sections of given sloped and flat roof buildings.

Outcome:

- Able to draw the various types of doors, windows, ventilators and roofs

Activity/Event:

Draw various types of doors, windows, ventilators and roofs using AutoCAD Software

Unit-V:

Planning and Designing of Buildings: Draw the plan, elevation and sections of residential and public buildings from the given line diagram.

Outcome:

- Able to study plan, elevation and sections of residential and public buildings
- Able to draw plan, elevation and sections of residential and public buildings from the given line diagram.

Activity/Event:

Draw plan, elevation and sections of residential and public buildings from the given line diagram using AutoCAD Software

Text Books:

1. Planning, designing and Scheduling by Gurucharan Singh and Jagadish Singh
2. Building planning and drawing by M. Chakravarthi.
3. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur

Reference Books:

1. Building drawing by M G Shah, C M Kale and S Y Patki, Tata McGraw Hill, New Delhi.
2. Principles of Building Drawing by M G Shah and C M Kale, Trinity Publications, New Delhi.
3. Civil Engineering drawing and House planning by B. P. Verma, Khanna publishers, New Delhi

Final Examination pattern

The end examination paper should consist of part A and part B. Part A consist of four questions in theory part out of which three questions are to be answered. Part B should consist of two questions from drawing part out which one is to be answered in drawing sheet. Weightage for Part A is 40% and Part B is 60%

Course Code	STRENGTH OF MATERIALS-II	L	T	P	Credits
1001172202		3	1	0	3

Course Overview:

The course covers principal stresses and strains by analytical and graphical solutions, torsion of circular shafts and springs, direct and bending stresses in columns and deflection of springs, columns and struts subjected to axial loading for different end conditions and stresses in beams subjected unsymmetrical bending

Course Objectives:

The students will be taught

1. The principal stresses and strains by analytical and graphical solution
2. The torsion of circular shafts and springs
3. The direct and bending stresses in columns and deflection of springs
4. The columns and struts subjected to axial loading for different end conditions
5. The stresses in beams subjected unsymmetrical bending

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Compute the principal stresses and strains by analytical and graphical solutions	Understanding	1,2
CO2	Compute the torsion and power transmitted in circular shafts and Design shafts according to theories of failure	Understanding	1,2
CO3	Determine direct and bending stresses in columns and compute deflections in springs	Applying	1,2
CO4	Analyze columns and struts subjected to axial loading under various end conditions	Applying	1,2
CO5	Determine the stresses in beams subjected to unsymmetrical bending	Applying	1,2

Unit-I:

Principal Stresses & 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 – Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions.

Outcome:

- Able to compute the principal stresses and strains by analytical and graphical solutions

Activity/Event: Seminar on advanced topics related to analytical and graphical solutions for computing principal stresses and strains

Unit-II:

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations - Assumptions made in the theory of pure torsion – Torsional moment of resistance – Polar section modulus – Power transmitted by shafts – Design of shafts according to theories of failure.

Outcome:

- Able to compute the torsion and power transmitted in circular shafts
- Able to design shafts according to theories of failure

Activity/Event:

Make different specimens to test their torque in Torsion Testing Machine followed by computing power transmitted and Torsional rigidity. After that specify suitability of the shafts for different constructions

Unit-III:

Direct and Bending Stresses: Stresses under the combined action of direct loading and B.M. Resultant stress when a column of rectangular section is subjected to an eccentric load single axes and both axes Middle third rule for rectangular sections. Theories of failure.
Springs: Introduction – Types of springs – deflection of close and open coiled helical springs under axial pull and axial couple – springs in series and parallel – Carriage or leaf springs.

Outcome:

- Able to compute direct and bending stresses in columns subjected to an eccentric load single axes and both axes
- Able to compute deflections in various types of springs under axial pull and axial couple

Activity/Event:
Collect or make various types of springs to test deflections in Spring Testing Machine. After that specify suitability of the springs to various constructions

Unit-IV:

Columns And Struts: Introduction – Types of columns – Short, medium and long columns – Axially loaded compression members – Crushing load – Euler's theorem for long columns-assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio – Euler's critical stress – Limitations of Euler's theory.

Outcome:

- Able to identify Short, medium and long columns
- Able to analyze columns and struts subjected to axial loading under various end conditions

Activity/Event:

Conduct the Non Destructive Tests on different existing columns to find their strengths and then assess the life period of the columns

Unit-V:

Unsymmetrical Bending: Properties of beam cross section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear centre and flexural axis for I-section and Channel section. Stresses in beams subjected to unsymmetrical bending.

Outcome:

- Able to compute the stresses in beams of different sections subjected to unsymmetrical bending

Activity/Event:

Seminar on advanced topics related to unsymmetrical bending of beams of various sections which are not covered in the syllabus

Text Books:

1. Mechanics of Structures by S. B. Junarkar and Dr. H. J. Shah, , 27th Revised and Enlarged, Charotar Publishing House, 2008
2. Mechanics of Materials by Gere and Timoshenko, 4th Edition, PWS Publishing Company, May 1997
3. Strength of materials by S.Ramamrutam, Dhanpat Rai Publishing Company, New Delhi.
4. Mechanics of Materials by Dr. B. C. Punmia, Firewall Media, New Delhi

Reference Books:

1. Mechanics of Materials by Ferdinand BeerJr., E. Russell Johnston, John DeWolf, David Mazurek, 6^{th} edition, McGraw Hill Publishers, 2012.
2. Fundamentals of Solid Mechanics, by M.L. Gambhir, PHI Learning Pvt. Ltd., New Delhi.
3. Strength of Materials by Ryder, Macmillan publishers, 1969.
4. Strength of Materials by Pytel and Singer, Harper Collins, 1980.

Course Code	MANAGEMENT SCIENCE	L	T	P	Credits
1099172203		2	1	0	0

Course Overview:

This course is intended to familiarize the students with the framework for the managers and leaders available for understanding and making decisions relating to issues related organizational structure, production operations, marketing, Human resource Management, product management and strategy.

Course Objectives:

1. Management Science is an approach to management decision-making that makes extensive use of quantitative methods
2. This course aims to introduce students to the application of quantitative techniques to problems where models capture problem structure and use it to help optimize the decision outcome.
3. The classes demonstrate how advances in imputing power have made these techniques more accessible to managers and how the techniques can be applied to a range of different situations.
4. Provide a basic understanding of management science and engineering principles, including analytical problem solving and communications skills.
5. Prepare for practice in a field that sees rapid changes in tools, problems, and opportunities.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Define management and its nature scope and functions and hierarchical levels and organizational structure and managing the culture	Remembering	12
CO2	Illustrate various functions of production and inventory management	Understanding	12
CO3	Determine the various concepts of strategic management and project management	Understanding	12
CO4	Analyze the process of matching manager qualifications with position requirements and concept of marketing mix	Understanding	2,12
CO5	Compare the various contemporary issues of management	Understanding	12

Unit-I:

Introduction to Management: Concept –nature and importance of Management –Generic Functions of Management – Principles of Management – Evolution of Management thought- Theories of Motivation (Maslowo's, hertz berg and X-Y Theory) – Decision making process- Designing organization structure- Principles of organization.

Outcome:

- Able to understand the importance of management
- Able to determine various organizational structures and their merits and demerits
- Able to differentiate between financial and non financial motivation of employees
- Able to explain the different styles of Leadership

Activity/Event:

Case study on financial and non financial motivation of the employees

Unit-II:

Operations Management: Plant location, Principles and Types of plant layout, production methods (job, batch mass production) – Work study- Statistical Quality Control- Control Charts (X Bar chart &R-charts, P-chart and C-chart) Simple problems- Material Management: Need for Inventory control- Tools and techniques of Inventory Control - EOQ, ABC analysis, HML, SDE, VED, and FSN analyses

Outcome:

- Able to understand the various functions of production and inventory management
- Able to analyze the importance of plant location and plant layout for a successful manufacturing Industry
- Able to construct various Statistical Quality Control charts for variables and attributes as well
- Able to compare and distinguish the various techniques of inventory control

Activity/Event:

Seminar on ABC analysis and other associated inventory control techniques

Unit-III:

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process –Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy, Alternatives. Global strategies, theories of Multinational Companies.

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability (Problems)

Outcome:

- Able to Bring out various concepts of strategic management and project management
- Able to understand the importance of corporate planning process
- Able to construct the SWOT analysis for various organization and individual as well
- Able to interpret the importance of PERT and CPM under net work analysis

Activity/Event:

Case study on SWOT analysis of generic alternative strategies

Unit-IV:

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager-Wage payment plans (Problems) – Job Evaluation and Merit Rating – Salient features of The Factories Act 1948 - Marketing Management, Marketing Mix strategies – Product, Price, Place and Promotion.

Outcome:

- Able to Elucidate the process of matching manager qualifications with position requirements and concept of marketing mix
- Able to Analyze the Marketing functions
- Able to highlight the various methods used for job evaluation and merit rating
- Able to understand the importance various statutory and non statutory well fare benefits according to the factories act 1948

Activity/Event:
Seminar on factories act 1948, statutory welfare and non statutory welfare measures

Unit-V:

Contemporary Management Practices: Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management ,Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Unit-V Outcome:

- Able to list out various contemporary management practices
- Able understand the importance of Management Information System
- Able to discuss the concepts of MRP, ERP, TQM And JIT systems
- Able to summarize the importance of six sigma , bench marking and Balanced Score card

Activity/Event:

- Able to define the challenge for engineers to create safety to risk
- Able to list the features for risk bearable level
- Able to summarize the different types of risk

Text Books:

1. Management Science by Dr. P. Vijaya Kumar &Dr. N. Appa Rao, Cengage learning, Delhi, 2012.
2. Management Science by Dr. A. R. Aryasri,TMH 2011.

Reference Books:

1. Essentials of management by Koontz & Weihrich,TMH 2011
2. Global Management Systems by Seth & Rastogi, Cengage learning Delhi, 2011
3. Organizational Behaviour by Robbins, Pearson publications, 2011
4. Production & Operations Management by Kanishka Bedi, Oxford Publications, 2011
5. Principles of Marketing by Philip Kotler & Armstrong, Pearson publications
6. Human Resource Management by Biswajit Patnaik, PHI, 2011

Course Code	HYDRAULICS AND HYDRAULICS MACHINERY	L	T	P	Credits
1001172204		3	1	0	3

Course Overview:

Hydraulics is the section of fluid mechanics which describes production, transmission and conversion of energy during mutual interaction of fluids and mechanisms in motion. This course starts from the deep fundamentals of fluid dynamics accompanied at later stages by an overall description of technical solutions used in machinery. The main objective of the course is to learn basic principles of fluid power generation, transmission and conversion with the use of hydraulic machines and supplementary passive equipment.

Course Objectives:

The students will be taught

1. The uniform flow in open channels
2. The Non-Uniform Flow in Open Channels
3. The Hydraulic Similitude and Basics of Turbo Machinery
4. The Hydraulic Turbines concepts
5. The Centrifugal-Pumps and Reciprocating-Pumps concepts

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe the concepts of uniform flow in open channels	Understanding	1
CO2	Describe the concepts of non-uniform flow in open channels	Understanding	1
CO3	Describe the concepts of Hydraulic Similitude and Basics of Turbo Machinery	Understanding	1
CO4	Describe the concepts of the Hydraulic Turbines in detail	Understanding	1
CO5	Describe the concepts of Centrifugal-Pumps and Reciprocating-Pumps in detail	Understanding	1

Unit-I:

Uniform Flow in Open Channels: Types of channels –Types of flows - Velocity distribution – Energy and momentum correction factors – Chezy's, and Manning's formulae for uniform flow – Most Economical sections, Critical flow: Specific energy-critical depth – computation of critical depth

Outcome:

- Able to derive Chezy's, and Manning's formulae for uniform flow
- Able to derive design parameters of Most Economical sections and the specific energy formulae

Activity/Event:

Seminar on advanced topics related to uniform flow in a channel section with composite roughness

Unit-II:

Non-Uniform Flow in Open Channels: Steady Gradually Varied flow-Dynamic equation, Mild, Critical, Steep, horizontal and adverse slopes-surface profiles direct step method- Rapidly varied flow, hydraulic jump, energy dissipation

Outcome:

- Able to derive equations for the Steady Gradually Varied flow along with slopes and surface profiles
- Able to derive equations for the Rapidly varied flow along with hydraulic jump and energy dissipation

Activity/Event:

Seminar on advanced topics related to computation of spatially varied flow using numerical integration

Unit-III:

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

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-Angular momentum principle.

Outcome:

- Able to derive Rayleigh's method and Buckingham's pi theorem
- Able to derive the hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes

Activity/Event:

Compute the hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes in the laboratory and validate with theoretical values

Unit-IV:

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, hydraulic design, draft tube – theory and efficiency. Governing of turbines-surge tanks-unit and specific quantities, selection of turbines, performance characteristics-geometric similarity-cavitation.

Outcome:

- Able to draw the layout of a typical Hydropower installation
- Able to Differentiate Pelton wheel, Francis turbine and Kaplan turbine
- Able to perform tests on Pelton wheel, Francis turbine and Kaplan turbine in the laboratory to find generated electricity

Activity/Event:

Perform the tests on the turbines, in the laboratory, include Pelton Turbine, Francis Turbine, Kaplan turbine with different kinetic energies to find the electricity generation and validate with theoretical values

Unit-V:

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- Cavitation.

Reciprocating-Pumps: Introduction, classification, components, working, discharge, indicator diagram, work done and slip.

Outcome:

- Able to perform tests on Centrifugal pump and Reciprocating pump

Activity/Event:
Perform tests on Centrifugal pump and Reciprocating pump in the laboratory to pump the water from the water bodies

Text Books:

1. Fluid Mechanics by Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
2. A text of Fluid mechanics and hydraulic machines by Dr.R.K.Bansal, Laxmi Publications (P) Ltd., New Delhi.
3. Introduction to Fluid Mechanics & Fluid Machines by S.K.Som&G.Biswas, Tata Mc.Grawhill publishers PVt.Ltd.

Reference Books:

1. Fluid mechanics and Fluid Machines by Rajput, S.Chand& Co.
2. Fluid Mechanics & Fluid Machines by Narayana Pillai, Universities press.
3. Fluid Mechanics and Machinery by Kothandaraman, New Age Publishers.
4. Flow in Open channels by K.Subramanya. Tata McGraw-Hill Publishers.
5. 5. Fluid Mechanics and Machinery by CSP Ojha, Oxford Higher Education.

Course Code	SURVEYING-II	L	T	P	Credits
1001172205		3	1	0	3

Course Overview:

At the end of the course the student should able to get knowledge on operation of Theodolite survey ,Tacheomatric surveying ,Curve setting, Areas from field notes and total station survey

Course Objectives:

The student will be taught

1. The Theodolite surveying concepts include traversing, trigonometric leveling etc..
2. The Tacheomatric surveying concepts include distances & elevations measuring, traversing etc.
3. The setting of curves concepts include simple and compound curves using various methods
4. The computation of areas and volumes of embankments, cuttings, reservoir etc.
5. The Total station surveying basic concepts along with traversing and Trilateration

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe concepts of theodolite surveying include traversing and trigonometric leveling	Understanding	1
CO2	Describe concepts of Tacheomatric surveying include distances & elevations measuring and traversing.	Understanding	1,2
CO3	Describe the concepts curve setting include simple and compound curves using various methods.	Understanding	1
CO4	Compute areas and volumes of embankments, cuttings, reservoir etc. by various methods	Understanding	1,2
CO5	Describe the basic concepts of Total station along with traversing survey and Trilateration	Understanding	1

Unit-I:

Theodolite: Vernier theodolite: Basic definitions; Fundamental lines and desired relations; Temporary adjustments; Measurement of a horizontal angle; Repetition and Reiteration methods of horizontal angle measurement. Measurement of vertical angle; Sources of errors in Theodolite survey. computation of latitude and departure , Omitted measurements.

Trigonometric Levelling: Definition, Methods of determination of heights by theodolite.

Outcome:

- Able to carry out theodolite survey to determine horizontal angles, vertical angles and heights
- Able to compute latitudes and departures through theodolite survey

Activity/Event:

With the Theodolite along with chain, cross staff, ranging rods and arrows perform the survey for measuring horizontal angles and vertical angles followed by measuring heights of objects in the field

Unit-II:

Tachometric Surveying::Definition, Advantages of Tachometric surveying, Principle of stadia measurements, Determination of constants K and C, Stadia and tangential methods of Tachometry. Distance and Elevation formulae for Staff vertical position.

Outcome:

- Able to derive distance and elevation formulae for Staff vertical position
- Able to carry out Tachometric survey to determine distances and heights of objects

Activity/Event:

With the Tachometer along with chain, cross staff, ranging rods and arrows perform the survey for measure distances and heights of objects in the field

Unit-III:

Curves: Types of curves, design and setting out – simple and compound curves– Definitions and Notations, designation of a curve, Rankines method, Two theodolite method, Reverse curves – Elements of reverse curve, relationship between various elements.

Outcome:

- Able to design simple and compound curves
- Able to set simple and compound curves in the field using theodolite

Activity/Event:

With the Theodolite along with chain, cross staff, ranging rods and arrows perform the survey for design and setting out the simple curve in the field

Unit-IV:

Computation of Areas and Volumes: Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries. Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

Outcome:

- Able to perform survey to compute areas and volumes of embankments, cuttings, reservoirs and so on

Activity/Event:

With the Dumpy level along with chain, cross staff, ranging rods and arrows perform the survey to find an area of irregular boundaries and determine the capacity of reservoir in the field

Unit-V:

Total Station Surveying: Basic Principle – Classifications -Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. Modern positioning systems – Traversing and Trilateration.

Outcome:

- Able to perform survey to calculate areas of traverse and heights of objects in the field
- Able to perform survey to measure reduced levels followed drawing contouring and profiles

Activity/Event:

With the Total station along prism perform the survey to find distances, areas of boundaries, Reduced levels followed by drawing of contouring and profiles

Text Books:

1. Surveying (Vol No.1, 2 &3) by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications Ltd, New Delhi.
2. Text book of Surveying (Vol No. 1&2) by S.K. Duggal, Tata McGraw Hill Publishing Co. Ltd. New Delhi.
3. Text book of Surveying by C. Venkataramaiah, University press, India Limited

Reference Books:

1. Text book of Surveying by Arora (Vol No. 1&2), Standard Book House, Delhi.
2. Higher Surveying by A.M. Chandra, New Age International Pvt Ltd.
3. Fundamentals of surveying by S.K. Roy, PHI learning (P) ltd.

Course Code	STRUCTURAL ANALYSIS - I	L	T	P	Credits
1001172206		3	1	0	3

Course Overview:

This is an elementary course on Structural Analysis. Various methods and their underlying mechanics in determining response of structures when subjected to external loading will be discussed in this course. This course is comprehensive at the basic level. Journey through this course will help students to build the foundation for more advanced courses related to structural engineering.

Course Objectives:

The students will be taught

1. The S.F, B.M and deflection of propped cantilevers
2. The S.F, B.M and deflection of fixed beams
3. The S.F, B.M and deflection of continuous beams
4. The deflection of beams, frames, trusses by strain energy method
5. The S.F and B.M of simply supported beams for moving loads

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Analyze the S.F, B.M and deflection of propped cantilevers	Analyzing	1,2,3
CO2	Analyze the S.F, B.M and deflection of fixed beams	Analyzing	1,2,3
CO3	Analyze the S.F, B.M and deflection of continuous beams	Analyzing	1,2,3
CO4	Analyze the deflection of beams, frames, trusses by strain energy method	Analyzing	1,2,3
CO5	Analyze S.F and B.M of simply supported beams for moving loads	Analyzing	1,2,3

Unit-I:

Propped Cantilevers: Analysis of propped cantilever –Shear Force and Bending Moment diagrams- Deflection of propped cantilever.

Outcome:

- Able to compute shear force, bending moment and deflections of propped cantilever beams with various types loadings
- Able to draw Shear force and Bending Moment diagrams

Activity/Event:

A seminar on advanced topics related to analysis of propped cantilever by Finite Element Analysis

Unit-II:

Fixed Beams: Introduction, Analysis of fixed beams, subjected to single and multiple point loads, UDL, UVL, couple and combination of loads. Draw SFD, BMD and deflection diagrams – Effect of sinking and rotation of supports.

Outcome:

- Able to compute shear force, bending moment and deflections of fixed beams with various types loadings
- Able to draw Shear force and Bending Moment diagrams

Activity/Event:

A seminar on advanced topics related to analysis of fixed beam by force method

Unit-III:

Continuous Beams: Introduction- Clapeyron's theorem of three moments- Analysis of continuous beams with constant and different moment of inertias for different spans - Effects of sinking of supports - SF and BM diagrams.

Outcome:

- Able to compute shear force, bending moments of fixed beams with various types loadings
- Able to draw Shear force and Bending Moment diagrams

Activity/Event:
A seminar on advanced topics related to analysis of continuous by moment distribution method

Unit-IV:

Energy Theorems: Introduction – Strain energy in linear elastic system, expression of Strain Energy due to axial load, shear load and flexural load, determination of deflections of simple beams, simple portal frames, simple trusses using first theorem Castigliano's theorem.

Outcome:

1. Able to derive expression for strain energy due to axial load
2. Able to solve the deflections of beams and frames

Activity/Event:

A seminar on advanced topics related to expression of strain energy due to Torsional loading

Unit-V:

Influence Lines: Definition of Influence line for reactions, SF and BM at a given position of loading, number of point loads, UDL

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 the span, UDL shorter than the span, Two point loads with fixed distance between them and several point loads-Load position for maximum B.M at a given section, Load position for max S.F. at a given section.

Outcome:

- Able to draw Influence Line Diagrams for Shear force and Bending moment of Simply supported beams

Activity/Event:

A seminar on advanced topics related to Influence diagrams for overhanging beams

Text Books:

1. Analysis of Structures (Vol I & II) by V.N. Vazirani & M.M.Ratwani, Khanna Publications, New Delhi.
2. Analysis of Structures by T.S. Thandava moorthy, Oxford University Press, New Delhi
3. Comprehensive Structural Analysis (Vol I & II) by Dr. R. Vaidyanathan &Dr.P.Perumal, Laxmi Publications Pvt. Ltd., New Delhi.
4. Basic structural Analysis by C.S. Reddy, Tata Mc Graw hill, New Delhi

Reference Books:

1. Devdas Menon, Structural Analysis, Narosa Publishing House, 2008. (ISBN: 9781842653371)
2. Hibbeler, R. C. (2002). Structural Analysis, 6/e, Pearson Education
3. Norris, C.H., Wilbur, J.B., and Utku, S., Elementary Structural Analysis, McGraw Hill
4. Wang, C.K., Intermediate Structural Analysis, McGraw Hill, 1983

Course Code	TRANSPORTATION ENGINEERING-I	L	T	P	Credits
1001172207		3	1	0	3

Course Overview:

Transport Engineering-I introduces you to the role of engineers in planning, designing and managing the transport system and infrastructure. You will be exposed to various aspects of the transport system such as planning and design. These aspects represent integral components of civil and transport infrastructure. The importance of sustainability will be emphasized as you discover the impacts the transport task have on the environment and measures to ameliorate them. The course comprises both theoretical components and application of theoretical knowledge into design practice.

Course Objectives:

The students will be taught

1. The history and basic concepts highway planning and alignment
2. The geometric design of highway elements includes cross section, sight distance, alignment both vertical and horizontal, curves etc.
3. The traffic engineering studies include traffic studies like volume parking, signaling, accident etc.
4. The highway materials include aggregates, concrete, bitumen which are used for base, sub base etc.
5. The design of pavements include flexible and rigid along with maintenance of highways

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand The history and basic concepts highway planning and alignment	Remembering	1
CO2	Design of geometric elements of highway includes cross section, sight distance, alignment both vertical and horizontal, curves etc.	Understanding	1,2
CO3	Describe traffic engineering studies include traffic studies like volume parking, signaling, accident etc.	Understanding	1
CO4	Distinguish the highway materials include aggregates, concrete, bitumen which are used for base, sub base and so on.	Understanding	1
CO5	Design of the pavements include flexible and rigid along with maintenance of highways	Applying	1,2,3

Unit-I:

Highway Planning and Alignment: Highway development in India; Classification of Roads; Road Network Patterns; Necessity for Highway Planning; Different Road Development Plans – First, second, third road development plans, road development vision 2021, Rural Road Development Plan – Vision 2025; Planning Surveys; Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports.

Outcome:

- Able to draw a highway network plan for a given area.
- Able to trace out the final Highway alignment from different alternative alignments.

Activity/Event:
Delineate the different possible alignments from a toposheet between specified two locations and finally trace one final alignment

Unit-II:

Highway Geometric Design: Importance of Geometric Design- Design controlsand Criteria- Highway Cross Section Elements- Sight Distance Elements-Stopping sightDistance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Horizontal Alignment-Design of Super elevation and Extra widening- Design of Transition Curves- Design of Vertical alignment- Gradients- Vertical curves.

Outcome:

- Able to design the different types of curves include Horizontal and Vertical curves
- Able to design and analyze sight distances include SSD, OSD and ISD

Activity/Event:

Design the different types of curves along the traced final alignment on the toposheet

Unit-III:

Traffic Engineering: Basic Parameters of Traffic-Volume, Speed and Density-Traffic Volume Studies; Speed studies –spot speed and speed & delay studies; Parking Studies; Road Accidents- Causes and Preventive measures - Condition Diagram and Collision Diagrams; PCU Factors, Capacity of Highways – Factors Affecting; LOS Concepts; Road Traffic Signs; Road markings; Types of Intersections; At-Grade Intersections – Design of Plain, Flared, Rotary and Channelized Intersections; Design of Traffic Signals –Webster Method –IRC Method.

Outcome:

- Able to design Intersections and prepare traffic management plans
- Able to identify the traffic signs and road marking
- Able to design traffic signal at different road junctions

Activity/Event:

Design traffic signal at three roads junction by conducting traffic volume studies

Unit-IV:

Highway Materials: Subgrade soil: classification –Group Index – Subgrade soil strength – California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Desirable properties – Tests for Road Aggregates – Bituminous Materials: Types – Desirable properties – Tests on Bitumen – Bituminous paving mixes: Requirements – Marshall Method of Mix Design.

Outcome:

- Able to conduct various tests on bitumen.
- Able design the bituminous mix.

Activity/Event:

Conduct California Bearing Ratio test (CBR) in the laboratory for collected specimen from the field and evaluate subgrade strength of roads. The results obtained by these tests are used with the empirical curves to determine the thickness of pavements and its component layers

Unit-V:

Design of Pavements: Types of pavements; Functions and requirements of different components of pavements; Design Factors

Flexible Pavements and Rigid Pavements: Design factors – Flexible Pavement Design Methods – CBR method – IRC method – Burmister method – Mechanistic method – IRC Method for Low volume Flexible pavements. Design Considerations – wheel load stresses –Temperature stresses – Frictional stresses – Combination of stresses – Design of slabs – Design of Joints – IRC method – Rigid pavements for low volume roads.

Outcome:

- Able to design flexible and rigid pavements

Activity/Event on Unit-V:

Design a flexible pavement by empirical design for determining appropriate layer thickness and composition

Text Books:

1. Highway Engineering by S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 7th edition (2000).
2. Transportation Engineering (Volume – 1) byC.Venkataramaiah, Universities Press, Hyderabad.
3. Traffic Engineering and Transportation Planning by L.R.Kadiyali and Lal- Khanna Publications.

Reference Books:

1. Principles and Practice of Highway Engineering Design by L.R.Kadiyali and Lal, Khanna Publications.
2. Text book of Highway Engineering by R.Srinivasa Kumar, Universities Press, Hyderabad.
3. Highway Engineering by Dr.S.K.Sharma, S.Chand Publishers.

Course Code	FLUID MECHANICS & HYDRAULICS MACHINERY LAB	L	T	P	Credits
1001172221		0	0	3	2

Course Overview:

The Fluid Mechanics and Hydraulic Engineering Laboratory is designed to examine the properties of fluids. The Hydraulic laboratory is equipped to conduct experiments like flow measuring equipments like flow in orifices, mouth pieces, notches, orifice meters, Venturimeter, verification of Bernoulli's, Friction factor in different diameters of pipes The fluid machinery laboratory is also equipped to identify the efficiencies and power generation in various turbines viz., Pelton wheel, Kaplan turbine, Francis turbine, and efficiencies to draw water from various pumps viz., single stage and multistage Centrifugal pumps, Single –stage Reciprocating pump. This laboratory is primarily used as an undergraduate teaching lab, though the experimental apparatus has been used for demonstrations in graduate classes. Both graduate and undergraduate research projects have been conducted in the laboratory.

Course Objectives:

The students will be explained

1. The Coefficient of discharge Venturimeter, Orifice meter, rectangular Notch and/or triangular Notch, a small orifice, an external mouth piece
2. The Bernoulli's equation, impact of jet on vanes and test hydraulic jump tests
3. The Pelton wheel turbine and Francis turbine tests
4. The centrifugal pump test
5. The reciprocating pump test

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Determine Coefficient of discharge Venturimeter. Orifice meter, rectangular Notch and /or Triangular Notch, a small orifice, an external mouth piece	Applying	1,2
CO2	Determine bernoulli's equation, impact of jet on vanes and hydraulic jump	Applying	1,2
CO3	Determine performance of Pelton wheel turbine and Francis turbine	Applying	1,2
CO4	Determine the efficiency centrifugal pump	Applying	1,2
CO5	The efficiency of reciprocating pump	Applying	1,2

List of Exercises:

1. Calibration of Venturimeter& Orifice meter
2. Determination of Coefficient of discharge for a small orifice by a constant head method.
3. Determination of Coefficient of discharge for an external mouth piece by variable head
4. method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.
13. Efficiency test on reciprocating pump.

List of Equipment:

1. Venturimeter setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal and Reciprocating pumps.

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	STRENGTH OF MATERIALS LAB	L	T	P	Credits
1001172222		0	0	3	2

Course Overview:

The Lab course covers tension test on steel bar, bending test on cantilever and simply supported beam, Torsion test, spring test, compression test on wood or concrete, impact test and shear test and deflection test on beams include cantilever, simply supported and continuous beam

Course Objectives:

The students will be explained

1. The tension test on steel bar
2. The bending test on cantilever and simply supported beam
3. The Torsion test, spring test, compression test on wood or concrete
4. The impact test and shear test
5. The deflection test on beams include cantilever, simply supported and continuous beam

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Determine the tensile force on steel bar	Applying	1,2
CO2	Determine the bending stress on cantilever and simply supported beam	Applying	1,2
CO3	Determine the Torsion, deflection in spring, compression force on wood or concrete	Applying	1,2
CO4	Determine Force shear force on steel bar	Applying	1,2
CO5	Determine the deflection test on beams include cantilever, simply supported and continuous beam	Applying	1,2

List of Exercises:

1. Tension test on Steel bar
2. Bending test on (Steel / Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on wood or concrete
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of Electrical resistance strain gauges
12. Continuous beam – deflection test.

List of Equipment:

1. UTM for conducting tension test on rods
2. Steel beam for flexure test
3. Wooden beam for flexure test
4. Torsion testing machine
5. Brinnell's / Rock well's hardness testing machine
6. Setup for spring tests
7. Compression testing machine
8. Izod Impact machine
9. Shear testing machine
10. Beam setup for Maxwell's theorem verification.
11. Continuous beam setup
12. Electrical Resistance gauges

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	INDUSTRIAL VISIT	L	T	P	Credits
1001172231		0	0	3	2

Industrial Visit: The industrial visit shall be carried out in their domain during the summer vacation after the second year second semester. A student has to submit a report which will be evaluated for 100 marks and will be submitted to an internal evaluation committee comprising Head of the Department or his / her nominee and two senior faculty of the department including the industrial visits coordinator/ supervisor. The industrial visit report shall be evaluated at the beginning of third year first semester before the first mid-term exams**.** Industry oriented MOOCs course (including NPTEL/ Coursera) for not less than EIGHT weeks can be considered as equivalent. The list of courses in such case shall be approved by Head of the department concerned. The registered course must not be same as any of the courses listed in the program structure of their regulation till final year. Marks/grades are awarded based on the performance in viva voce or written examination conducted for Coursera courses and online courses other than SWAYAM/NPTEL where there is no end examination.

PROGRAM STRUCTURE

FOR

III-B.Tech

I & II SEMESTERS

DEPARTMENT OF CIVIL ENGINEERING
PROGRAM STRUCTURE

III B.Tech **I Semester**

S. No	Course Code	Name of the Course	L	T	P	Credits
1.	1099172206	Managerial Economics & Financial Analysis	3	1	0	3
2.	1001173101	Engineering Geology	3	1	0	3
3.	1001173102	Structural Analysis –II	3	1	0	3
4.	1001173103	Design of Reinforced Concrete Structures	3	1	0	3
5.	1001173104	Transportation Engineering – II	3	1	0	3
6.	1001173121	Surveying Field Work-II	3	1	0	3
7.	1001173122	Engineering Geology Lab	0	0	3	2
8.	1001173123	Transportation Engineering Lab	0	0	3	2
					Total Credits	**21**

III B.Tech **II Semester**

S.No	Course Code	Name of the Subject	L	T	P	Credits
1	1001173201	Design of Steel Structures	3	1	0	3
2	1001173202	Geotechnical Engineering – I	3	1	0	3
3	1001173203	Environmental Engineering – I	3	1	0	3
4	1001173204	Water Resources Engineering -I	3	1	0	3
5	**Elective-I:**					
	1001173205	f. Advanced Surveying using GPS	3	1	0	3
	1001173206	g. Groundwater development and Management				
	1001173207	h. Waste Water Management				
	1001173208	i. Advanced Concrete Technology				
	1001173209	**j.** Traffic Engineering				
6	**Open Elective-I:**					
	1004173209	f. Electronic Instrumentation	3	1	0	3
	1005173206	g. Introduction to Data Base Management Systems				
	1003173205	i. Alternative Energy Sources				

	1003173205	j. Heating, Ventilation and Air Conditioning				
	1001173291	k. Massive Open Online Course (MOOCs) l. *Any available online course approved by department committee at the time of semester commencement.				
7	1001173221	Geotechnical Engineering Lab	0	0	3	2
8	1001173222	Environmental Engineering Lab	0	0	3	2
9	1001173223	Computer Aided Engineering Lab	0	0	3	2
Total Credits:						**24**

S.No	Course Code	Name of the Subject	L	T	P	Credits
1	1001173241	Industry Oriented Mini Project	0	0	0	2

DETAILED SYLLABUS

FOR

III-B.Tech

I-SEMESTER

Course Code	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS	L	T	P	Credits
1099172206		3	1	0	3

Course Overview:

The present course is designed in such a way that it gives an overview of concepts of Economics. Managerial Economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial Analysis gives clear idea about concepts, conventions and accounting procedures along with introducing students to fundamentals of ratio analysis and interpretation of financial statements. Break Even Analysis is very helpful to the Business Concern for Decision Making, controlling and forward Strategic Planning. Ratio analysis gives an idea about financial forecasting, financial planning, controlling the business and decision making.

Course Objectives:

1. Understand the concepts of managerial economics and the market dynamics namely Demand, Elasticity of demand and pricing in different market structures.
2. Acquire the knowledge about production theories and cost analysis besides dealing with the production and factors of production.
3. Analyse the different market structures and understand various pricing methods which are adopted in attracting the customers under different markets.
4. To provide the basic knowledge on financial accounting
5. To understanding Capital budgeting decisions.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe the economic activities performed by the businessmen in the business for profit earning. Understand the significance of demand, its analysis, measurement of demand and its Forecasting	Understanding	12
CO2	Evaluate the production theories and pricing policies of various enterprises	Understanding	2,12
CO3	Design and implement different structures of market covering how price is determined under different market structures. Also can able to take decisions using business cycles. Analyze different forms of business organizations existing in the modern business and able to choose suitable form of business	Understanding	2,12
CO4	Able to prepare financial statements	Remembering	12
CO5	Evaluate investment proposals using capital budgeting tools and techniques.	Understanding	2,12

Unit-I:

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting

Outcome:
Describe the economic activities performed by the businessmen in the business for profit earning. Understand the significance of demand, its analysis, measurement of demand and its Forecasting

Activity/Event : Presentations and object oriented tests

Unit-II:

Production and Cost Analyses: Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of breakeven point.

Outcome:

Evaluate the production theories and pricing policies of various enterprises

Activity/Event:

Presentations and object oriented tests

Unit-III:

Part:I: Introduction to Markets, Theories of the Firm & Pricing Policies: Managerial Theories of firm: Marris and Williamson's models – Significance of Pricing and various methods of pricing with contemporary examples.Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price andOutput Determination.

Part: II: Types of Business Organization and Business Cycles: Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and theirforms – Business Cycles : Meaning and Features – Phases of Business Cycle.

Outcome:
Design and implement different structures of market covering how price is determined under different market structures. Also can able to take decisions using business cycles

Activity/Event:

Presentations and object oriented tests

Unit-IV:

Introduction to Accounting and Capital Budgeting Decisions: Part I: Introduction to Accounting, Double Entry Systems Journal, Ledger, Trail Balance, preparation of Financial Statements (Problems)

Outcome:

Analyse different forms of business organizations existing in the modern business and able to choose suitable form of business

Activity/Event:

Presentations and object oriented tests

Unit-V:

Capital Budgeting Decisions: Classification of Capital- Methods of appraising Project profitability: Traditional Methods (Payback period, Accounting rate of return) and Time value of money- Modern methods (Net Present Value method, Internal Rate of Return Method and Profitability Index Method) - Problems

Outcome:

Able to prepare financial statements and understand and implement the capital budgeting tools and techniques.

Activity/Event:

Presentations and object oriented tests

Text Books:

1. M.Kasi Reddy & Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 10th Revised Edition, 2012.
2. Varshney &Maheswari, "Managerial Economics", Sulthan Chand Publishers, 1st Revised Edition, 2009.
3. S.N. Maheshwari &S.K.Maheshwari, "Financial Accounting", Vikas Publication House Pvt.Ltd, 4th Edition, 2012.

Reference Books:

1. D.N. Dwivedi, "Managerial Economics", Vikas Publication House Pvt.Ltd, 2nd Edition, 2012.
2. R.Narayana Swamy, "Financial Accounting- A managerial Perspective", Pearson publications, 1st Indian Reprint Edition, 2012.
3. J.V.Prabhakar Rao &P.V.Rao, "Managerial Economics & Financial Analysis", Maruthi Publishers, 1st Revised Editon, 2011

Course Code	ENGINEERING GEOLOGY	L	T	P	Credits
1001173101		3	1	0	3

Course Overview:

This course deals with the importance of geology, study of different case histories of failure of some civil engineering constructions due to geological draw backs, study of various minerals, classification of rocks, study of various rocks, study of geological structures and Geophysical studies

Course Objectives:

The student will be taught

6. The case histories of failure of some civil engineering constructions due to geological draw backs
7. The properties of various rock forming minerals and economic minerals
8. The classification of rocks and megascopic study of igneous, sedimentary and metamorphic rocks
9. The common geological structures associating with the rocks such as folds, faults, unconformities and joints
10. The importance of Geophysical studies and principles of geophysical study by various methods

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Explain the case histories of failure of some civil engineering constructions due to geological draw backs	Understanding	1,6
CO2	Distinguish the properties of various rock forming minerals and economic minerals	Understanding	1
CO3	Distinguish megascopic study of igneous, sedimentary and metamorphic rocks	Understanding	1
CO4	Describe the common geological structures associating with the rocks such as folds, faults, unconformities and joints	Understanding	1
CO5	Describe importance of Geophysical studies and principles of geophysical study by various methods	Understanding	1

Unit-I:

Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological draw backs. Importance of Physical geology

Outcome:

Able to explain failure of some Civil Engineering constructions due to geological draw backs

Activity/Event:

Seminar on recent failure of Civil Engineering constructions due to geological draw backs

Unit-II:

Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Physical properties of Minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz , Flint , Jasper, Olivine , Augite , Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economic minerals such as Pyrite, Hematite, Magnetite, Chromite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite.

Outcome:

- Able to explain physical properties of rock forming and economic minerals
- Able to identify rock forming and economic minerals

Activity/Event:

Identification of rock forming and economic minerals through their physical properties in the laboratory

Unit-III:

Petrology: Definition of rock**,** Geological classification of Igneous, Sedimentary and Metamorphic rocks. Dykes and sills, common structures and textures of Igneous, Sedimentary and Metamorphic rocks. Their distinguishing features, Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

Outcome:

- Able to describe general classification of rocks
- Able to identify different types rocks through megascopic study

Activity/Event:
Identification of rocks through megascopic study in the laboratory
Unit-IV:

Structural geology: Out crop, strike and dip, Study of common geological structures associating with the rocks such as folds, faults, unconformities and joints - their important types.

Outcome:

- Able to state out crop, strike and dip
- Able to distinguish folds and faults, unconformities and joints

Activity/Event:

Wooden models of folds, faults, unconformities and joints can be made in the workshop laboratory

Unit-V:

Geophysical investigation: Importance of Geophysical studies, Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods. Importance of Electrical resistivity methods and seismic refraction methods.

Outcome:

- Able to explain importance of Geophysical studies
- Able to explain principles of geophysical study by Various methods
- Able to distinguish the importance of Electrical resistivity methods and seismic refraction methods

Activity/Event

The groundwater exploration can be done using Electrical Resistivity Meter Survey

Text Books:

1. Principles of Engineering Geology by K.V.G.K. Gokhale – B.S. publications, 2009.
2. Engineering Geology by N.Chennkesavulu, Mc-Millan, India Ltd. 2005.
3. Engineering and General Geology by Parbin Singh, SK Katria& Sons, 2009.

Reference Books:

1. F.G. Bell, Fundamentals of Engineering Geology, Butterworths Publications, New Delhi, 1992.
2. Krynine& Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution

Course Code	STRUCTURAL ANALYSIS-II	L	T	P	Credits
1001173102		3	1	0	3

Course Overview:

This course embraces classical and modern methods for the analysis of statically indeterminate structures. Principal topics are the Force method & Displacement method of matrix method of structural analysis. Displacement technique involving Kani's method and Moment Distribution approach are introduced for structures with/without sway.

Course Objectives:

The student will be taught

1. The different types of Structures
2. The concepts of Arches with their analysis
3. The concepts of lateral Load analysis
4. The analysis of Cables and Suspension Bridges
5. The analysis of structures by using Moment distribution, Kani's and Matrix methods.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Differentiate Determinate and Indeterminate Structures	Understanding	1
CO2	Analyze the two hinged and three hinged arches for different support levels	Analyzing	1,2
CO3	Analyze structures using portal and cantilever methods	Analyzing	1,2
CO4	Analyze Cable and Suspension Bridge structures	Analyzing	1,2
CO5	Analyze structures using Moment Distribution, Kani's and Matrix methods.	Analyzing	1,2

Unit-I:

Three Hinged Arches: Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature.

Two Hinged Arches: Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses.

Outcome:

- Differentiate Determinate and Indeterminate Structures
- Can able to analyze curved beams (Arches) for different support levels

Activity/Event:

Determination of support reactions is the important part in designing the three-pinned arch. As a group, you will be given two types of experiment involving three-pinned arch due to point load and three-pinned arch due to uniformly distributed load. The experiments will be subjected to different loading. You are required to carry out the tests using the appropriate apparatus in the laboratory.

Unit-II:

Cable Structures : Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, temperature stresses

Suspension bridge: Analysis of simple suspension bridge, Three hinged stiffening girder suspension bridges.

Outcome:

- Able to identify various Suspension Bridges with & without stiffeners
- Able to Analyze Cable and Suspension Bridge structures

Activity/Event:

Build the strongest of all the bridge structures – Student should be able to build any one type of suspension bridge with different materials such that it should sustain to loads applied on it

Unit-III:

Lateral Load Analysis Using Approximate Methods**:** Application to building frames.

(i) **Portal frame method**

(ii) **Cantilever method**

Outcome:

- Understand Concepts of lateral Load analysis
- Carryout lateral Load analysis of structures

Activity/Event:

Construct a 2D frame with any elastic material subjected to Lateral Force Analysis (Static Analysis) & compare results with Portal Method & Cantilever Method of analysis

Unit-IV:

Moment Distribution Method: Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including Sway.

Kani's Method: Analysis of continuous beams – including settlement of supports and single bay portal frames with and without side sway.

Outcome:

- Able to Analyze structures using Moment Distribution, Kani's Method

Activity/Event:

Analyze any innovative frame structure with suitable loading using Moment Distribution, Kani's Method & compare the results of each

Unit-V:

Flexibility matrix method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

Stiffness matrix method: Introduction, application to continuous beams (maximum of two unknowns) including support settlements.

Outcome:

- Able to Analyze structures using matrix methods

Activity/Event:

Prepare an excel code for Continuous beam subjected static loading using matrix method of structural analysis with pictorial representation.

Text Books:

1 'Structural Analysis' by T.S.Thandavamoorthy, Oxford university press, India.
2 'Structural Analysis' by R.C. Hibbeler, Pearson Education, India
3 'Theory of Structures – II' by B.C.Punmia, Jain & Jain, Laxmi Publications, India.
4 'Structural Analysis' by C.S. Reddy, Tata Mc-Graw hill, New Delhi.

Reference Books:

1 'Intermediate Structural Analysis' by C. K. Wang, Tata McGraw Hill, India.
2 'Theory of structures' by Ramamuratam, Dhanpatrai Publications.
3 'Analysis of structures' by Vazrani&Ratwani – Khanna Publications.
4 'Comprehensive Structural Analysis-Vol.I&2' by Dr. R. Vaidyanathan &Dr. P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi.

Course Code	DESIGN OF REINFORCED CONCRETE STRUCTURES	L	T	P	Credits
1001173103		3	1	0	3

Course Overview:

This course will give the student knowledge about the design of various structural elements like beams, columns, slabs, footings etc in various constructions built up in reinforced concrete as per the IS 456-2000

Course Objectives:

The student will be taught

1. The different types of design philosophies
2. The concepts of design of flexural members
3. The concepts of shear, bond and torsion
4. The different types of compression members and design
5. The different types of footings and their design

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Explain different types of design philosophies	Understanding	1
CO2	Design flexural members with detailing	Applying	1,2,3
CO3	Design structures subjected to shear, bond and Torsion	Applying	1,2,3
CO4	Design one way and two way slabs	Applying	1,2,3
CO5	Design different types of compression members and footings	Applying	1,2

Unit-I:

Introduction:

a) **Working stress method**: Introduction- differences between limit state and working stress method

b) Limit State Design: Concepts of limit state design – Basic statistical principles – Characteristic loads – Characteristic strength – Partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design – stress - block parameters – limiting moment of Resistance.

Outcome:

Able to identify the importance of limit state of design and the difference between working stress method and limit state design

Activity/Event:
Illustration of stress block parameters

Unit-II:

Design for Flexure: Limit state analysis and design of singly reinforced sections effective depth- Moment of Resistance- Doubly reinforced and flanged (T and L) beam sections- Minimum depth for a given capacity- Limiting Percentage of Steel- Minimum Tension Reinforcement-Maximum Flexural Steel- Design of Flanged Sections (T&L)-Effective width of flange –Behavior- Analysis and Design

Outcome:

Able to design singly and doubly reinforced beams and flanged beams using IS code

Activity/Event:

Draw the reinforcement details of singly and doubly reinforced beams

Unit-III:

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

Outcome:
Able to design torsional and shear reinforcement

Activity/Event:

Draw detailing of shear and torsional reinforcement in beams

Unit-IV:

Slabs: Classification of slabs, design of one - way slabs, one way continuous slab using IS Coefficients (Conventional) –Design of two - way slabs-simply supported and various edge conditions using IS Coefficients.

Outcome:

Able to design one way and two way slabs

Activity/Event:
Draw the reinforcement details of one way and two way slabs

Unit-V:

Design of Compression members: Effective length of a column, Design of short and long columns – under axial loads, uniaxial bending and biaxial bending – I S Code provisions.

Footings: Different types of footings – Design of isolated footings – pedestal, square, rectangular footings subjected to axial loads

Outcome:

- Able to design columns subjected to axial loads
- Able to design different types of footings.

Activity/Event:

Draw reinforcement detailing of columns and isolated footings

Text Books:

1. Design of reinforced concrete structures in Limit State Design, A. K. Jain
2. Design of Reinforced concrete Structures, N. Subrahmanyian
3. Reinforced Concrete Structures, S. Unnikrishna Pillai &Devdas Menon, Tata Mc.GrawHill, New Delhi.

Course Code	TRANSPORTATION ENGINEERING-II	L	T	P	Credits
1001173104		3	1	0	3

Course Overview:

This course will give the student knowledge about Railways, Airport and Harbour planning design principles and maintenance & rehabilitation methods.

Course Objectives:

The student will be taught

1. The various components and their functions in a railway track.
2. The design principles of geometrics in a railway track.
3. The various factors that effecting airport and aircraft.
4. The design principles of airport geometrics and pavements.
5. The planning, construction and maintenance of Docks and Harbours.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Design geometrics in a railway track.	Applying	1,2
CO2	Design good transportation network	Applying	1
CO3	Illustrate the master plan and site selection for airport	Understanding	1,6
CO4	Design airport geometrics and airfield pavements.	Applying	1,2,6
CO5	Plan, construct and maintain docks and harbours.	Applying	1,6

Unit-I:

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

Outcome:

- Able to know Track Guage suitable to different topography.
- Able to know functions of various components of railway track.

Activity/Event:

Make a visit to nearby railway track to explain about components of permanent way, track guage and Adzing of sleepers.

Unit-II:

Geometric Design of Railway Track:
Alignment – Engineering Surveys – Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve.

Turnouts & Controllers:
Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Interlocking

Outcome:
- Able to trace out track alignment from different alternative alignments.
- Able to know the track layout and purpose of different signals.

Activity/Event:

Make a visit to nearby railway station to explain about degree of curve, track layouts, crossings & turnouts and information about signals.

Unit-III:

Airport Planning & Design:
Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway– Terminal area and Airport layout – Visual aids and Air traffic control.

Outcome:
- Able to know parameters to consider for airport site selection.
- Able to know direction and intensity of wind for runway design by Wind rose diagram.

Activity/Event:

Make a visit to nearby airport to explain about airport layout, terminal area, visual aids and air traffic control.

Unit-IV:

Runway Design:

Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

Outcome:
- Able to design Flexible and Rigid pavements by LCN system of pavement.
- Able to estimate types of failures and their maintenance and rehabilitation methods.

Activity/Event:

Design a flexible pavement by LCN system method for determining appropriate layer thickness and composition.

Unit-V:

Planning, Layout, Construction & Maintenance Of Docks & Harbours:

Classification of ports – Requirement of a good port – classification of Harbours – Docks – Dry & wet docks – Transition sheds and workhouses – Layouts; Quays – construction of Quay walls – Wharves – Jetties – Tides – Tidal data and Analysis – Break waters – Dredging – Maintenance of Ports and Harbours – Navigational aids.

Outcome:

- Able to know ideal conditions for good port and harbour.
- Able to know maintenance of ports and Harbours.

Activity/Event:

Design a flexible pavement by empirical design for determining appropriate layer thickness and composition

Text Books:

1. Railway Engineering by Satish Chandra and Agarwal M.M., Oxford University Press, New Delhi
2. Airport Engineering by Khanna & Arora – Nemchand Bros, New Delhi.
3. Docks and Harbour Engineering by Bindra S.P. – Dhanpathi Rai & Sons, New Delhi.

Reference Books:

1. Railway Engineering by Saxena & Arora – Dhanpat Rai, New Delhi.
2. Transportation Engineering Planning Design' by Wright P.H. &Ashfort N.J. – John Wiley & Sons.
3. Airport Engineering' by Virendra Kumar, Dhanpat Rai Publishers, New Delhi.
4. Transportation Engineering' by Srinivasa Kumar R, University Press, Hyderabad
5. Highway, Railway, Airport and Harbour Engineering' by Subramanian KP, Scitech Publications (India) Pvt. Limited, Chennai.

Course Code	SURVEYING FIELD WORK– II	L	T	P	Credits
1001173121		0	0	3	2

Course Overview:
The Lab course covers study of theodolite ,measuring horizontal and vertical angles by different methods , trigonometric levelling , tachometric levelling , curve setting , and total station

Course Objectives:

The students will be explained

1 The study of theodolite and measuring horizontal and vertical angles
2 The trigonometric leveling heights and distances
3 The tachometric leveling heights and distances
4 The curve setting by simple offsets
5 The total station

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Compute the horizontal and vertical angles	Applying	1,2
CO2	Compute the heights and distances by method of trigonometric leveling	Applying	1,2
CO3	Find the distances and heights with tachometric	Applying	1,2
CO4	Design and set the simple curve	Applying	1,2,3
CO5	Compute the areas, heights, distances and setting out the structures	Applying	1,2

List of Exercises:

1. Study of theodolite
2. Measurement of horizontal angles by repetition method
3. Measurement of horizontal angles by reiteration method
4. Measurement of vertical angles
5. Trigonometric leveling - heights and distance problem (two exercises)
6. Determination of constants of tachometer.
7. Heights and distance using Principles of tachometric surveying (Two Exercises)
8. Setting out a simple curve by means of offsets from long chord

9. Determine of area using total station.
10. Determination of remote height using total station.
11. Setting out of structures using total station

List of Equipment:

12. Theodolite
13. Tripod stand
14. Staff
15. Tape
16. Pegs
17. Metric chain
18. Total station

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room/Laboratory

Course Code	ENGINEERING GEOLOGY LAB	L	T	P	Credits
1001173122		0	0	3	2

Course Overview:

This Lab course covers study and identification of minerals, megascopic description and identification of rocks, interpretation and drawing of sections for geological maps and simple structural geological problems

Course Objectives:

The students will be explained

1. The physical properties of minerals and their identification
2. The megascopic description of rocks and their identification
3. The interpretation of geological maps
4. The drawing of sections of geological maps
5. The structural geological problems

Course Outcomes:

The student will be able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Identify the minerals through their physical properties	Remembering	1
CO2	Identify the rocks through megascopic study	Understanding	1
CO3	Interpret the geological maps	Understanding	1
CO4	Draw the sections of geological maps	Applying	1
CO5	Solve the structural geological problems	Applying	1,2

List of Exercises:

1. Study of physical properties and identification of minerals referred under theory.
2. Megascopic description and identification of rocks referred under theory.
3. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.
4. Simple Structural Geology problems.

List of Tools:

1. Hand lens
2. Mohs hardness testing tool kit
3. Retractable Blade knife
4. Reference materials
5. Streak Plate etc,.

Lab Examination Pattern:

1. Description and identification of Six minerals
2. Description and identification of Six Rocks (including igneous, sedimentary and metamorphic rocks)
3. Interpretation of a Geological map along with a geological section.
4. Simple strike and Dip problems.

Course Code	TRANSPORTATION ENGINEERING LAB	L	T	P	Credits
1001173123		0	0	3	2

Course Overview:

The Lab Courses is divided into three sections. First section contains the standardized tests for checking the mechanical properties (Aggregate Impact Value, Aggregate Crushing Value, and Percent Fines Value), and shape characteristics (Flakiness Index, Elongation Index and Angularity Number) of aggregates used in roadway construction. Second section describes the detail procedure of measuring the capacity of any roadway section, and saturation flow, Design of Signal Cycle Times, turning movements and Start-up time lost of any signalized intersection. Third section deals with bituminous material, which is a vital component of roadway construction and Marshal for bitumen mix design.

Course Objectives:

The students will be explained

1. To test crushing value, impact resistance, specific gravity and water absorption, percentage attrition, percentage abrasion, flakiness index and elongation index for the given road aggregates.
2. To know penetration value, ductility value, softening point, flash and fire point, viscosity and stripping for the given bitumen grade.
3. To test the stability for the given bitumen mix.
4. To carry out surveys for traffic volume, speed and parking
5. To carry out surveys for Turning Movements at signalized Intersections
6. To Analyze Saturation flow and Turning Movements.

Course Outcomes:

The students will be able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Test aggregates and judge the suitability of materials for the road construction	Applying	1
CO2	Test the given bitumen samples and judge their suitability for the road construction	Applying	1
CO3	Compute the optimum bitumen content for the mix design	Applying	1
CO4	Determine the traffic volume, speed and parking characteristics	Applying	1,2,3
CO5	Determine the traffic Capacity and saturation flow	Applying	1
CO6	Design signal cycle times and find the Start-up Lost time	Applying	1,2,3

List of Exercises:

Tests on Aggregates

1. Aggregate Crushing Value Test
2. Determination of Aggregate Impact Value
3. Specific Gravity And Water Absorption Test
4. Determination of Los Angeles Abrasion Value
5. Flakiness Index And Elongation of Coarse Aggregate

Traffic Engineering

6. Spot Speed Study
7. Turning movements and Start-up Lost time
8. Determination of Traffic Capacity and Saturation flow
9. Design of Signal Cycle Times
10. Parking study.

Tests on Bituminous Material

11. Penetration Value of Bituminous Material
12. Ductility of Bituminous Material
13. Softening Point of Bituminous Material (Ring & Ball Method)
14. Viscosity Test For Cutback Bitumen
15. Specific Gravity of Bitumen
16. Flash & Fire Points of Bituminous Material
17. Marshall Method of Mix Design

List of Equipment:

1. Apparatus for aggregate crushing test.
2. Aggregate Impact testing machine
3. Pycnometers.
4. Los angles Abrasion test machine
5. Deval's Attrition test machine
6. Length and elongation gauges
7. Bitumen penetration test setup.
8. Bitumen Ductility test setup.
9. Ring and ball apparatus
10. Viscometer.
11. Marshal Mix design apparatus.
12. Radar gun for spot speed measurement.
13. Video graphic Cameras for traffic Volume, Turning movements and Approaching Speed.
14. Stop Watches

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room/Laboratory

DETAILED SYLLABUS FOR

III-B.Tech

II-SEMESTER

Course Code	DESIGN OF STEEL STRUCTURES	L	T	P	Credits
1001173201		3	1	0	3

Course Overview:

This course will give the student knowledge about the design of various structural steel elements like beams, built up columns, compression members, tension members, plate girders and gantry girders

Course Objectives:

The students will be explained

1. The different types of Connections and relevant IS codes
2. The concepts of design of flexural members
3. The design Concepts of tension and compression members in trusses
4. The different types of Columns and their design
5. The Plate girder and Gantry Girder and their Design

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Explain different types of Connections and relevant IS codes	Understanding	1
CO2	Design beams of laterally supported and unsupported	Applying	1,3
CO3	Design compression members of different types with connection detailing	Applying	1,3
CO4	Design Plate Girder and Gantry Girder with connection detailing	Applying	1,3
CO5	Produce the drawings pertaining to different components of steel structures	Understanding	1,3

UNIT – I

Connections:

Introduction:

(a) Riveted connections – Definition,-Codal Provisions,
(**b) Welded connections**: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of fillet weld subjected to moment acting in the plane and at right Angles to the plane of the joints.

Outcome:

- Able to differentiate riveted and welded connections and able to design fillet welds subjected to moment

Activity/Event:

Illustration of different types of connections

UNIT – II:

Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams- check for deflection, shear, buckling, check for bearing, laterally Supported and unsupported beams.

Outcome:

- Able to design laterally supported and unsupported beams using IS code

Activity/Event:

Detailing of simple beams

UNIT-III

Compression members: effective length of columns. Slenderness ratio –Permissible stresses. Design of compression members, struts etc. Design of Columns**,** Built up compression members – Design of lacings and battens.

Outcome:

- Able to design compression members, struts, built up beams

Activity/Event:

Detailing of Column including lacing and battens.

UNIT –IV

a) Tension Members and compression members: General Design of members subjected to direct tension

b) **Roof Trusses:** Different types of trusses – Design loads – Load combinations as per IS Code recommendations, Design of simple roof trusses involving the design of purlins only

Outcome:

- Able to design tension members

Activity/Event:

Detailing of steel roof trusses including joint details.

UNIT–V

a) Design of Plate Girder: Design consideration – IS Code recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections.

b) Design of Gantry Girder: impact factors - longitudinal forces, Design of Gantry girders.

Outcome:

- Able to design plate girders and gantry girders

Activity/Event :
Detailing of Plate girder including curtailment, splicing and stiffeners.

Text Books:
1. Steel Structures Design and Practice, N. Subramanian, Oxford University Press.
2. Design of steel structures, S. K. Duggal, Tata Mc Graw Hill, New Delhi
3. Design of Steel Structures S. S. Bhavikatti, I. K International Publishing House Pvt. Ltd.

References
1. Structural Design in Steel, Sarwar Alam Raz, New Age International Publishers, New Delhi
2. Design of Steel Structures, M. Raghupathi, Tata Mc. Graw-Hill
3. Structural Design and Drawing, N. Krishna Raju; University Press,

IS Codes:
1) Indian Standard Code for General Construction in Steel, 3rd revision, Indian Standards Institution, New Delhi,2008.
2) IS – 875, Code of practice for design loads (other than earth quake) for buildings and structures (Part-1-Part 5),Bureau of Indian standards.
3) Steel Tables.
These codes and steel tables are permitted to use in the examinations.

Course Code	GEOTECHNICAL ENGINEERING - I	L	T	P	Credits
1001173202		3	1	0	3

Course Overview:

Geotechnical engineering deals with the behavior of soils under the influence of loading. It is one of the most important branches of civil engineering. It uses the concepts of soil and rock mechanics to model real world engineering problems, aided by empirical observations and a systematic classification of soil materials which seeks to correlate classification and physical properties with engineering behavior. This course serves as an introduction to geotechnical engineering and covers basic concepts and terminology.

Course Objectives:

The student will be taught

1. The fundamental concepts of soil mechanics
2. The index properties of soil
3. The concept of permeability and seepage of water through soils and determine the seepage discharge
4. The stress distribution under applied loads
5. The compaction and consolidation of soils
6. The magnitude and the rate of consolidation settlement.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Summarize the physical properties of soil and establish their inter-relationships	Understanding	1
CO2	Classify the different types of soil and recognize the various index properties of the soils.	Understanding	1
CO3	Analyze the effect of seepage in soil	Analyzing	1,2
CO4	Calculate the settlements and increase in the vertical stress due to super structure loads.	Analyzing	1,2
CO5	Demonstrate the compaction characteristics, consolidation parameters and its significance.	Understanding	1

Unit-I:

Introduction: Origin and Formation of soils; Residual and Transported soils.

Physical Properties of Soil: Three phase system - phase diagram - physical properties Functional Relationships between physical properties-determination of water content, specific gravity, In-situ density-Relative density and its determination.

Outcome:

- Summarize the physical properties of soil and establish their inter-relationships

Activity/Event

Solving the Previous GATE problems.

Unit-II:

Plasticity Characteristics of soil: Atterberg's limits and their determination-liquid limit, plastic limit, shrinkage limit and index properties-Activity-Free swell index.

Soil Classification: Grain size analysis, sedimentation analysis-hydrometer analysis- grain size distribution curves. Various Types of soil Classifications – Unified soil classification and I.S. Soil classification.

Outcome:

- Classify the different types of soil and recognize the various index properties of the soils

Activity/Event

Laboratory Demonstration on determination of Index Properties of soil.

Unit-III:

Permeability: Soil water, Capillary rise, One dimensioned flow of water through soils, Darcy's law, Permeability – Factors affecting –laboratory determination of Coefficient of permeability – Permeability of layered systems.
Total, neutral and effective stresses –quick sand condition – 2-D flow and Laplace's equation - Seepage through soils –Flow nets: Characteristics and Uses

Outcome:

- Analyze the effect of seepage in soil.

Activity/Event
Laboratory Demonstration on determination of Permeability of Soil and a seminar on the determination of permeability of In-situ soil (At Site).

Unit-IV:

Stress Distribution: Stresses due to self weight-total, neutral and effective stresses- Vertical stress due to applied loads- Boussinesq theory- Concentrated load-Strip footing-below center of circular footing- Rectangular footing-Newmark's influence chart - Pressure bulb Significant depth- Westergaard theory - 2:1 distribution method

Outcome:
Calculate the settlements and increase in the vertical stress due to super structure loads

Activity/Event:

A Video Module on the Pressure Bulb Concept.

Unit-V:

Compaction: Principle of compaction, OMC and MDD, Lab tests-IS light weight and heavy weight compaction tests, factors effecting compaction., zero air void line-effect of compaction on engineering properties of soil, field tests for compaction control.

Consolidation: Compressibility of soils – e-p and e-log p curves – Stress history –Concept of consolidation - Spring Analogy - Terzaghi's theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determination of coefficient of consolidation (C_v) - Over consolidated and normally consolidated clays.

Outcome:

- Demonstrate the compaction characteristics, consolidation parameters and its significance.

Activity/Event

Laboratory Demonstration on Determination of Compaction and Consolidation Characteristics. Solving previous GATE Problems.

Text Books:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age International Publishers.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers
3. Arora, K.R. (2001), "Soil Mechanics and Foundation Engineering", Standard Publishers, Delhi – 110 006.

Reference Books:

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.
2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.
3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi

Course Code	ENVIRONMENTAL ENGINEERING-I	L	T	P	Credits
1001173203		3	1	0	3

Course Overview:

This course will give the student knowledge about Water sources, Quality parameters Quantity of water required, Collection, conveyance and distribution; various treatment methods Water treatment, Distribution Network and Water supply arrangements in buildings.

Course Objectives:

The student will be taught

1. The basic knowledge on sources, quality, quantity, demand, conveyance, treatment systems, storage and distribution of water; and water supply arrangements in buildings.
2. The skills in analysis, design and problem solving in water supply engineering issues using appropriate techniques.
3. The ethics in solving water supply engineering problems ensuring health and safety.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Acquire the basic knowledge on sources, quality, quantity, demand, conveyance, treatment systems, storage and distribution of water; and water supply arrangements in buildings.	Understanding	1
CO2	Analyze problems associated with water supply engineering	Applying	1
CO3	Design water conveyance, treatment, storage and distribution systems	Applying	1,2
CO4	Solve water supply engineering problems through proper investigations and interpretation	Applying	1,2,6
CO5	Solve the water supply engineering problems by using appropriate techniques	Applying	1,6
CO6	Give solutions to water supply engineering problems ensuring health and safety	Applying	1,6,8
CO7	Maintain quality standards in analysis, treatment and distribution of water in water supply schemes.	Understanding	1,6

Unit-I:

Water Sources and Quality:
Importance of water supply engineering, Need for protected water supply, Objectives of water supply systems, Flow diagram of water supply systems, Different sources of water, Quantity and quality of different sources – Physical, chemical and biological impurities and their testing parameters.

Outcome:

- Acquire the basic knowledge on sources of water, quality parameters.

Activity/Event:

Estimation of various quality parameters of water in the laboratory.

Unit-II:

Quantity, Demand, Collection and Conveyance
Types and variation in water demand, Factors affecting water demand, Design period, Forecasting of population, different methods and their suitability, Water quality standards – Drinking, Construction; Intake works for collection of surface water, Conveyance of water – Gravity and pumping methods; Different materials used for conveying conduits and their suitability.

Outcome:

- Able to estimate the quantity of water required; various demands of water.

Activity/Event:

Design water conveyance system.

Unit-III:

Water Treatment:
Conventional water treatment processes – Units and their functions; Aeration, Coagulation, Flocculation, Clarification, Determination of optimum dose of alum for coagulation of water, Theory of filtration, Different types of filters and their design, Disinfection – Disinfectants, Mechanism of disinfection, Different methods of disinfection, Break point chlorination, Types of chlorination, Dose of disinfectant.

Outcome:

- Able to solve water supply engineering problems through proper investigations and interpretation.

Activity/Event:

Design of Water Treatment plant

Unit-IV:

Advanced Treatment Methods and Distribution:

Advanced Treatment Methods: Removal of fluorides, arsenic, hardness, iron and manganese, salinity, colour, organic chemical and biological residues; Adsorption with activated carbon, ion–exchange resins; Membrane processes, Chemical oxidation.

Distribution: Distribution- Systems of distribution, Distribution reservoirs, Distribution networks, Design of simple networks, Pipe accessories, Valves and their location and suitability, EPANET software.

Outcome:

- Able to use advanced techniques for water treatment.
- Analyze problems associated with water distribution network.

Activity/Event:
Import the layout of water distribution network into EPANET and analyze various parameters.

Unit-V:

Water Supply Arrangements in Buildings:

Definition of technical terms used in water supply arrangements, House water connection, Water storage, Water piping systems in buildings, Connection from water main to building, Water supply fittings, Principles and precautions in laying pipe lines in the premises of buildings, Detection and prevention of leakages.

Outcome:

- Acquire the basic knowledge on storage and distribution of water; and water supply arrangements in buildings.

Activity/Event:
Prepare a model for water supply network for any residential building.

Text Books:

1. S. K. Garg, *Environmental Engineering, Vol. I: Water Supply Engineering,* Khanna Publishers, 20th Edition, 2011.
2. G. S. Birdie and J. S. Birdie, *Water Supply and Sanitary Engineering*, Dhanpat Rai and Sons Publishers, 9th Edition, 2011.

Reference Books:

1. K. N. Duggal, *Elements of Environmental Engineering*, S. Chand Publishers, 2010.
2. H. S. Peavy and D. R. Rowe, *Environmental Engineering*, McGraw–Hill Publishing Company, 2nd Edition, 1984.
3. P. N. Modi, *Water Supply Engineering*, Standard Book House, 3rd edition, 2010.
4. S. K. Duggal, *Elements of Water Supply Engineering,* S. Chand & Co, 2010.

Course Code		L	T	P	Credits
1001173204	WATER RESOURCES ENGINEERING-I	3	1	0	3

Course Overview:

Hydrology is the study of the processes which cycle water among the oceans, atmosphere and land surface.. In many places water is relatively scarce with most precipitation falling as a snow on the high mountains.. This course is about learning the concepts and physical principles of water flow as well as the techniques that can be used to solve hydrologic problems. In practice hydrologists have to quantify rates at which water is exchanged among the atmospheres, ocean and land surface.

Course Objectives: The student will be taught

1. The hydrologic cycle, precipitation and its relevance to civil engineering
2. The abstractions from precipitation, evaporation, Evapo transpiration and Infiltration
3. The concepts of runoff and hydrograph analysis
4. The flood frequency analysis, design flood, flood routing
5. The concepts of groundwater movement and well hydraulics

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe the hydrologic cycle, precipitation and its relevance to civil engineering	Understanding	1,6
CO2	Describe abstractions from precipitation, evaporation, Evapotranspiration and Infiltration.	Understanding	1
CO3	Describe concepts of runoff and hydrograph analysis	Understanding	1
CO4	Analyze flood frequency and design flood and flood routing	Applying	1,3
CO5	Analyze the groundwater movement and well hydraulics	Applying	1,3

Unit-I:

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data.

Precipitation: Types and forms, measurement, rain gauge network, presentation of rain fall data, average rainfall, continuity and consistency of rainfall data, frequency of rainfall, Intensity-Duration-Frequency (IDF) curves, Depth-Area-Duration (DAD) curves, Probable Maximum Precipitation (PMP), design storm

Outcome:

- Introduce hydrologic cycle and its relevance to civil engineering

Activity/Event:

Study a topo sheet of Visakhapatnam region.

Unit-II:

Abstractions from Precipitation: Initial abstractions.

Evaporation: factors affecting, measurement, reduction

Evapo transpiration: factors affecting, measurement, control

Infiltration: factors affecting, Infiltration capacity curve, measurement, infiltration indices.

Outcome:

- Understand the students understand physical processes in hydrology and,
- components of the hydrologic cycle
- Appreciate concepts and theory of physical processes and interactions
- Learn measurement and estimation of the components hydrologic cycle.

Activity/Event:

Estimate runoff using runoff co-efficient method.

Unit-III:

Runoff: Catchment characteristics**,** Factors affecting runoff, components, computation-empirical formulae, tables and curves, stream gauging, rating curve, flow mass curve and flow duration curve.

Hydrograph analysis: Components of hydrograph, separation of base flow, effective rain fall hyetograph and direct runoff hydrograph, unit hydrograph, assumptions, derivation of unit hydrograph, unit hydrographs of different durations, principle of superposition and S-hydrograph methods, limitations and applications of unit hydrograph, synthetic unit hydrograph.

Outcome:

Thorough understanding of hydrograph, its components, unit hydrograph theory and its analysis

Activity/Event:

Delineate the watersheds using the topo sheet.

Unit-IV:

Floods:

Causes and effects, frequency analysis- Gumbel's and Log-Pearson type distribution methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), flood control methods and management.

Flood Routing: Hydrologic routing, channel and reservoir routing-Muskingum and Puls methods of routing.

Outcome:

- Understand flood frequency analysis, design flood, flood routing

Activity/Event:
Derive the watershed map from the Digital Elevation Model.

Unit-V:

Groundwater:

Occurrence, types of aquifers, aquifer parameters, porosity, specificyield, permeability, transmissivity and storage coefficient, types of wells, Darcy's law, Dupuit's equation- steady radial flow to wells in confined and unconfined aquifers, yield of a open well-recuperation test

Outcome:

- Understand the concepts of groundwater movement and well hydraulics

Activity/Event

Derive the stream line network from the Digital Elevation Model.

Text Books:

1. Engineering Hydrology, Jayarami Reddy, P., Laxmi Publications Pvt. Ltd., (2013), New Delhi
2. Irrigation and Water Power Engineering, B. C. Punmia, Pande B. B. Lal, Ashok Kumar Jain and Arun Kumar Jain, Lakshmi Publications (P) Ltd.

Reference Books:

1. Engineering Hydrology Subramanya, K, Tata McGraw-Hill Education Pvt Ltd, (2013),New Delhi.
2. Irrigation Engineering and Hydraulic Structure, Santosh Kumar Garg, Khanna Publishers.
3. Applied hydrology, Chow V. T., D. R Maidment and L.W. Mays, Tata McGraw Hill Education Pvt Ltd, (2011), New Delhi.
4. Water Resources Engineering, Mays L.W, Wiley India Pvt. Ltd, (2013)

Course Code	ADVANCED SURVEYING USING GPS (ELECTIVE-I)	L	T	P	Credits
1001173205		3	1	0	3

Course Overview:

The objective of the course is to provide optimal insights into land surveying using GPS (Global Positioning System). The course starts with an introduction to land surveying leading to GPS as the state-of-art for surveying of land. Then, different aspects of GPS systems such as GPS architecture, GPS signals, GPS receivers, GPS software has been discussed followed by GPS positioning & GPS observables. Next, it provides GPS processing fundamentals consisting of pre-processing and processing steps under different processing strategies followed by quality assessment and field procedure of GPS surveying. The course concludes with a detail demonstration of GPS field surveying followed by processing of collected data.

Course Objectives:

The student will be taught

1. The basic concepts of geodesy
2. The basic concepts of Global Positioning systems
3. The GPS Signal structure and GPS orbits
4. The GPS errors and accuracy
5. The GPS applications

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Explain basic concepts of geodesy	Understanding	1,5
CO2	Explain basic concepts of Global Positioning systems	Understanding	1,5
CO3	Describe the GPS Signal structure and GPS orbits	Understanding	1,5
CO4	Explain GPS errors and accuracy	Understanding	1,5
CO5	Illustrate GPS applications	Understanding	1,5,4

Unit-I:

Introduction to Geodesy:

Definitions and fundamentals of Geodesy, Earth, Geoid and Ellipsoid of rotation, Reference surface, Geodetic systems, Indian Geodetic System, Coordinate systems and transformation.

Outcome:

- Able to explain about geodesy and its systems

Activity/Event:

Seminar on Geodesy

Unit-II:

Introduction to GPS:
History: Transit, Timation, NAVSTAR GPS, GLONASS, GALILEO. GPS design objectives and details of *segments* space, control and user, blocks of GPS- Block I, II/IIA, IIR Satellites, IIF, Advantages and current limitations of GPS, Status of GPS Surveying, Applications.

Outcome:
- Able to explain concepts of GPS

Activity/Event: Seminar on GPS

Unit-III:

GPS Signal structure: Carriers, GPS codes: C/A, P, navigational message, GPS receiver: Types and Structure of receivers, Principles of GPS position fixing: Pseudo ranging**.**

GPS Orbits: Determination of GPS satellite coordinates, Types of ephemerides, GPS data formats: RINEX, SP3.

Outcome:
- Able to explain the GPS Signal structure and orbits

Activity/Event: Seminar on GPS orbits

Unit-IV:

GPS errors and accuracy:
Satellite dependent: Ephemeris errors and orbit perturbations, Forces on GPS satellites, Effects of orbital bias, Types of satellite ephemerides, Satellite clock bias, Selective availability. Receiver dependent: Receiver clock bias, Cycle slip, Selective availability (SA). Observation medium dependent: Ionospheric errors, Tropospheric errors. Station dependent: Multipath, Station coordinates. Satellite geometry based measures: Geometry dependent (Dilution of Precision: DOP), User Equivalent Range Error UERE.

Outcome:
- Able to describe GPS errors and accuracy

Activity/Event:

Find the errors in handheld GPS in the field

Unit-V:

GPS Applications:

Geodetic control surveys, Cadastral surveys, Photogrammetry, Remote sensing, Engineering and monitoring. Military applications, Geographical Information System, Vehicle tracking and car navigation, LBS and special applications.

Outcome:

- Able to illustrate the applications of GPS

Activity/Event:

Find the locations of various point of the VIIT using handheld GPS. One more activity will be done on path finding

Text Books:

1. Bradford W. Parkinson & James Spilker., Global Positioning System: Theory and Applications, Vol I,1996
2. Hofmann W.B &Lichtenegger, H. Collins., Global Positioning System – Theory and Practice, Springer-Verlag Wein, New York,2001.
3. Gunter Seeber., Satellite Geodesy Foundations-Methods and Applications,2003.

References:

1. P. R. Wolf, and C. D. Ghilani, 1997. Adjustment Computations: Statistics and Least Squares in Surveying and GIS, Publisher: John Wiley & Sons, New York (USA), pages 564.
2. J. V. Sickle, 2001. GPS for Land Surveyors Publisher: Ann Arbor Press, Michigan(USA), pages 284.
3. B. Hofmann-Wellenhof, H. Lichtenegger and J. Collins, 1994. Global Positioning System: Theory and Practice, Publisher: Springer, Berlin (Germany), pages 355.
4. Gunter Seeber, 2003. Satellite Geodesy, Publisher: Walter de Gruyter, Berlin (Germany), pages 612.
5. A. Leick, 2004. GPS Satellite Survey (2nd ed.), Publisher: John Wiley & Sons, New York (USA), pages 429.

Course Code	GROUNDWATER DEVELOPMENT AND MANAGEMENT (ELECTIVE-I)	L	T	P	Credits
1001173206		3	1	0	3

Course Objectives:

The student will be taught

1. The flow towards wells in confined and unconfined aquifers.
2. The improvement of the groundwater potential using various recharge techniques.
3. The importance of saline water intrusion in coastal aquifers and its control measures.
4. The various geophysical approaches for groundwater exploration.
5. The groundwater management using advanced tools.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Estimate aquifer parameters and yield of wells	Applying	1
CO2	Analyse radial flow towards wells in confined and unconfined aquifers.	Applying	1,4
CO3	Interpret geophysical exploration data for scientific source finding of aquifers.	Understanding	1,2,4
CO4	Determine the process of artificial recharge for increasing groundwater potential	Applying	1,7
CO5	Apply appropriate measures for groundwater management	Applying	1,7

Unit-I:

Introduction Groundwater in the hydrologic cycle, groundwater occurrence, aquifer parameters and their determination, general groundwater flow equation. Well Hydraulics Steady radial flow and unsteady radial flow to a well in confined and unconfined aquifers, Theis solution, Jocob and Chow's methods, Leaky aquifers.

Outcome:

- Able to estimate aquifer parameters
- Able to estimate yield of wells

Activity/Event:

A pumping test can carried out to find the yield of well

Unit-II:

Well Construction and Development Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail- down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

Outcome:

- Able to understand well construction and development of water wells
- Able know well maintenance

Activity/Event:
A model wells can be prepared by showing well construction and development

Unit-III:

Artificial Recharge Concept of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch and furrow, flooding and recharge well methods, recharge mounds and induced recharge. Saline Water Intrusion Occurrence of saline water intrusion, Ghyben-Herzberg relation, Shape of interface, control of saline water intrusion.

Outcome:

- Able to understand the concepts artificial recharge
- Able to explain control of saline water intrusion

Activity/Event:

Identification of suitable locations for artificial reachrge

Unit-IV:

Geophysics Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photogrammetry applications.

Outcome:

- Able to explain different types Geophysical methods
- Able to understand Geophysical logging and resistivity logging

Activity/Event:
Exploration of Groundwater potential at any using ERM Survey

Unit-V:

Groundwater Modelling and Management Basic principles of groundwater modeling- Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

Outcome:

- Able to understand the Groundwater modeling
- Able to Explain Groundwater Management

Activity/Event:

Groundwater modelling is developed using the modern tools

Text Books:

1. 'Groundwater' by Raghunath H M, New Age International Publishers, 2005.
2. 'Groundwater Hydrology'by Todd D.K., Wiley India Pvt Ltd., 2014.
3. 'Groundwater Hydrology'by Todd D K and L W Mays, CBS Publications, 2005.

References:

1. 'Groundwater Assessment and Management' by Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. 'Groundwater Hydrology' by Bouwer H, McGraw Hill Book Company, 1978.
3. 'Groundwater Systems Planning and Management' by Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. 'Groundwater Resources Evaluation' by Walton W C, Mc Graw Hill Book Company, 1978.

Course Code	WASTE WATER MANAGEMENT (ELECTIVE-I)	L	T	P	Credits
1001173207		3	1	0	3

Course Overview:

This course will give the student knowledge about Industrial waste water along with managing and treatment methods required for these waste water.

Course Objectives:

The student will be taught

1. The quality of domestic & industrial water requirements and wastewater quantity generation.
2. The treatment methods for industrial wastewater.
3. The common methods of treatment in different industries
4. The operational problems of common effluent treatment plant.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Distinguish between the quality of domestic and industrial water requirements and wastewater quantity generation.	Understanding	1,7
CO2	Impart knowledge on selection of treatment methods for industrial wastewater.	Understanding	1,4,7
CO3	Describe the common methods of treatment in different industries	Understanding	1,7
CO4	Explain operational problems of common effluent treatment plant	Understanding	1,4,7
CO5	Explain the manufacturing process of various industries	Understanding	1

Unit-I:

Industrial Water Quality Analysis:

Wastewater Quality characterization - Physical, Chemical and Biological; unit operations and processes used in water and waste water treatment.

Outcome:

- Able to identify the characteristics of waste water

Activity/Event:

Seminar on difference between Municipal wastewater and Industrial waste water.

Unit-II:

Miscellaneous Treatment:

Introduction to Advanced water treatments - Adsorption - Ion Exchange - Reverse Osmosis - Electro dialysis - Micro, Ultra & Nano filtration - Chemical oxidation process.

Outcome:

- Able to identify and differentiate the usage between primary, secondary and advanced treatments.
- Able to select which advanced treatment is necessary pertaining to constituents of waste water.

Activity/Event:

Seminar on other advanced methods of treatment

Unit-III:

Basic theories of Industrial Wastewater Management:

Measurement of industrial wastewater flow - Industrial wastewater sampling and preservation of samples for analysis - Toxicity of industrial effluents due to Heavy metals - Volume and Strength reduction -Neutralization - Equalization, Stabilization and proportioning.

Outcome:

- Able to understand how to minimize and manage industrial waste before its treatment

Activity/Event:
Analyzing the application of Industrial wastewater management in different industries
Unit-IV:

Industrial Wastewater Disposal Management:

Discharges into Streams, Lakes and oceans and associated problems - Land treatment - Common Effluent Treatment Plants: advantages and suitability, Limitations and challenges.

Outcome:

- Able to understand the problems by disposal of untreated waste.
- Able to understand the remedies or methods to manage these wastes.

Activity/Event:

Draw CETP from different industries and analyze the differences in it.

Unit-V:

Process and Treatment of specific Industries:

Manufacturing Process and origin, characteristics, effects and treatment methods of liquid waste from Paper and Pulp industries, Tanneries, Sugar Mills, Distillers, Dairy and food processing industries, Fertilizers, Textiles, Steel plants, Pharmaceutical Plants.

Outcome:

- Able to understand different industries manufacturing process along with the waste generated at point source of each unit.
- Able to know the treatment process required for individual industry depending upon the variation of waste from them.

Activity/Event:

Visiting an nearby industry and observing the manufacturing and treatment process

Text Books:

1. Wastewater Treatment by M.N. Rao and A.K. Dutta, Oxford & IBH, New Delhi.
2. Industrial Wastewater Treatment by KVSG Murali Krishna.
3. Industrial Wastewater treatment by A.D. Patwardhan, PHI Learning, Delhi
4. Industrial Water Pollution Control by W. Wesley Eckenfelder, Mc- GrawHill, Third Edition

Reference Books:

1. Wastewater Engineering by Metcalf and Eddy Inc., Tata McGrawhill Co., New Delhi
2. H. S Peavy, D. R. Rowe and George Tchobanoglous, Environmental Engineering, McGraw-Hill International Ed., 1985.
3. Wastewater Treatment- Concepts and Design Approach by G.L. Karia& R.A. Christian, Prentice Hall of India.
4. Wastewater Treatment for Pollution Control and Reuse, by Soli. J Arceivala, Shyam R Asolekar, Mc-Graw Hill, New Delhi; 3rd Edition.

Course Code	ADVANCED CONCRETE TECHNOLOGY (ELECTIVE-I)	L	T	P	Credits
1001173208		3	1	0	3

Course Overview:

The course covers analysis of using new materials, recycling and reuse different types of materials blended with cement special concretes fiber reinforced concrete high performance concrete non destructive evaluation and durability.

Course Objectives:

The student will be taught

1. The Properties of concrete and use additives and admixtures.
2. The various special concretes used for special purposes
3. The significance of NDT evaluation of concrete
4. The high performance of concrete
5. The durability of concrete

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Use of new materials in Concretes and understand how they affect the properties of concrete	Understanding	1
CO2	Describe the merits and demerits and manufacturing procedures of various special concretes used for special purposes	Understanding	1
CO3	Appreciate RMC MIX design for special concrete	Applying	1,3
CO4	Appreciate need for NDT evaluation of concrete and have knowledge on the working principle of some of the methods	Understanding	1,3
CO5	Describe durability and high performance of concrete	Understanding	1

UNIT-I:

Mix Design Analysis of Using New Materials, Recycling and Reuse:

Different Types of Materials blended with cement – Pozzolana cement, reaction hydration with supplementary cementious materials, admixtures and additives- Properties effecting the Materials - Mix design analysis according to IS 10262

Outcome:

- Able to design the mix calculations.

Activity/Event:

Seminar on advanced topics related to analytical and graphical solutions for computing principal stresses and strains

UNIT-II:

Special Concretes Fiber Reinforced Concrete:

Properties of constituent materials- Mix proportions, mixing and casting methods, Mechanical properties of fiber reinforced concrete - Applications of fiber reinforced concretes

Outcome:

- Able to know the special concretes
- Able to know the fiber reinforced concrete

Activity/Event:

Make different specimens to test their compressive strengths in concrete technology laboratory.

UNIT-III:

High Performance Concrete:

Introduction - Development of high performance concretes - Materials of high performance - Properties of high performance concretes Self Consolidating concrete Introduction – Properties – Applications – springs in series and parallel.

Outcome:

- Able to know the properties of high performance concretes
- Able to know the self-consolidated concrete

Activity/Event:

High performance concretes is analyses by using various concreting materials in laboratory

UNIT-IV:

Non Destructive Evaluation:

Importance of these Methods – Rebound hammer, Ultrasonic pulse velocity test, Concrete behavior under corrosion - Disintegrated mechanisms - Moisture effects and thermal effects - Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content

Outcome:

- Able to understand the non distructive testing methods.
- Able to analyze concrete behavior under different conditions.

Activity/Event:

Conduct the Non Destructive Tests on different existing buildings to find their strengths and then assess the life period of the buildings

UNIT-V:

Durability: Factors affecting durability of concrete, tests on durability with special reference to Rapid chloride permeability Test.

Outcome:

- Able to know the chloride permeability Test

Activity/Event:

Seminar on advanced topics related to durability of modern structures.

Text Books:

1. R. Santhakumar,, Concrete Technology", Oxford University Press 2 P.K Mehta.
2. Concrete technology- Neville & Brooks
3. Advanced Concrete Technology by M.S. Shetty.

Reference Books:

1. Mehta and Monteiro, „Concrete-Micro structure, Properties and Materials", McGraw Hill Professional
2. Concrete repair and maintenance Illustrated- Peter H Emmons
3. Neville, "Properties of Concrete", Prentice Hall, Newyork
4. John Newman and Ban SengChoo ,Advanced Concrete Technology", ButterworthHeinemann Ltd.

Course Code	TRAFFIC ENGINEERING (ELECTIVE-I)	L	T	P	Credits
1001173209		3	1	0	3

Course Overview:

The course deals with importance of Traffic engineering, Traffic characteristics, Traffic Surveys include volume, speed, parking and accident studies. Also discuss about statistical methods for traffic engineering, relation between volume, speed and density. And traffic management techniques

Course Objectives:

The student will be taught

1. The characteristics of road user, vehicle and pavement
2. The types of parking facilities in a given area
3. The statistical methods for traffic engineering
4. To know the traffic regulation on the road
5. To know the traffic management measures

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Describe the traffic volume of vehicles	Understanding	1
CO2	Design On-street or Off- street parking facility for a study area	Applying	1,3
CO3	Design the Level of Service of a pavement	Applying	1,3
CO4	Design rotary intersection of a pavement	Applying	1,3
CO5	Design travel demand models	Applying	1,3

Unit-I:

Traffic Engineering:

Introduction, Importance of Traffic Engineering under Indian conditions,Traffic characteristics, The Road user and the vehicle. Traffic Surveys: Speed, Journey Time & Delay Surveys, methods of measuring Spot speeds, methods of measurement of Running Speed and Journey Speed, moving observer method, Traffic volume studies – Types of Counts, Automatic devices, Presentation of traffic volume study data.

Outcome:

- Able to know traffic speed, traffic volume and traffic delays.
- Able to know working of automatic devices for traffic studies

Activity/Event:
Conduct survey on moving observer method to determine running time and journey time over selected stretch of the pavement

Unit-II:

Origin & Destination Survey – Need for O – D surveys, Survey methods, Presentation of Results, Parking Surveys – Types of Parking surveys, Parking Space Inventory, Cordon Count, Questionnaire type parking usage Survey – Design of parking facility. Analysis and Interpretations of Traffic Studies.

Outcome:

- Able to know Origin & Destination studies
- Able to know the types of parking surveys

Activity/Event:

Conduct both off-street and on-street studies on a study area to determine the capacity of parking load and capacity of parking lots

Unit-III:

Statistical methods for Traffic engineering - Mean, Standard Deviation and Variance. Traffic flow characteristics, Traffic Capacity studies – factors affecting practical capacity, Design Capacity and Level of Service, Passenger Car Unit. Accident Studies – Accident studies and records, Accident investigations, Measures for reduction in accident rates, Traffic Safety.

Outcome:

- Able to know traffic flow characteristics
- Able to know measures for reduction in accident rates

Activity/Event:

Conduct a volume survey on a given area, based on the data determine congestion level, then fix the level of service suitable for that road

Unit-IV:

Relationship between Volume, Speed, Density and Capacity. Traffic Operations – Traffic regulation, Traffic Control Devices, Intersections –Intersection-At Grade-Channelized and Unchannelized intersections, Rotary intersections, Grade – separated Intersections, Grade separated structures.

Outcome:

- Able to know conflict points at intersections of a road
- Able to know traffic operations and traffic regulation

Activity/Event:

Conduct traffic spot speed studies to determine the safe speed and design speed of a road in a particular location

Unit-V:

Traffic Management – Transportation system Management, Travel Demand Management Techniques, Traffic management measures.

Outcome:

- Able to know the traffic management tools
- Able to know travel demand techniques

Activity/Event:

Conduct surveys with the help of Intelligent Transportation Systems, than prepare models for travel demand

Text Books:

1. Highway Engineering by S.K.Khanna&C.E.G.Justo, Nemchand& Bros., 7th edition (2000).
2. Transportation Engineering (Volume – 1) byC.Venkataramaiah, Universities Press, Hyderabad.
3. Traffic Engineering and Transportation Planning by L.R.Kadiyali and Lal- Khanna Publications.

Reference Books:

1. Principles and Practice of Highway Engineering Design by L.R.Kadiyali and Lal, Khanna Publications.
2. Text book of Highway Engineering by R.Srinivasa Kumar, Universities Press, Hyderabad.
3. Highway Engineering by Dr.S.K.Sharma, S.Chand Publishers.

Course Code	ELECTRONIC INSTRUMENTATION (OPEN ELECTIVE-I)	L	T	P	Credits
1004173209		3	1	0	3

Course overview and objectives:

The objective of the course is to provide a brief knowledge of measurements and measuring instruments related to engineering. The basic idea of this course is to give the sufficient information of measurements in any kind of industry viz. electrical, electronics, mechanical etc.

Course Outcomes:

After completion of the course students able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Select the instrument to be used based on the requirements.	Understanding	1,2
CO2	Understand and analyze different signal generators and analyzers	Applying	1,2,3
CO3	Understand the design of oscilloscopes for different applications	Understanding	1,2
CO4	Design different transducers for measurement of different parameters.	Applying	1,2,3,4

Unit-I:

Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, Range extension/Solid state and differential voltmeters, AC voltmeters- multi range, range extension, shunt. Thermocouple type RF ammeter, Ohmmeters series type, and shunt type, Multi-meter for Voltage, Current and resistance measurements.

Unit-III:

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO.

Unit-IV:

AC Bridges Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance - Schearing Bridge. Wheat stone bridge. Wien Bridge, Errors and precautions in using bridges.

Unit-V:

Transducers- active & passive transducers : Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors, electrodes for resistants, wenner/schlumberge measurements.

Measurement of physical parameters: flow measurements, displacement meters, liquid level measurement, measurement of velocity, humidity, moisture, pressure

Text Books:

1. Electronic instrumentation, H.S.Kalsi, Tata McGraw Hill, 2nd edition 2004.
2. Modern Electronic Instrumentation and Measurement Techniques, A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

Reference Books:

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

Course Code	INTRODUCTION TO DATA BASE MANAGEMENT SYSTEMS (OPEN ELECTIVE-I)	L	T	P	Credits
1005173206		3	1	0	3

Course Overview:

This course introduces database design and creation using a DBMS product. Emphasis is on data dictionaries, normalization, data integrity, data modelling, and creation of simple tables, queries, reports, and forms. Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms.

Course Objectives:

- Provide students with theoretical knowledge and practical skills in the use of database and database management systems in information technology applications.
- The logical design, physical design and implementation of relational databases are covered.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Describe ER model and normalization of or database design.	Analyzing	1, 2, 4
CO2	Create, maintain and manipulate a relational database using SQL	Applying	1,2,4,5
CO3	Design and build database system for a given real world problem	Applying	1,2,4,5
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.	Understand	1, 2

Unit-I:

Introduction to Database Systems:

File System Vs DBMS, Advantages of DBMS, Structure of DBMS, Levels of Data Abstraction (Data Independence),Database Users and Administrators, Different Data Models.

E-R Model:

Overview of Database Design, Entities, Attributes, and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model

Outcome: After Completion of the Unit, Student will Be able to:

1. Describe the Architecture of Database Management Systems
2. Design different ER Models
3. Understand the applications of dbms,difference between filesystems vs dbms, identify the data models ,understand dbms structure

Activity: Draw ER Diagram for Various Real Time Systems.

Unit-II:

Relational model: Introduction to the Relational Model, Relational model constraints over relations. Relational Algebra and calculus

Outcome: After Completion of the Unit, Student will Be able to:

1. To differentiate the knowledge in TRC & DRC
2. Compare relational model with the structured query language (SQL)
3. Understands the relational algebra concepts, selection ,projection ,relational calculus which helps in understanding queries

Activity: Tabulate Various Relational Modelsfor Real Time Application.

Unit-III:

SQL Queries:

The Form of Basic SQL Query, Union, Intersect and Except-Nested Queries-Aggregative Operators- Group By and Having Clauses-Null Values-Outer Joins,triggers

Schema Refinement (Normalization):

Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF)

Outcome: After Completion of the Unit, Student will Be able to:

1. Design the new database.
2. Master the basic concepts and appreciate the applications of database systems.
3. Master the basics of SQL and construct queries using SQL.

Activity: Design a new Database and normalize the data

Unit-IV:

Overview of Storage and Indexing:

Data on External Storage – File Organization and Indexing– Cluster Indexes, Primary and Secondary Indexes – Index . – Hash Based Indexing – Tree base Indexing.

Outcome: After Completion of the Unit, Student will Be able to:

1. Differentiate different indexing techniques in real time.
2. An ability to use and apply current technical concepts and practices in the coreinformation technologies.
3. Be familiar with a commercial relational database system (Oracle) by writing SQLusing the system.
4. Be familiar with the relational database theory, and be able to Write relational algebraexpressions for queries

Activity: Create your own data base and connect the front-End and back-End

Unit-V:

Introduction to transaction management, ACID properties, transaction states, concurrent and non concurrent schedules, requirement of concurrency control, requirement of recovery, log based recovery

Outcome: After Completion of the Unit, Student will Be able to:

- Understands the properties of transaction management.

Activity: Perform Transaction on Various Real Time Concepts.

Text Books:

1. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH
2. Database System Concepts. 6/e Silberschatz, Korth, TMH
3. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Course Code	ALTERNATIVE ENERGY SOURCES (OPEN ELECTIVE-I)	L	T	P	Credits
1003173206		3	1	0	3

Course Overview:

This course deals with the importance of solar thermal collectors, operation of photovoltaic systems, study of different fuel cells and forms of biomass, study of conversion systems of wind energy, OTEC and Wave energy.

Course Objectives:

1. To explain various types of solar thermal collectors.
2. To detail working of a photovoltaic system.
3. To discuss fuel cells and biomass conversion technologies.
4. To study wind energy conversion system.
5. To examine ocean thermal energy conversion and wave energy conversion.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Distinguish various types of solar thermal collectors	Understanding	1
CO2	Describe the working of a photovoltaic system	Understanding	1
CO3	Analyze the operation of fuel cells and biomass conversion technologies	Understanding	1
CO4	Identify various parts in a wind energy conversion system.	Understanding	1
CO5	Elaborate on ocean thermal energy conversion and wave energy conversion	Understanding	1

Unit-I:

Introduction:
Overview of the course; Global warming; Introduction to Renewable Energy Technologies Energy Storage: Introduction; Necessity of Energy Storage; Energy Storage Methods.

Solar Energy: Fundamentals; Solar Radiation; Estimation of solar radiation on horizontal and inclined surfaces; Measurement of solar radiation data Solar Thermal systems: Introduction; Basics of thermodynamics and heat transfer; Flat plate collector; Evacuated Tubular Collector; Solar air collector; Solar concentrator; Solar distillation; Solar cooker; Solar refrigeration and air conditioning; Thermal energy storage systems.

Outcome:

- Able to distinguish various types of solar thermal collectors.

Activity/Event:
Presentation on various types of solar thermal collectors-ratings, applications.

Unit-II:

Solar Photovoltaic systems:

Introduction; Solar cell Fundamentals; Characteristics and classification; Solar cell: Module, panel and Array construction; Photovoltaic thermal systems.

Outcome:

- To describe the working of a photovoltaic system.

Activity/Event:
Identification of design specifications of various components installed in PV system in VIIT.

Unit-III:

Fuel cells:

Overview; Classification of fuel cells; operating principles; Fuel cell thermodynamics Biomass Energy: Introduction; Photosynthesis Process; Biofuels; Biomass Resources; Biomass conversion technologies; Urban waste to energy conversion; Biomass gasification.

Outcome:

- To analyze the operation of fuel cells and biomass conversion technologies.

Activity/Event:
To prepare a report on latest biomass conversion technologies and biofuels.
Unit-IV:

Wind Energy:
Introduction; Origin and nature of winds; Wind turbine siting; Basics of fluid mechanics; Wind turbine aerodynamics; wind turbine types and their construction; Wind energy conversion systems.

Outcome:

- To identify various parts in a wind energy conversion system.

Activity/Event:
To prepare a model of wind energy conversion system.

Unit-V:

Ocean energy:

Principle of ocean thermal energy conversion, Wave energy conversion machines, Power plants based on ocean energy, Problems associated with ocean thermal energy conversion systems, Thermoelectric OTEC, Developments of OTEC, Economics. Impact of renewable energy generation on environment, Kyoto Protocol, Cost of electricity production from different energy sources, Energy options for Indian economy.

Outcome:

- To elaborate on ocean thermal energy conversion and wave energy conversion.

Activity/Event:

To identify various OTEC plants, Wave energy plants in India & world.

Text Books:

1. Sukhatme S.P. and J.K.Nayak, Solar Energy - Principles of Thermal Collection and Storage, Tata McGraw Hill, New Delhi, 2008.
2. Khan B.H., Non-Conventional Energy Resources,Tata McGraw Hill, New Delhi, 2006.
3. J.A. Duffie and W.A. Beckman, Solar Energy - Thermal Pro

Reference Books:

1. Renewable Energy Resources Basic Principles and Applications / G.N.Tiwari and M.K.Ghosal / Narosa.
2. Wind Energy Handbook / Tony Burton, David Sharpe, Nick Jenkins and Ervin Bossanyi / WileyWind Electrical Systems / S.N.Bhadra, D.Kastha and S.Banerjee / Oxford.
3. Biogas Technology - A Practical Hand Book / K.Khendelwal& S.S. Mahdi / McGraw-Hill

Course Code	HEATING , VENTILATION AND AIRCONDITIONING (OPEN ELECTIVE-I)	L	T	P	Credits
1003173205		3	1	0	3

Course Overview:

This course deals with the heating, ventilation and air conditioning systems where load calculations are performed to design suitable equipment for required comfort conditioning. The course is also aimed at imparting knowledge of psychometric properties and processes which are used in air-conditioning systems for comfort applications.

Course Objectives:

1. To understand the impact of global warming temperatures on human comfort conditions.
2. To promote sustainable human comfort condition.
3. To design suitable air conditioning equipment based on required loads.
4. To suggest optimum duct and ventilating system.
5. To distinguish among various types and mediums of air conditioning systems.

Course Outcomes:

At the end of the course the student should be able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the role of HVAC systems for human sustainability	Understanding	1,6,7
CO2	Study the behavior, properties and affects of moist air.	Applying	1
CO3	Estimate heating and cooling loads to design an optimized duct and ventilating system.	Analyzing	1,2,3,7,11
CO4	Evaluate standard requirements of ventilation for human comfort.	Evaluate	1,3,11,12
CO5	Explain the need for air conditioning system with respect to global warming temperatures	Evaluate	1,3,11,12

Unit-I:

Introduction:

History and Development of HVAC, applications of HVAC, definitions and terminology.

Psychrometry:

Applied Psychrometry, Psychrometric processes using chart - Basic processes such as sensible heating/cooling, humidification/dehumidification and their combinations, steam and adiabatic humidification, adiabatic mixing, etc. - Bypass factor and Sensible heat ratio.

Requirements of human comfort and concept of effective temperature- comfort chart- comfort air conditioning.

Outcome: At the end of the unit, the student should be able to

- Understand the significance of HVAC systems.
- Study and interpret values from psychrometric charts.
- Understand the requirements of human comfort.

Activity/Event:

- Check inside and outside atmosphere humidity levels by using Hygrometer.

Unit-II:

Load Estimation: Heating Load:

Outdoor Design Conditions, Indoor Design Conditions, Transmission Heat Losses, Infiltration, Heat losses from Air Ducts, Auxiliary Heat Sources, Intermittently heated Structures, Supply Air for Space Heating, source Media for Space Heating.

Cooling Load:

Heat Gain, Cooling Load, and Heat Extraction Rate, Application of Cooling Load Estimation of sensible heat, latent heat and RSHF, Design Considerations, Internal Heat Gains.

Outcome: At the end of the unit, the student should be able to

- Explain the factors needed to be considered while designing an air conditioning system.
- Evaluate the parameters affecting the cooling and heating load.

Activity/Event:

- Estimate the Cooling load required for Central Library.

Unit-III:

Air Distribution:

Ducts, Types of ducts, Fundamentals of air flow in ducts, design consideration of ducts, duct materials and properties, insulating materials, methods of sizing and balancing.

Outcome: At the end of the unit, the student should be able to

- Design a duct based on application.
- Select the proper material required for duct system.

Activity/Event:

- . Compare various ducts used in centralized air conditioning plants located in the city.

Unit-IV:

Ventilation: Requirement of ventilation air, various sources of infiltration air, ventilation and infiltration as a part of cooling load, threshold limits of contaminants, air flow round buildings. Methods of Ventilation - Natural, wind effect, stack effect, combined effect - Mechanical, forced, exhaust, and combined - Displacement ventilation.

Outcome: At the end of the unit, the student should be able to

- Evaluate ventilation standards for human comfort.
- Identify sources of contaminants and eliminate them.

Activity/Event:

Observe the effect of ventilation air in the presence and absence of perfume.

Unit-V:

Air conditioning systems:

Classification of air conditioning system, Air Conditioning Equipment: Filters, Grills and Registers, Fans & Blowers.

Outcome: At the end of the unit, the student should be able to

- Know the usage of different air conditioning systems with respect to application.
- Understand the role of various equipment's used in air conditioning systems.

Activity/Event:

- Assemble and disassemble a window air conditioning unit.

Text Books:

1. Refrigeration and Air Conditioning, Arora &Domkundwar, Dhanapat rai & Co.
2. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
3. Heating, Ventilating and Air Conditioning-Analysis and Design, Mc Quiston, Faye; Parker, Jerald; Spitler, Jeffrey, 5th ed. John Wiley & Sons, 2000.

Reference Books:

1. ASHRAE Handbook - Fundamentals, American Society of Heating, Refrigerating and Air - Conditioning Engineers Inc., Atlanta, USA, 2009.
2. HVAC Handbook, ISHRAE
3. Refrigerant &Psychrometrc Tables and Charts ,Dr.S.S.Banwait,Dr.S.C.Laroiya, Birla Publications
4. Air conditioning and ventilation of buildings, Croome, D.J. and Roberts, B.M., Pergamon.
5. Refrigeration and Air Conditioning, Stoecker, W.F., and Jones, J.W., 2nd Edition, Tata McGraw Hill, New Delhi 1982.

Course Code	MASSIVE OPEN ONLINE COURSE (MOOCs) (OPEN ELECTIVE-I)	L	T	P	Credits
1001173291		3	1	0	3

*Any available online course approved by department committee at the time of semester commencement.

Course Code	GEOTECHNICAL ENGINEERING LAB	L	T	P	Credits
1001173221		0	0	3	2

Course Overview:

This course will show how to conduct the various types of tests used for soil testing. Each experiment of soil testing is presented with brief introduction covering the important details of the experiment, the theory and the purpose for which it is to be performed, followed by the detailed explanation of apparatus required, procedure and specimen calculations. These should enable students to perform the experiment and compute the results of experiments very easily.

Course Objectives:

The students will be explained

1. The index properties required for classification of soils.
2. The compaction characteristics of soils
3. The consolidation behaviour from relevant lab tests
4. The permeability of soils.
5. The shear parameters of soil through different laboratory tests.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Determine index properties of soil followed by their classification	Applying	1
CO2	Determine permeability of soils	Applying	1
CO3	Determine Compaction strength characteristics	Applying	1
CO4	Determine Consolidation strength characteristics	Applying	1
CO5	Determine shear strength characteristics	Applying	1

List of Exercises:

1. Specific gravity, G
2. Atterberg's Limits.
3. Field density-Core cutter and Sand replacement methods
4. Grain size analysis by sieving
5. Hydrometer Analysis Test
6. Permeability of soil - Constant and Variable head tests
7. Compaction test

8. Consolidation test (to be demonstrated)
9. Direct Shear test
10. Triaxial Compression test (UU Test)
11. Unconfined Compression test
12. Vane Shear test
13. Differential free swell (DFS)
14. CBR Test.

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
a) Constant head test
b) Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests.
8. Shaking table, funnel for sand raining technique.
9. Apparatus for CBR test
10. 10 tons loading frame with proving rings of 0.5 tons and 5 tons capacity
11. One dimensional consolation test apparatus with all accessories.
12. Triaxial cell with provision for accommodating 38 mm dia specimens.
13. Box shear test apparatus
14. Laboratory vane shear apparatus.
15. Hot air ovens (range of temperature 500 - 1500C

Reference Books:

1. Determination of Soil Properties, J. E. Bowles.
2. IS Code 2720 – relevant parts.
3. Punmia, B.C. (1995), "Soil Mechanics and Foundation Engineering", Laxmi Publications Pvt. Ltd., New Delhi.
4. Relevant NPTEL Courses.
5. Arora, K.R. (2001), "Soil Mechanics and Foundation Engineering", Standard Publishers, Delhi – 110 006.

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	ENVIRONMENTAL ENGINEERING LAB	L	T	P	Credits
1001173222		0	0	3	2

Course Overview:

The Lab course covers Experimental analysis of physical, chemical and biological parameters of water and wastewater.

Course Objectives:

The student will be taught

1. The knowledge of experimental analysis of water and wastewater.
2. The skills in analysis, problem solving, team spirit and communication in water and wastewater issues by using appropriate techniques.
3. The ethics in solving water and wastewater problems ensuring health, safety and environmental sustainability

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Demonstrate the knowledge on experimental analysis of water and wastewater.	Understanding	1,7
CO2	Analyze water and wastewater by using appropriate techniques	Applying	1,3
CO3	Solve water and wastewater problems by considering environmental sustainability	Applying	1,3
CO4	Maintain standards in water and wastewater analysis	Understanding	1,7,6
CO5	Function effectively as an individual, and as a member or leader in teams to solve the water and wastewater problems	Understanding	1,9,7
CO6	Communicate effectively on water and wastewater analysis in written, oral and graphical forms.	Understanding	1,3,7

List of Exercises:

1. Determination of pH, turbidity and electrical conductivity
2. Determination of Total Hardness along with Calcium and Magnesium hardness
3. Determination of alkalinity and acidity
4. Determination of total suspended solids and total dissolved solids
5. Determination of total solids, volatile and fixed solids.
6. Determination of chlorides
7. Determination of optimum coagulant dose

8. Determination of residual chlorine
9. Determination of Dissolved Oxygen
10. Determination of B.O.D
11. Determination of C.O.D
12. Determination of iron
13. Determination of fluorides

List of Equipment:

1. pH Meter
2. Turbidity Meter
3. Conductivity Meter
4. Hot air Oven, Muffle furnace, Desiccator.
5. DO meter
6. COD Digestor
7. UV Spectrophotometer
8. BOD incubator
9. Imhoff Cone
10.

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	COMPUTER AIIDED ENGINEERING LAB	L	T	P	Credits
1001173223		0	0	3	2

Course Overview:

The Lab course covers introduction of AutoCAD and basic tools bars of draw and modified commands, conventional signs , different doors and windows , RCC footings , single and multi storied buildings , staircase , RCC lintel cum sunshade and RCC beams

Course Objectives:

The students will be explained

1. The operating software of AutoCAD
2. The different types of footings
3. The doors and windows
4. Single storied building and multi storied building
5. The lintel cum sunshade and RCC beam

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Draw the conventional signs and symbols	Understanding	1,5
CO2	Draw the plan and sectional elevation of footing	Applying	1,3,5
CO3	Draw the plan, elevation and section of single storied and multi storied building	Applying	1,3,5
CO4	Draw the plan and cross section of doglegged staircase	Applying	1,3,5
CO5	Draw the cross section of lintel cum sunshade and RCC Beam	Applying	1,3,5

List of Exercises:

1. Introduction to AutoCAD
2. AutoCAD – Basics
3. Draw the conventional symbols and signs in AutoCAD
4. Draw the plan and sectional elevation of RCC Footings and load bearing wall
5. Detailing of building components like Doors, Windows, Roof Trusses
6. Plan of a Single Storeyed building in AutoCAD
7. Plan of a Multi Storeyed building in AutoCAD
8. Section and Elevation of a Single Storeyed building in AutoCAD
9. Section and Elevation of a Multi Storeyed building in AutoCAD
10. Draw the plan and sectional elevation of doglegged staircase
11. Draw the cross section lintel cum sunshade and RCC Beams
12. Conversion of data from Excel to AutoCAD to draw points, lines and polygons

Requirements

1. AutoCAD
2. Windows 64 bit OS
3. 4 GB RAM

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	INDUSTRY ORIENTED MINI PROJECT	L	T	P	Credits
1003173241		0	0	0	2

Industry- Oriented Mini Project: The Industry oriented mini project is carried out during the third year second semester vacation. The students have an option to choose their own area of interest which may be related to the course work. Mini project report is evaluated for 100 marks in fourth year first semester before the first mid-term exam. Assessment is done by the supervisor /guide for 40 marks based on the work and mini project report. The remaining 60 marks are allocated for presentation by the student to a committee comprising of the project supervisor and two senior faculty members nominated by Head of the Department

PROGRAM STRUCTURE

FOR

IV-B.Tech

I & II SEMESTERS

DEPARTMENT OF CIVIL ENGINEERING
PROGRAM STRUCTURE

IV B.Tech **I Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1	1001174101	Estimation and Contracts	3	1	0	3
2	1001174102	Water Resource Engineering-II	3	1	0	3
3	1001174103	Geotechnical Engineering – II	3	1	0	3
4	1001174104	Environmental Engineering-II	3	1	0	3
5	**Elective – II**					
	1001174105	A) Advanced Structural Engineering	3	1	0	3
	1001174106	B) Urban Hydrology				
	1001174107	C) Ground Improvement Techniques				
	1001174108	D) Pavement Analysis and Design				
	1001174109	E)Remote Sensing & GIS Applications				
	1001174110	F) Industry orientated course (BIM/TEKLA/REVIT/E-TAB/CYCLONE)				
6	**Open Elective-II**					
	1005172104	A) Java Programming	3	1	0	3
	1003173201	B) Finite Element Methods				
	1004173207	C) Digital Image Processing				
	1005172105	D) Data Structures through C				
	1099174101	E) Entrepreneurship Development				
7	1099173101	IPR & Patents (Audit Course)	2	0	0	0
8	1001174121	GIS & CAD Lab	0	0	3	2
9	1001174122	Design & Drawing of Hydraulic Structures	0	0	3	2
					Total Credits :	22

IV B.Tech **II Semester**

S. No	Course Code	Course Title	L	T	P	Credits
1	1001174201	Soil Dynamics and Foundations	3	0	0	3
2	1001174202	Construction Technology and Management	3	0	0	3
3	1001174203	Prestressed Concrete	3	0	0	3
4	**Elective – III**					
	1001174204	A).Bridge Engineering	3	0	0	3
	1001174205	B).Environmental Impact Assessment and Management				
	1001174206	C).Solid and Hazardous Waste Management				
	1001174207	D).Water Resources Systems Planning and Management				
	1001174208	E).Transportation Planning				
Or						
	1001174281	Internship	0	0	0	12
5	1001174251	Technical Seminar	0	3	0	2
6	1001174261	Comprehensive Viva	0	0	0	2
7	1001174231	Main Project	0	0	0	10
					Total Credits :	**26**

DETAILED SYLLABUS FOR

IV-B.Tech

I-SEMESTER

Course Code	Estimation and Contracts	L	T	P	Credits
1001174101		3	1	0	3

Course Overview:

Estimation is the technique of calculating or computing the various quantities and the expected expenditure to be incurred on a particular work or project. Before sanction or approval of any project or work, its estimated cost worked out and necessary funds are sanctioned by the competent authority. The rate of each item should also be reasonable and workable. The rates in the estimate provide for the complete work, which consist of the cost of materials, cost of transport cost of scaffolding, cost of tools and plants , cost of water , taxes, establishment and supervision cost, reasonable cost, reasonable profit of contractor, etc

Course Objectives:

1. Classify basic concepts, techniques, applications and specifications of estimation and costing.
2. Understand how to prepare a detailed estimate for a residential building and calculate the quantities for various items of work.
3. Identify the preparation of bar bending schedule for reinforcement works.
4. Analyse the rates for various items of work and to prepare a abstract estimate.
5. Create various tender documents for bidding purpose.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Calculate the quantity of materials required for civil engineering works as per specifications.	L3	1,2
CO2	Calculate the quantities of steel for different items of work & demonstrate the calculation of earth work quantity for roads and canals.	L4	1,2,4,6,7
CO3	Evaluate the rates for various items of work	L5	,2,4,6,8,12
CO4	Evaluate contracts and tenders in construction practices	L5	,2,6,7,8,12

UNIT-I I

Introduction: general items of work in building – standard unit's principles of working out quantities for detailed and abstract estimates – approximate method of estimating. Standards Specifications: standard specifications for different items of building construction.

Unit-I outcome:

- Able to know main items in the building constructions

Activity/event on unit-I:

- Make a visit to nearby constructions to explain about items of building construction.

UNIT-II
Estimation of buildings: detailed estimates of buildings

Unit-II outcome:

- Able to calculate the quantity of materials required for civil engineering works as per specifications.

Activity/event on unit-II:

- Calculate the quantities for their residential own plan.

UNIT-III
Rate Analysis: working out data for various items of work over head and contingent charges.
Unit-III outcome:

- Able to Evaluate contracts and tenders in construction practices

Activity/event on unit-III:

- Valuate their own property.

UNIT – IV
Earthwork Estimation: earthwork for roads and canals. Reinforcement estimation: reinforcement bar bending and bar requirement schedules.
Unit-IV outcome:

- Able to calculate the quantities of steel for different items of work & calculation of earth work quantity for roads and canals.

Activity/event on unit-IV:

- Make a visit to nearby construction explain about bar bending.

UNIT – V
Contracts and Tenders: contracts – types of contracts – contract documents – conditions of contract – types of tenders – requirement of tendering. Valuation: valuation of buildings.

Unit-V outcome:

- Able to Evaluate the rates for various items of work

Activity/event on unit-V:

- Exercise on approved tenders.

TEXT BOOKS

1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Contracts and estimations by B.S.Patil, Universities.Press, Hyderabad.

REFERENCES:

1. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.
2. Engineering construction cost by Peurifoy , TMH Publishers.
3. Standard Schedule of rates and standard data book by public works department.
4. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.) Note : Standards scheduled of rates is permitted in the examination hall

Course code		L	T	P	Credits
1001174102	**WATER RESOURCES ENGINEERING–II**	**3**	**1**	**0**	**3**

Course Overview:

The present course is designed in such a way that it gives a clear understanding about the concept of irrigation engineering, various hydraulic structures and their design purposes etc. Water Resources Engineering-II enables the students to acquire knowledge about various crops, their rotation and their water requirements. It also makes the student to design various irrigation structures and their regulatory works.

Course Objectives

The course is designed to

1. Introduce the types of crops and crop seasons with their water requirements.
2. Introduce various types of canals and their designs.
3. Discuss the concepts of river diversion works.
4. Know the concepts for analysis and design principles of storage and diversion head works.
5. Learn design principles of different types of dams.

Course Outcomes: At the end of the course, the student will be able to

	Course outcome	**Bloom's taxonomy**	**Bloom's Taxonomy Level**	**PO**
CO1	**Understand** various techniques and water requirement of crop	Remembering Understanding Applying	L1 L2 L3	PO-1 PO-2 PO-3
CO2	**Analyze** the design of lined & unlined canal and its problems	Applying Analyzing	L3 L4	PO-1 PO-2 PO-6
CO3	**Understand** location and necessity of canal falls Plan diversion head works. **Design** Different cross drainage works and canal regulators,	Understanding Applying Analyzing	L2 L3 L4	PO-1 PO-2 PO-3
CO4	**Understand** the weirs and energy dissipating structures. **Differentiate** various types of Dams & their properties.	Understanding Applying Analyzing	L2 L3 L4	PO-1 PO-2 PO-4 PO-7

Unit-I

INTRODUCTION:

Irrigation: Necessity and importance, methods of irrigation- surface and sprinkler methods, types of crops and crop seasons, crop rotation, soil-water-plant relationship, soil moisture constants, consumptive use and its estimation, crop water requirement, duty and delta, factors affecting duty, irrigation efficiencies, standards of quality for irrigation water.

Outcome: Students will be Able to understand various crop and crop seasons in India and estimate water requirement to crops.

Activity: To give a presentation on indigenous crops in India state wise and other countries.

UNIT II

CANALS:

Classification of canals, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals - Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting, maintenance of irrigation channels.

Outcome: Student will Able to explain design of various canal systems.

Activity: Designing a canal across the nearest water body as per IS: 7112, 1975.

UNIT- III

CANAL STRUCTURES:

Falls: Types and location, design principles of Sarda type fall and straight glacis fall.

Regulators: Head and cross regulators, design principles.

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

River Training: Objectives and classification- marginal embankment, guide banks, cut offs

groynes, aprons.

Outcome: Student will be able to understand various river training works.

Activity: Presentation on different types of river training works in various countries across the world.

Unit-IV

DIVERSION HEAD WORKS:

Types of diversion head works, weirs and barrages, layout of diversion head works, components. Causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow.

Outcome: Student will be able to distinguish different kinds of diversion works in water bearing bodies.

Activity: Make a model of river having a reservoir, canal and diversion works.

Unit-V

Reservoir planning:

Reservoir Planning: Investigations, site selection, zones of storage, yield and storage capacity of reservoir, reservoir sedimentation.

Dams: Types-

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries.

Earth Dams: Types, causes of failure, criteria for safe design

Spillways: Types, design principles of Ogee spillways, types of spillways. Energy dissipation below spillways-stilling basin.

Outcome: Student will be able to categorize different types of dams and their properties.

Activity: Make a model of dam with spill way.

Text Books:

1. 'Irrigation and Water Power Engineering 'by B. C. Punmia, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd., New Delhi.
2. 'Irrigation Engineering and hydraulic structures' by S K Garg, Khanna publishers, New Delhi.
3. 'Irrigation Water Resources and Water Power Engineering' by Modi P N (2011), Standard Book House, New Delhi.

Reference Books:

1. 'Irrigation Engineering' by Raghunath H.M (2012), Wiley India.
2. 'Irrigation Engineering' by Sharma R.K. and Sharma, T.K (2012), S.Chand& Co Publishers.
3. 'Water Resources Engineering' by Satyanarayana Murthy Challa (2008), New Age International Publishers.

Course Code **GEOTECHNICAL ENGINEERING - II** **L T P Credits**

1001174103 **3 1 0 3**

Course Overview:

Geotechnical engineering deals with the behavior of soils under the influence of loading. It is one of the most important branches of civil engineering. It uses the concepts of soil and rock mechanics to model real world engineering problems. This course serves as a Geotechnical engineering II and covers the slope failures and its stability, soil exploration, earth pressure theories, types of foundations and bearing capacity.

Course Objectives

The objectives of this course is to

1. Explain how soil shear parameters are affected by different drainage conditions
2. Learn the principles of field tests for soil investigation
3. Explain how earth pressure theory is important in retaining structure design
4. Enable the student about types of foundation and theories required for the determination of bearing capacity

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Calculate the shear parameters of the soil affected by different drainage conditions	Understanding	1,2
CO2	Prepare the soil investigation report by using suitable field test	Understanding, Applying	1,2
CO3	Calculate the earth pressure values for design of retaining structures	Applying, Analyzing	1,3
CO4	Determine the bearing capacity of the soil using different theories	Applying, Analyzing	1,2

UNIT- I

Shear strength: basic mechanism of shear strength - Mohr's and Coulomb failure theories - stress strain behavior of sands and clays - shear strength determination - various drainage conditions.
Outcome: Calculate the shear parameters of the soil affected by different drainage conditions

Activity/Event: Solving the Previous GATE problems

UNIT II:

Soil exploration: Methods of soil exploration- Boring and Sampling - Plate load test, static and dynamic penetrations tests - geophysical explorations - pressure meter test - preparation and planning of soil investigation report.
Outcome: Prepare the soil investigation report by using suitable field test

Activity/Event: Preparation of bore log report for different locations.

Unit-III

Stability of slopes: Infinite and finite slopes in sand and clay, types of failures, factor of safety of infinite slopes, stability analysis by Swedish arc method, standard method of slices- Taylor's stability number - stability of slopes of dams and embankments - different conditions.

Earth retaining structures: Rankine's & Coulomb's theory of earth pressure .

Outcome: Calculate the earth pressure values for design of retaining structures
Activity/Event: Solving the Previous GATE problems.

Unit-IV
Shallow foundations - Bearing capacity criteria: Types of foundations and factors to be considered in their location - bearing capacity - criteria for determination of bearing capacity- factors influencing bearing capacity - analytical methods to determine bearing capacity - Terzaghi's theory - IS methods.

Settlement Criteria: Penetration test - safe bearing pressure based on N-Value - allowable bearing pressure, safe bearing capacity and settlement from plate load test - types of foundation settlements and their determination - allowable settlements of structures.

Outcome: Determine the bearing capacity of the soil using different theories
Activity/Event on Unit-IV: Solving the Previous GATE problems.

Unit-V
Deep foundation - piles - types - load carrying capacity of pile - static and dynamic formula - pile load test - pile groups - Efficiency - Settlement of piles and pile groups - Negative skin friction - Well foundation - introduction - components of well foundation

Outcome: Determine the bearing capacity of the soil using different theories.

Activity/Event: Solving the Previous GATE problems.

Text Books:

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age International Publishers.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers
3. Arora, K.R. (2001), "Soil Mechanics and Foundation Engineering", Standard Publishers, Delhi – 110 006.

Reference Books:

1. Fundamentals of Soil Mechanics, D. W. Taylor, Wiley.

2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall.

3. Fundamentals of Geotechnical Engineering, B M Das, Cengage Learning, New Delhi

4. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publications Pvt. Ltd., New Delhi, 1995.

Course Code		L	T	P	Credits
1001174104	ENVIRONMENTAL ENGINEERING – II	3	1	0	3

Course Overview:

This course will give the knowledge of characterization of wastewater and helps in planning and design of sewerage systems, appurtenances used in the sewerage system and design of wastewater treatment plant.

Course Objectives

The objective of this course is to:

1. Outline the planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city.
2. Provide knowledge of characterization of wastewater generated in a community.
3. Summarize the appurtenance in sewerage systems and their necessity and Impart understanding and need for treatment of sewage.
4. Planning and design of the septic tank and Imhoff tank and the disposal methods of the effluent from these low-cost treatment systems and realize the importance of regulations in the disposal of effluents in rivers.

Course Outcomes:

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Plan and design the sewerage systems	Understanding Applying	L2 L3	PO-1, PO-2, PO-3, PO-4 PO-5, PO-6,PO-7,PO-8, PO-11, PO-12
CO2	Select the appropriate appurtenances in the sewerage systems	Understanding Applying	L2 L3	PO-1, PO-2, PO-3, PO-4 PO-5
CO3	Selection of suitable treatment flow for sewage treatment	Understanding Applying	L2 L3	PO-2, PO-3, PO-4 PO-5, PO-6,PO-7, PO-12
CO4	Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river	Understanding Applying	L2 L3	PO-2, PO-3, PO-5, PO-6 PO-7, PO-8

UNIT-I

Introduction to sanitation: Systems of sewerage, types of collection systems, difference in the design of water supply pipes and sewer pipes, sewer materials, laying of sewer pipes, Assumptions in sewer design, self-cleansing velocity, maximum velocity.

Sewer Appurtenances: Classification of sewers, shape of sewer pipes, methods of ventilation,

maintenance of sewer.

Outcomes: Explain the need for wastewater treatment

Activity: Design of the sewerage system

UNIT-II

Sewage Characteristics: Sewage characteristics – Physical, Chemical and Biological Characteristics and their testing – BOD-first stage BOD exertion – COD - Relative Stability and Population Equivalent.

Biochemical Reactions in treatment of wastewater: Biochemical reactions, Biological Growth curve, decomposition of sewage.

Outcomes: Categorize the wastewater based on characteristics

Activity: Compare the characteristics of water and wastewater

UNIT-III

Treatment of Sewage: Treatment Methods – unit operations and unit process, Preliminary Treatment- screening, Grit chamber, Skimming Tank. Primary Treatment – design of sedimentation tank.

Secondary Treatment: Aerobic and anaerobic treatment process - comparison.

Suspended Growth Process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated Sludge Processes, miscellaneous methods, Oxidation Ponds, Aerated Lagoons.

Outcomes: Design criteria for primary and secondary treatment

Activity: Study the sewage characteristics of various industries

UNIT – IV

Attached Growth Process: Trickling Filters-mechanism of impurities removal -classification– filter problems-design and operation- recirculation. RBC's,

Anaerobic Biological Units: Septic tank – design criteria, disposal of effluent from a septic tank, Imhoff tank, sludge digestion – sludge digestion process, stages of decomposition, factors affecting sludge digestion

Outcomes: Emphasize the need for sludge handling and treatment of biological sludge

Activity: Effluent standards of wastewater

UNIT-V

Bio-Solids (Sludge) management: characteristics- thickening- digestion, drying and sludge disposal

Disposal of sewage Effluent: Various methods of disposal, various natural forces of self-purification, zones of pollution in a river stream, Indices of self-purification, Oxygen Sag Curve, Disposal of wastewater in lakes and management of lake water, disposal of wastewater in the sea, disposal on land.
Outcomes: Illustrate the treatment and disposal of sludge & sewage effluents

Activity: Design of wastewater treatment plant

Text Books:

1. Garg, S.K.(2015), "Environmental Engineering(Vol.II): Sewage disposal and Air Pollution Engineering", Khanna Publishers, Delhi 33th Edition.
2. Modi, P.N.(2010), "Sewage Treatment Disposal and WasteWater Engineering" Stand Book House, Delhi, 4thEdition.

Reference Books:

1. Metcalf & Eddy (2002), "Wastewater Engineering: Treatment and Reuse" Tata McGraw-Hill, New Delhi, 4th Edition.
2. Raju, B.S.N. (1995), "Water supply and Waste Water Engineering" McGraw-Hill Education, New Delhi.
3. Peavy, H.S., Rowe, D.R., and Tchobanoglous, G, (1985), "Environmental Engineering" McGraw-Hill international edition, New York, 7th Edition.
4. BIS 3025 (Part 44): Method of Sampling and Test (Physical and Chemical) for Water and Wastewater, Part 44: Biochemical Oxygen Demand (BOD) (First Revision
5. Relevant NPTEL Courses.

Course Code	Advanced structural Engineering	L	T	P	C
1001174105	**Elective - II**	3	1	0	3

Course overview:

The design of special structures such as RCC walls, RCC water tank, flat slab, bunkers and silos, chimneys and transmission tower are learned in advanced structural engineering. These kinds of structures are not commonly constructed in every domestic purposes, that's why they are called special structures. In this course, one can understand the science behind the design of special structural. The check for bending, shear, crack, deflection and torsion are the safety criteria from design point of view. As they are the special structures, from safe design point of view working stress method is adopted for maximum cases. After this course one can safely design the above structures using different Indian standards.

Course objectives:

1. To familiarize the students with Retaining walls.
2. To quip student with concepts of design of different types of RCC water tanks.
3. To understand Concepts of flat slabs.
4. To visualize the different types of Bunkers, Silos.
5. To know the physical purpose of Chimneys.
6. To understand different types of transmission towers.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the design of different types of RCC retaining walls	Understanding, Analyzing	1,2
CO2	Carry out analysis and design of Slab bridges, T Carryout analysis and design of different types of RCC water tanks.	Understanding, Analyzing	2,3
CO3	Understand the design of RCC flat slab	Understanding, Analyzing	1,2,3
CO4	Understand the design process of Bunkers, Silos Chimney.	Understanding, Analyzing	2,3,5
CO5	Understand the design of transmission towers and loading on them.	Understanding, Analyzing	2,3,5

UNIT – I

Footing and retaining wall: Analysis design of RCC Retaining walls: Cantilever and Counter fort.

- **Unit-I Outcome:** Student should be able to know the design of RCC retaining wall.
- **Activity/event on unit-I:** Visit a nearby RCC retaining wall construction site to understand the physical importance.

UNIT – II

Water tank: Analysis and Design of RCC underground and elevated Water Tanks as per IS 3370- Circular and Rectangular types- Intze tank including staging.

- **Unit-II Outcome:** Student should be able to know the design of water tank as per Indian code.
- **Activity/event on unit-II:** Visit a nearby water tank for better understanding.

UNIT – III

Flat slab: Analysis and Design of Flat Slabs- Concept of grid floor- Direct Design and Equivalent Frame Methods- Check for Punching shear.

- **Unit-III Outcome:** Able to calculate the design of flat slab.
- **Activity/event on unit-III:** Make a visit to a flat slab building for better visualization.

UNIT – IV

Bunkers, silos and Chimney: Analysis and Design of Bunkers and Silos- Concepts of Loading. Analysis and Design of Chimney, basic concept of loading

- **Unit-IV Outcome:** Students should be able to calculate the design of bunkers, silos and chimney.
- **Activity/event on unit-IV:** Visit a nearby bunkers and silos to visualize the structure.

UNIT – V

Transmission towers: Introduction to Transmission Towers- Principles and procedures.

- **Unit-VI Outcome:** Students should be able to calculate the design of transmission towers
- **Activity/event on unit-VI:** Visit a nearby transmission towers to visualize the structure.

TEXT BOOKS:

1. Reinforced Concrete Structures' Vol-2, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi.
2. Advanced Reinforced Concrete Design, N. Krishna Raju, CBS Pub. & Distr., Delhi.
3. Reinforced Concrete Structures, N. Subrahmanian, Oxford Publishers.
4. Design Drawing of Concrete and Steel Structures, N. Krishna Raju University Press 2005.

REFERENCES:

1. Essentials of Bridge Engineering, D. Johnson Victor, Oxford and IBM publication Co., Pvt. Ltd.
2. Reinforced concrete design, S. U, Pillai and D. Menon, Tata Mc. Grawhill Publishing Company.
3. Codes: Relevant IS: 3370.
4. Reinforced Concrete Design of Tall Buildings, B.S. Taranath, CRC Press, New York.
5. Advanced Reinforced Concrete Design, P.C. Varghese, PHI, New Delhi.
6. Reinforced Concrete, S.K. Mallick and A.P. Gupta, Oxford and IBH Pub., New Delhi.
7. Reinforced Concrete Design, S.U. Pillai and D. Menon, Tata McGraw Hill Pub, New Delhi.

Course Code	URBAN HYDROLOGY	L	T	P	Credits
1001174106	Elective - II	**3**	**1**	**0**	**3**

Course Overview:

Urban hydrology is a part of surface hydrology which focuses on the effects of various factors of urbanization on hydrological cycle. It also includes planning of various drainage systems and storm water networks in urban areas.

Course Objectives

The course is designed to

1. Understand the impact of urbanization on hydrology.
2. Understand the importance of short duration rainfall runoff data for urban hydrology studies.
3. Learn the methods of reuse of storm and waste water.
4. Understand the concepts in design of various components of urban drainage systems
5. Learn the design process of storm water network.

Course Outcomes: At the end of the course, the student will be able to

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	**Analyze** the problems of urbanization on hydrological system.	Understanding Applying Analyze	L2 L3 L4	PO-1, PO-2, PO-3, PO-4
CO2	**Develop** intensity duration frequency curves for urban drainage systems.	Understanding Applying Analyze	L2 L3 L4	PO-1, PO-2, PO-3, PO-4
CO3	**Use** various approaches to estimate peak flow.	Understanding Applying Analyze	L2 L3 L4	PO-1, PO-2, PO-3, PO-4
CO4	**Analyze** the elements of urban drainage system. **Apply** best management practices to manage urban flooding.	Understanding Applying Analyze	L2 L3 L4	PO-1, PO-2, PO-3, PO-4, PO-5

UNIT-I

INTRODUCTION:

Urbanization and its effect on water cycle– urban hydrologic cycle – trends in urbanization – Effect of urbanization on hydrology

Outcome:

Students will be Able to understand the urban hydrological cycle.

Activity:

To give a seminar on recent urbanization trends in the country.

UNIT II

PRECIPITATION ANALYSIS:

Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration-Frequency (IDF)curves, design storms for urban drainage systems.

Outcome:

Student will able to analyze precipitation data for design storm.

Activity:

To Develop IDF curves for raw data.

UNIT- III

APPROACHES TO URBAN DRAINAGE SYSTEM:

Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and stormwater reuse, major and minor systems.

Outcome:
Student will be able to estimate peak flow of storm.

Activity:
To give a presentation on waste water reuse,

UNIT-IV

ELEMENTS OF DRAINAGE SYSTEMS:

Open channel, underground drains, appurtenances, pumping, source control.

Outcome:

Student will be able to analyze & design urban drainage systems.

Activity:

To plan an underground drainage system using any of the latest software's.

UNIT-V

ANALYSIS AND MANAGEMENT:

Storm water drainage structures, design of storm water network- Best Management Practices– detention and retention facilities, swales, constructed wetlands, models available for storm water management.

Outcome:

Student will be able to carry out storm water drainage design

Activity:

To give a seminar on management practices in storm water design.

Text Books:

4. 'Manual on Drainage in Urbanized area', Geiger W. F., J Marsalek, W. J. Rawls and F. C.
5. 'Urban Hydrology', Hall M J (1984), Elsevier Applied Science Publisher.
6. 'Urban Hydrology', Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling, Akan A.O and R.L. Houghtalen (2006), Wiley International.

Course Code	GROUND IMPROVEMENT TECHNIQUES	L	T	P	Credits
1001174107	Elective – II	**3**	**1**	**0**	**3**

Course Overview:

Ground Improvement indicates a technique that advances the engineering properties and parameters of different soil types when treated. It has developed into a sophisticated tool to support foundations and other ground structures. The course introduces the concepts underneath a range of ground improvement techniques, and an appreciation of how these techniques are applied in practice.

Course Objectives

The student will be taught

1. The need for different ground improvement methods for improving the properties of remolded and in-situ soils using various techniques.
2. The methods of dewatering and its criteria
3. Soil Stabilization methods and how the reinforced earth technology can avoid the problems posted by retaining walls.
4. The use of geotextiles and geosynthetics in improving the engineering performance of soils.
5. The concepts, purpose and effects of grouting.

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

	Course outcome	**Bloom's taxonomy**	**Bloom's Taxonomy Level**	**PO**
CO1	**Possess the knowledge** of various methods of ground improvement and their suitability to different field situations.	Remembering	L1	PO1
CO2	**Understand** the concept of Dewatering Techniques.	Understanding	L2	PO1 PO5
CO3	**Understand** the stabilization methods and design principles of retaining walls for **analysis**	Understanding Analyzing	L2 L3	PO1 PO2 PO5
CO4	**Outline** the various function of Geosynthetics and its **application** in Civil engineering	Understanding Applying	L2 L2	PO1 PO4
CO5	**Understand** the concepts and **applications** of grouting techniques.	Understanding Applying	L2 L2	PO1 PO4 PO5

UNIT- I

In-situ densification Methods:

In-situ densification Methods in granular soils – Introduction of Vibration at the ground surface and at depth, Impact at the Ground surface and at depth.

In-situ Densification methods in cohesive soils – Preloading or dewatering, Vertical Drains – sand drains and geodrains – Stone and lime columns – Thermal methods.

Outcome: Able to understand the methods of in-situ densification

Activity/Event: Carry out a Comparative study on sand drains and stone columns with the reparation of a detailed report

UNIT IIL:

Dewatering: Methods of dewatering – Sumps and interceptor ditches – Single, multi stage well points – Vacuum well points – Horizontal wells – criteria for selection of fill material around drains –Electro-osmosis

Outcome: Study different types of dewatering and working criteria.

Activity/Event: Identify and locate any bore logged areas for dewatering

Outcome:

- Study utilization of industrial wastes and other stabilizers for ground improvement
- Understand principles of reinforced earth walls and slope stability

Activity/Event: Check slope stability for an earthen embankment

Outcome: Understand the utilization of advanced materials for ground improvement

Activity/Event on Unit-IV: Seminar on advances in geosynthetics with low cost output

Outcome: Understand the methods of grouting

Activity/Event: A case study on advanced grouting techniques

Text Books:

1. Purushothama Raj P. (1999), Ground Improvement Techniques, Lakshmi Publications, New Delhi.
2. Nihar Ranjan Patro (2012), Ground Improvement Techniques, Vikas Publishing House (P), New Delhi.
3. Narasinga Rao B.N.D (2015), Soil Mechanics and Foundation Engineering, Wiley Publishers, pp. 963-1038, 1st Edition.

Reference Books:

1. Hausmann Manfred R. (1990), Engineering Principles of Ground Modification, McGraw-Hill.
2. Moseley, M.D. (1998), Ground Treatment, Blackie Academic and Professional.
3. Venkatappa Rao, G. and Suryanarayana Raju, G.V.S. (1990), "Engineering with Geosynthetics", Tata McGraw Hill Publishing Co. Ltd., New Delhi.

Course Code	PAVEMENT ANALYSIS AND DESIGN	L	T	P	Credits
1001174108	Elective - II	3	1	0	3

Course Overview:

Pavement Analysis and design introduces you to the role of engineers in designing and maintaining the pavement and infrastructure. You will be exposed to various aspects of the design. These aspects represent integral components of civil and transport infrastructure. The course comprises both theoretical components and application of theoretical knowledge into design practice.

Course Objectives:

The students will be taught

1. The Components of pavement , Functions of different pavement components, stresses, different types of failure
2. The Elements in Design of Flexible Pavements**,** various parameters like loading characteristics, area of contact and tyre pressure, equivalent wheel load factors, climatic and environmental factors etc.
4. The various flexible pavement design methods like CBR method, IRC method etc.
5. The various rigid pavement design methods like Picketts's method, IRC method etc.
6. The Analysis of Various stresses like temperature stress, frictional stress, warping stress , Analysis of concrete slabs etc.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand The basic of components of pavement, stresses occurred in pavement and Understand The basic elements in design of flexible pavement	Understanding	1,2
CO2	Design of the flexible pavements along with various Standard methods	Applying	1,2,3, 5,7,8
CO3	Design of the Rigid pavements along with various standard methods	Applying	1,2,3,5,7,8
CO4	Analysis of Temperature stresses , reinforced slabs	Analyzing	1,2,4,5

Unit-I:

Introduction: Components of pavement structure, importance of sub grade soil, properties on pavement performance. Functions of subgrade, subbase, base course and wearing course.

Stresses in Flexible Pavements: Stresses in homogeneous masses and layered systems, deflections, shear failures, equivalent wheel and axle loads

Unit-I Outcome:

- Able to understand The basic of components of pavement
- Able to analyze stresses occurred in pavement

Activity/Event on Unit-1:

Draw cross section of highway on A3 Chart showing components of pavement

Unit-II:

Elements in Design of Flexible Pavements: Loading characteristics-static, impact and repeated loads, effects of dual wheels and tandem axles, area of contact and tyre pressure, modulus or CBR value of different layers, equivalent single wheel load, equivalent wheel load factors, climatic and environmental factors..

Unit-II Outcome:

- Able to understand the elements in design of flexible pavement.
- Able to understand about load factors

Activity/Event on Unit-II:

Conduct various load studies nearby toll plaza and find load factor

Unit-III:

Design Methods for Flexible Pavements: California bearing ratio (CBR) method, Design of flexible pavements for different climatic conditions, IRC method for Flexible Pavement Design. Design of bituminous pavement by using IIT pave software

Unit-III Outcome:

- Able to design flexible pavement using IRC method
- Able to design flexible pavement using CBR method

Activity/Event on Unit-III:

Design flexible pavement using IIT pave software for Visakhapatnam conditions

Unit-IV:

Rigid Pavements: Wheel load stresses, Soil sub grade, Western guard's analysis, Design of rigid pavements, IRC method for Rigid Pavement by standard procedure from IRC 58, Design Pickett's corner load theory and influence charts.

Unit-IV Outcome:

1. Able to design Rigid pavement using IRC method
2. Able to design Rigid pavement using Westergaurd analysis method

Activity/Event on Unit-IV:

1. Find the wheel load stresses based on load data at sheelanagar port road toll plaza

Unit-V:

Temperature Stresses: Westergaard's and Thomlinson's analysis of warping stresses, Combination of stresses due to different causes, Effect of temperature variation on Rigid Pavements.

Reinforced Concrete Slabs: concrete slabs-general details. Design of Tie Bars and Dowel Bars

Unit-V Outcome:

- Able to design RCC Slabs
- Able to understand stresses developed in flexible and rigid pavements

Activity/Event on Unit-V:

Determine warping and frictional stresses for Visakhapatnam conditions

Text Books:

1. Yoder, E.J. and Witczak, M.W., "Principles of Pavement Design 2nd Ed", John Wiley &Songs, Inc. 1975
2. O'Flaherty, A. Coleman, "Highways : The Location, Design, Construction and Maintenance of Road Pavements", 4th Ed., Elsevier 2006
3. Fwa, T.F., "The Handbook of Highway Engineering", CRC Press Taylor &Francies Group 2006
4. Khanna, S.K. and Justo, C.E.G., "Highway Engineering", Nem Chand Jain & Bros. 2005
5. Papagiannakis, A.T. and Masad, E.A., "Pavement Design and Materials, John Wiley&Design of flexible pavements by IRC:37- 2018

Reference Books:

1. Principles and Practice of Highway Engineering Design by L.R.Kadiyali and Lal, Khanna Publications.
2. Text book of Highway Engineering by R.Srinivasa Kumar, Universities Press, Hyderabad.
3. Highway Engineering by Dr.S.K.Sharma, S.Chand Publishers.

Course Code	REMOTE SENSING & GIS APPLICATIONS	L	T	P	Credits
1001174109	Elective - II	3	1	0	3

Course Overview:

This course will make the student to understand about the principles of GIS, Remote Sensing, Spatial Systems, and its applications to Engineering Problems.

Course Objectives:

The student will be taught

1) To introduce the basic principles of Remote Sensing.
2) To explain platforms, sensors and image processing
3) To introduce the basic concepts of GIS
4) To explain the fundamental concepts of GIS and Spatial analysis
5) GIS application in various Engineering problems

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Retrieve the information content of remotely sensed data	Understanding	1,2
CO2	To be familiar to understand of Image enhancement and Image classification	Understanding	1,2,4,5
CO3	Create and input spatial data for GIS application	Applying	1,2,4,5,6,
CO4	Analyze spatial and attribute data for solving spatial problems	Analyzing	1,2,3,4,5,7
CO5	Apply problem specific remote sensing data for engineering applications	Applying	1,2,4,,7,9

Unit-I:

Introduction: Basic components of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, Sensors- types and characterstics, passive sensor, active sensor, platforms-airborne remote sensing, spaceborne remote sensing, data pre-processing, Important Remote Sensing programmes.

Unit-I Outcome:

- Able to explain basic principles of Remote Sensing &Analyze the energy interactions in the atmosphere and earth surface features

Activity/Event on Unit-1:
Seminar on LANDSAT, SPOT, NOAA and IRS Satellites & Sensors

Unit-II:

Geographic Information System: Introduction, key components, spatial data, raster data models, vector data models, raster versus vector, GIS in Spatial analysis, digitization Process, data Base handling & types of data structures, map Projections.

Unit-II Outcome:

- Able to describe components of GIS
- Able to explain spatial & non spatial data
- Able to understand Map projections

Activity/Event on Unit-II:
Digitization of vector data & Problem Identification and Implementation of a GIS project.

Unit-III:
Image analysis: introduction, elements of visual interpretations, digital image processing- digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, image pre-processing, image rectification, image enhancement, image classification, supervised classification, unsupervised classification.

Unit-III Outcome:

- Able to describe general Image interpretation keys
- Able to describe image enhancement techniques

Activity/Event on Unit-III:
Pre-processing of satellite images and Image classification

Unit-IV:

RS & GIS Techniques for Natural resources Management:
Land use/land cover classification systems, Forest cover, agriculture, wasteland management& Water Resources Management.

Unit-IV Outcome:

- Able to apply problem specific remote sensing data for engineering applications
- Able to Understand RS & GIS applications in Natural resource management

Activity/Event on Unit-IV:

LULC classification & Hydrological Modeling to understand the applications

Unit-V:

RS & GIS Techniques for Infrastructure Planning and Management:
Urban utilities, cadastral mapping and transport network. GPS Navigation system for various applications.

RS & GIS Techniques for Natural Disasters Management:
Earthquakes, Landslides, cyclones and Floods – Hazard Zonation, Risk assessment, Relief and Rehabilitation measures

Unit-V Outcome:

- Able to explain importance of Rs& GIS in Infrastructure Management
- Able to distinguish the Solution for Natural Disasters

Activity/Event on Unit-V:

Overlay Analysis, Buffer analysis &Network analysis to understand the applications

Text Books:

1. Remote sensing and image interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc
2. Remote sensing of the Environment by Jhon R Jensen, Pearson Publication
3. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications

4.Geographic Information Systems: A management perspective, Stan Aronoff; WDL publication Ottawa, Canada; 1995,

Reference Books:

1. Burrogh P.A., Principles of Geographical Information System for Land Resources Assessment, Oxford Publications, 1980 2. Kang-tsungChang ,
2. Introduction to Geographical Information System, , Fourth Edition, Tata McGraw Hill,2008
3. Pinde Fu and JiulinSun,Web GIS: Principles and applications,ISBN:9781589482456, ESRI, 2010
4. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU KAKINADA 2001, B.S.Publications.

Course Code	INDUSTRY ORIENTATED COURSE (BIM/TEKLA/REVIT/E-TAB/CYCLONE) Elective - II	L	T	P	Credits
1001174110		3	1	0	3

Course code	JAVA PROGRAMMING	L	T	P	Credits
1005172104	OPEN ELECTIVE	3	1	0	3

Course Overview:

1. Java has emerged as the object-oriented programming language of choice.
2. Some of the important concepts of Java include are:
   1) A Java virtual machine (JVM), which provides the fundamental basis for platform independence
   2) Automated storage management techniques, such as garbage collection, collection frameworks
   3) Language syntax that is similar to that of the C language.

Course Objectives:

- To Understanding the object oriented programming concepts like Data Abstraction, Encapsulation, Inheritance and Polymorphism.
- Gain the knowledge about the relationship between the classes and objects.
- Understand the principles of Inheritance, Packages, Multithreading and Interfaces.
- To understand and apply the concepts of Applets and AWT.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Identify the concepts and features of object oriented programming in Java.	Understanding	PO1, PO2
CO2	Describe and implement the programs with command line arguments and Scanner Class.	Analyzing	PO1, PO2, PO3,PO5
CO3	Analyze and implement the concepts of Inheritances and Multithreading with real world scenario.	Applying	PO1, PO2, PO3,PO5
CO4	Develop GUI programs using Applets and Event Handling.	Applying	PO1, PO2, PO3,PO5

Unit-I:

Introduction to OOP, procedural programming language and object oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure.

Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and associativity, primitive type conversion and casting, flow of control.

Outcome:

After reading this Unit, student should be able to understand:

- Be familiar with Object oriented programming techniques.
- Explain the structure of the program
- Demonstrate various control structures in JAVA.

Activity: Simulate various control structures for real time applications.

Unit-II:

Abstract Data Type, Classes and objects, class declaration, creating objects, methods, constructors and constructor overloading, garbage collector, importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

Outcome:

After reading this Unit, student should be able to understand:

- Outline the relation between class and object.
- Illustrate the difference between method and constructor overloading.
- Make use of static keyword and this keyword.
- Analyze the Command Line arguments.

Activity: Develop real time applications using OOPs concepts through various ADT's.

Unit-III:

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class. Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package. Exception handling, importance of try, catch, throw, throws and finally block, user defined exceptions, Assertions, Collection inbuilt classes.

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, thread synchronization, communication between threads. Reading data from files and writing data to files.

Outcome:

After reading this Unit, student should be able to understand:

- Classify various types of Inheritance.
- Illustrate the difference between method overloading and overriding.
- Demonstrate to usage of Packages.
- Make use of Exception Handling.
- Develop and make use of synchronization through multithreading.

Activity: Develop enhanced applications from existing versions to new versions.

Unit-IV:

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners.

Outcome:

After reading this Unit, student should be able to understand:

- Explain the structure of Applet Program.
- Construct an approach for event delegation model.
- Build the frame based applications using event handling mechanism.

Activity: Develop client browser applications with Graphics

Unit-V:

Java Swing package and AWT package: introduction, components and containers, JButton,Jlabel, JCheckbox, JRadio Button, JListJBoxes, JChoice Boxes, JContainer class, JLayouts,JMenu and JScrollbar.

Outcome:

After reading this Unit, student should be able to understand:

- Extend the importance of AWT.

- Develop the components and containers in AWT.
- Develop the GUI application using checkboxes, radio buttons, List Boxes etc.
- Construct different types of Layouts.

Activity: Develop a client side module which contains checkboxes, text fields, text area, radio buttons etc.

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, Saurabh Choudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.

Reference Books:

1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in
2. Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box.

Course Code		L	T	P	Credits
1003173201	**FINITE ELEMENT METHODS OPEN ELECTIVE**	3	1	0	3

Course Overview:

This course is an introduction to the finite element method as applicable to a range of problems in physics and engineering sciences. The treatment is mathematical, but only for the purpose of clarifying the formulation. This *course* introduces *finite element methods* for the analysis of solid, structural, fluid, field, and heat transfer problem

Course Objectives:

1. Understand the basic principles of finite element analysis procedure
2. Know the Theory and characteristics of finite elements that represent engineering structures.
3. Understand and apply finite element solutions to structural, thermal, dynamic problem to develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.

Learn to model complex geometry problems and solutiontechniques.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Understand the concepts behind variational methods and weighted residual methods in FEM.	Understanding	PO:1 , PO:2, PO:3
CO2	Identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements.	Analyzing	PO:1, PO:2, PO:3, PO:4, PO:5
CO3	Apply suitable boundary conditions to a global structural equation, and reduce it to a solvable form.	Evaluating	PO:1, PO:2, PO:3, PO:4, PO:5
CO4	Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.	Applying	PO:1, PO:2, PO:3, PO:4, PO:5, PO:6, PO:12

Unit-I:

Introduction to finite element method, Weak form; Formulation of Finite Element Equations for 1D elements: 1D beam (weak formulation of governing differential equations); Discretization of weak form and boundary conditions, concept of potential energy (PE), one dimensional problems

Outcome:

Understand the concepts behind variation methods. Implement numerical methods to solve mechanics of solids problems.

Activity: Modeling of the stepped bar with reference of machine tools experiment.

Unit-II:

Discretization of domain, element shapes, Discretization procedures, assembly of stiffness matrix, band width, node numbering, mesh generation, interpolation functions, local and global coordinates, convergence requirements, treatment of boundary conditions: elimination approach and penalty approach, Analysis of one dimensional bar problems.

Outcome:

Identify the application and characteristics of FEA elements such as bars, beams, Develop element characteristic equation procedure and generation of global stiffness equation will be applied.

Activity: 1. Prepare finite element models for different types of 1-Dbar.
2. Prepare simple truss model using truss elements.

Unit-III:

Analysis of Trusses: Finite element modeling coordinates and shapes functions, assembly of global stiffness matrix and load vector, finite element equations, treatment of boundary conditions, stress-strain and support reaction calculations. Analysis of Beams: Element stiffness matrix for Hermit beam element, derivation of load vector for concentrated and UDL, simple problems on beams.

Outcome: Able to give the differences between 1-D, and 2-D finite element analysis procedure.

Activity:

Sample beam deflection activity, Draw bending moment and shear force diagrams of Beams and Frames using FEM approach.

Unit-IV:

Finite element modeling one and two dimensional heat transfer**:** 2D conduction. Formulation of axis-symmetric problems. Two dimensional four nodded isoperimetric elements and numerical integration.

Outcome:

Implement the formulation techniques to solve two-dimensional problems using triangle and quadrilateral elements.

Activity: Prepare finite element model of 2-D plate with triangular elements.

Unit-V:

Dynamic Analysis: Formulation of finite element model, element consistent and lumped mass matrices, evaluation of eigen values and eigen vectors, free vibration analysis of 1-D bar elements. Steady state heat transfer analysis: one dimensional analysis of a fin and two dimensional analysis of thin plate.

Outcome:

Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer, and fluid flow.

Activity: Prepare the rectangular fin.

Text Books:

1. Introduction to Finite Elements in Engineering / Chandraputla, AshokandBelegundu / Prentice – Hall

Reference Books:

1. S.S. Rao,The Finite Element Method in Engineering, Pergamon(2004)
2. K. J. Bathe, Finite Element Procedures, PrenticeHall(1996)
3. J. N. Reddy, An Introduction to Finite Element Method, McGraw HillPublication(2003)

Course Code	DIGITAL IMAGE PROCESSING	L	T	P	Credits
1004173207		3	0	0	3

Course Overview:

Digital image processing including visual perception, image formation, spatial transformations, image enhancement, color image representation and processing, edge detection, image segmentation.

Course Objectives:

- To introduce fundamentals of Image Processing.
- To expose various intensity transformations in spatial and frequency domains.
- To impart concepts various coding techniques for image compression.
- To dissimilate various segmentation techniques for images.
- To introduce the concepts of colour image segmentation.

Course Outcomes:

	Course outcome	Skill	PO
CO1	Analyze various types of images mathematically	Analyze	PO2, PO4, PO5
CO2	Compare image enhancement methods in spatial and frequency domains	Understand	PO2
CO3	Demonstrate various segmentation algorithms for given image	Apply	PO2
CO4	Justify different techniques for image compression	Analyze	PO2, PO4, PO5

Unit-I:

Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures.

Outcome:

- Explain mathematical models of various types of images
- Define image processing parameters such as adjacency and distance measures

Activity/Event: Seminar

Unit-II:

Image Enhancements and Filtering- Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters – low-pass and high-pass.

Outcome:

1. Compare image enhancement methods in spatial and frequency domains
2. Apply frequency Domain filtering techniques for image enhancement

Activity/Event: Executing programs using MATLAB software.

Unit-III:

Image Segmentation, Detection of discontinuities, edge linking and boundary detection, thresholding – global and adaptive, region-based segmentation.

Outcome:

1. Describe various Image segmentation techniques.
2. Illustrate detection of discontinuities in an image .

Activity/Event: Executing programs using MATLAB software.

Unit-IV:

Image Compression, -Redundancy, inter-pixel and psycho-visual; Loss less compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image compression standards – JPEG and JPEG-2000.

Outcome:

1. Describe various transform techniques for lossy compression
2. Apply various coding techniques for lossless compression

Activity/Event: Executing programs using MATLAB software.

Unit-V:

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Outcome:

1. Describe various color models for color image processing
2. Apply various techniques for color image smoothing, sharpening and segmentation

Activity/Event: Executing programs using MATLAB software.

Text Books:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education, 2008.
2. Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India, 2nd edition 2004.

Reference Books:

1. Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, “Digital Image processing using MATLAB”, Tata McGraw Hill, 2010.
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image processing”, Tata McGraw Hill.

Course Code		L	T	P	Credits
1005172105	**DATA STRUCTURES THROUGH C**	3	1	0	3

Course Overview:

Data Structure is a systematic way to organize data in order to use it efficiently. Following terms are the foundation terms of a data structure.

The purpose of this course is to provide the students with solid foundations in the basic concepts of programming: data structures and algorithms. The main objective of the course is to teach the students how to select and design data structures and algorithms that are appropriate for problems that they might encounter. This course is also about showing the correctness of algorithms and studying their computational complexities. This course offers the students a mixture of theoretical knowledge and practical experience. The study of data structures and algorithms is carried out with C Language.

Course Objectives:

1. Basics of data structures including their fundamentals building blocks: arrays and linked list.
2. To solve problems using linear data structures such as linear lists, stacks, queues.
3. To solve problems using searching and sorting techniques.
4. To be familiar with non-linear data structures such as trees.

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Understand data structures concepts for solving computing problems.	Understand	PO1, PO2
CO2	Implement standard data structures like stack, queue	Applying	PO1, PO2, PO3, PO5
CO3	Understand sorting and searching algorithms to the small and large data.	Understand	PO1, PO2
CO4	Apply AND Implement basic data structures such as trees for real-time applications	Applying	PO1, PO2, PO3, PO4, PO5

Unit-I: Arrays And Linked Lists:

Abstract Data Types(ADTs) , Dynamic allocation of Arrays, Structures and unions, Polynomials, Spares Matrices Representation of multidimensional Arrays. Single Linked List and Chains, Representing Chains in C, Polynomials, Polynomial Representation- Adding Polynomials- Circular List Representation of Polynomials, Equivalence Classes, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input-Deleting a Sparse Matrix, Doubly Linked Lists.

Outcome:

1. Differentiate primitive and non primitive data structures.
2. Design and apply appropriate data structures for solving computing problems.
3. Real time applications of arrays and Linked Lists.

Activity: Construct an Abstract Data Type for real-time applications.

Unit-II: Stacks and Queues:

The Stack, Stacks using Dynamic Arrays, Recursion, Linked Stacks, The Queue, Linked Queues, Circular Queues using Dynamic Arrays, De-queue. Application of stacks and queues, Evaluation of Expressions, Expression- Postfix Notation- Infix to Postfix Towers Of Hanoi Problem

Outcome:

- Implement standard data structures like stack, queue
- Able to implement real time applications on Stacks and Queues.

Activity: Identify applications of stack/Queue in real-time and implement it with Stack/Queue.

Unit-III: Searching and Sorting:

Searching: Linear Search, Binary Search, Fibonacci search. Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort Merging, Iterative Merge Sort, Recursive Merge Sort, Heap Sort

Outcome: Apply sorting and searching algorithms to the small and large data sets.

Activity: Select an appropriate optimized sorting/searching technique for a real-time application and justify.

Unit-IV: Trees:

Introduction, Terminology, Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal and Tree Iterators, Introduction, Inorder Traversal Preorder Traversal, Postorder Traversal, Threaded Binary Trees, Inorder Traversal of a Threaded Binary Tree, Inserting a Node into a Threaded Binary Tree

Outcome:

- Summarize basic tree concepts, operations and applications.
- Apply basic data structures such as trees for real-time applications.

Activity: Construct an optimized binary tree with age of your family members and perform traversals on that tree. Outline the observations.

Unit-V: Advanced Concept of Trees:

Binary Search Trees, Definition, Searching a Binary Search Tree, Insertion into a Binary Search Tree, Deletion from a Binary Search Tree, Height of Binary Search Tree. Heaps, Priority Queues, Definition of a Max/Min Heap, Insertion into a Max/Min Heap, Deletion from a Max/Min Heap

Outcome:

1. Demonstrate the use of Heaps in various applications.
2. Demonstrate the use of Binary Search Trees in various applications.

Activity: Construct a Binary Search Tree for an Arithmetic Expression.

Text Books:

1. Fundamentals of Data Structures in C, Ellis Horowtiz, S.Sahni, Andrews Freed, University Press (India). Second Edition.
2. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

Reference Books:

1. Classic Data Structures, Debasis Samantha, PHI. (Second Edition)
2. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
3. Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition.

Course Code	ENTREPRENEURSHIP DEVELOPMENT OPEN ELECTIVE	L	T	P	Credits
1099174101		3	1	0	3

Unit-I: Entrepreneurship

Importance, growth, Opportunities - Characteristics and Qualities of Entrepreneur- Role of Entrepreneurship- Social Entrepreneurship. Women Entrepreneurship: Role & Importance, Problems of Women Entrepreneurs, Assistance to women entrepreneurship – corporate entrepreneurship – mobility of entrepreneur

Activity/Event on Unit-1: Video Presentations of successful people/Case study on Women entrepreneurship and their role on future India

Unit-II: Training

Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit - Training for New and Existing Entrepreneurs, Feedback and Performance of Trainees. Creativity and Entrepreneurship: Sources and Methods of Ideas Planning and Development of Programmes. Incubation process: Idea to venture.

Activity/Event on Unit-II: Case study on creativity, Innovation on entrepreneurs.

Unit-III: Planning and Evaluation of Projects

Growth of Firm – Project identification and selection - Factors inducing growth- - Project Feasibility Study - Post Planning of Project-Project Planning and Control.

Activity/Event on Unit-III: Task on creating pseudo projects with feasibility reports.

Unit-IV: Small and Micro Enterprises

Importance, definitions – policies and their support to MSMEs - growth and growth strategies – sickness in small business and remedies – small entrepreneurs in International business.

Activity/Event on Unit-IV: Power point presentation on MSME policies and support

Unit-V: Institutional support to entrepreneur and MSMEs

Role of Government - Role of IDBI, NIESBUD, SISI, and DIC - Financial Institutions-Commercial Banks, Entrepreneurial Development Institutes, Universities and other Educational Institutions offering Entrepreneurial Development Programme. Types and Sources of Financing for Start-up Businesses.

Activity/Event on Unit-V: Role play on EDP'S role on entrepreneurship Development.

Text Books:

- Arya Kumar: "Entrepreneurship", Pearson, Publishing House,New Delhi, 2012.

- P.C.Shejwalkar: “Entrepreneurship Development”, Everest, Publishing House, New Delhi,

Reference Books:

- VSP Rao, Kuratko: “Entrepreneurship’, Cengage Learning, NewDelhi,
- K.Ramachandran: “Entrepreneurship Development”, TMH, NewDelhi, 2012
- B.Janakiram, M Rizwana: “Entrepreneurship Development” ExcelBooks, New Delhi, 2011
- Rajeev Roy: “Entrepreneurship”, Oxford University Press, NewDelhi,2012
- Manjunatha, Amit Kumar Goudar: “Management andEntrepreneurship” University Science Press, New Delhi, 2011
- Eric A Morse, Ronald K Mitchell: “Cases in Entrepreneurship”, SAGE Publication, New Delhi, 2011

Course Code	IPR & PATENTS (AUDIT COURSE)	L	T	P	Credits
1099173101		2	0	0	0

- **UNIT I**

  Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

UNIT II

- Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers **–** Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law-Semiconductor Chip Protection Act.

- **UNIT III**

  Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

- **UNIT IV**

  Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

- **UNIT V**

  Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

UNIT VI

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime

Course Code		L	T	P	Credits
1001174121	GIS & CAD **LAB**	**0**	**0**	**3**	**2**

Course Overview:

The Lab course covers introduction of GIS and STADD, basic tools bars of Arc GIS software, Georeferencing, Digitization, Image Enhancement of satellite images & Simple applications of civil Engineering, 2D & 3D frames, design of retaining wall and simple towers.

Course Objectives:

The students will be explained

1. Introduce image processing and GIS software familiarize structural analysis software
2. Understand the process of digitization, creation of thematic map from toposheets and maps.
3. Learn to apply GIS software to simple problems in water resources and transportation engineering.
4. Learn to analyse 2 D and 3D frame steel tubular truss using structural analysis software.
5. Learn to analyse and design retaining wall and simple towers.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	An ability to introduce image processing and GIS software	Understanding	1,2,4,5,10,12
CO2	An ability to familiarize structural analysis software	Understanding	1,2,4,5,10,12
CO3	An ability to understand the process of digitization, creation of thematic mapfromtoposheets and maps.	Applying	1,2,4,5,10,12
CO4	An ability to learn to apply GIS software to simple problems in water resourcesand transportation engineering	Analyzing	1,2,4,6,7,10,
CO5	An ability to learn to analyse 2 D and 3D frame steel tubular truss using structuralanalysis software	Applying	1,2,3,4,7,9

List of Exercises:

EXCERCISES IN GIS:

1. Digitization of Map/Toposheet
2. Creation of thematic maps.
3. Estimation of features and interpretation
4. Developing Digital Elevation model
5. Simple applications of GIS in water Resources Engineering
6. Applications of GIS in Transportation Engineering

EXCERCISIES IN STADD:

1. Analysis and design of simple beams
2. Analysis and design of Continuous beams
3. 2-D Frame analysis
4. Analysis of steel trusses
5. Simple Tower Analysis and Design
6. Analysis and design of multi storey building

Requirements GIS:

SOFTWARES:

Arc GIS10.4
ERDAS8.7
MapInfo6.5
Any one or Equivalent

COMPUTER AIDED DESIGN AND DRAWING:

SOFTWARE:

STAAD PRO /Equivalent
STRAAP
STUDDS

Note: Any 10 experiments are sufficient and remaining should be discussed in the class room

Course Code	DESIGN AND DRAWING OF IRRIGATION STRUCTURES	L	T	P	Credits
10011174122		0	0	3	2

Course Overview:

The present course is designed in such a way that it gives a clear understanding about the concept of Irrigation structures drawing such as water storage structures, water supply hydraulic structures, and regulatory structures cross drainage works. Irrigation Design And Drawing enables the students to acquire knowledge about various components of hydraulic structures. It also makes the student to design various irrigation structures

Course Objectives:

The course is designed to

1. The main objective of the course went on making students to understand the theory, design and drawing of Hydraulic structures.
2. To impart knowledge regarding the design of the various minor irrigation structures
3. To convey the knowledge on the causes of failure, design criteria and stability analysis of different types of hydraulic structures

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Design and drawing of Surplus weirTank sluice with a tower head	Applying	1,2,3,7,810,11
CO2	Design and drawing of Canal drop-Notch type	Applying	1,2,3,7,810,11
CO3	Design and drawing of cross regulator /head regultor	Applying	1,2,3,7,810,11
CO4	Design and drawing of Syphon aqueduct type III	Analyzing	1,2,3,7,810,11
CO5	Design and drawing of Under tunnel	Applying	1,2,3,7,810,11

List of Exercises:

Syllabus:

Drawing of Irrigation structures with simple components design

- Surplus weir
- Tank sluice with a tower head
- Canal drop-Notch type
- Canal regulator
- Syphon aqueduct type III
- Under tunnel

Final Examination pattern: Any two question of the above six designs may be asked out of which the candidate has to answer one question. The duration of the examination is three hours

Text Books :

1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy, New age International Publishers.
2. Water Resources and Water Power Engineering Modi. P. N., Irrigation, Standard Book House,
   Irrigation and Water Resources Engineering, Asawa. G.L. New Age International, 2000

Reference :

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Standard Book House.
2. Irrigation and Water Power Engineering, B. C Punmia& Lal, Lakshmi Publications Pvt. Ltd., New Delhi.
3. Theory & Design of Irrigation Structures - Vol III Varshney, R.S., Nem Chand & Bros., Roorkee.
4. Water Resources Engineering-Principles and Practice Sathyanarayana M. C., New Age International Publishers. 2009

DETAILED SYLLABUS FOR

IV-B.Tech

II-SEMESTER

Course Code		L	T	P	Credits
1001174201	**Soil Dynamics and Foundations**	3	1	0	3

Course Overview:

The basic **course** in **soil mechanics**/geotechnical engineering generally introduces the fundamental concepts, principles and applications of **soil** as engineering material with properties under static loading. ... Phenomena like liquefaction and lateral spreading of **soil** are also discussed

Course Objectives

From this course students will learn the following

1. To explain the significance of dynamic load in machine foundation analysis

2. To understand the fundamentals of soil dynamics and techniques of isolation

3. To explain theory of vibration for different field conditions

4. To know the behavior of the machine foundations and its design

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

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Solve geotechnical earthquake Engineering problems	Understanding Applying	L2 L3	PO1 PO2
CO2	Study the principles of design of various machine foundations	Understanding Applying	L2 L3	PO1 PO2
CO3	Study the parameters of the soil under dynamic conditions and Vibration Isolation	Understanding Applying	L2 L3	PO1 PO2 PO3
CO4	Do machine foundation analysis and design for reciprocating and impact machines	Understanding Applying	L2 L3	PO1 PO2

UNIT- I

Methods of dynamic analysis-Lumped mass method – Procedure for Dynamic analysis of machine foundations-Resonance and its effect – free and forced Vibrations with and without damping – Magnification factor –Logarithmic decrement.
Outcome: Solve geotechnical earthquake Engineering problems

Activity/Event: List out the fundamental of vibration

UNIT II:

Natural frequency of foundation – soil system – Barkan‟s and I.S. methods of determining natural frequency. Dynamic Properties of Soils: Coefficient of elastic, uniform and non-uniform compression and shear -Determination of dynamic properties of soil-Steady state vibration test, block vibration test, cyclic plate load test.

Outcome:
Study the principles of design of various machine foundations

Activity/Event: Demonstrate the various test used for determination the dynamic properties of soil.

Unit-III

Apparent soil mass -bulb of pressure concept – Pauw‟s analogy of foundation – soil system. Elastic half space theory-elastic half space analogue method-elastic soil spring analogy.

Outcome:
Study the parameters of the soil under dynamic conditions

Activity/Event:

- Prepare a note on importance of the soil spring analogy in day to day life

Unit-IV
General requirements of machine foundations-Principles of Design of Foundations for Reciprocating, Impact machines, Foundation for Rotary- Low, Medium & High as per IS code.

Outcome:
Do machine foundation analysis and design for reciprocating and impact machines

Activity/Event on Unit-IV: Illustrate the different types of machine foundations

Unit-V

Vibration Isolation Technique; Mechanical isolation - Foundation Isolation - isolation by location - isolation by barriers- active and passive isolation tests. Dynamic Bearing capacity of shallow foundations; Pile foundations under dynamic loads

Outcome:
Study about Vibration Isolation

Activity/Event: Quantify the infulence of dynamic load on the bearing capacity of shallow and pile foundation

Text Books:

1. Soil Dynamics by Shamsher Prakash, Shamsher Prakash Foundation

Reference Books:

1) Hand-book of machine foundations by Srinivasulu and Vaidyanathan – M/s. Tata McGraw Hill Publications.
2) I.S. Codes.
3) Soil Mechanics and Foundation Engineering by B.C. Punmia – M/s. Lakshmi publishing co.
4) Vibrations of soils and Foundation by Richart Hall and Woods Prentice Hall Inc., New Jersey.

Course Code		L	T	P	Credits
1001174202	**CONSTRUCTION TECHNOLOGY AND MANAGEMENT**	3	1	0	3

Course overview:

The course deals with the concepts of overall planning, scheduling and controlling of projects from beginning to completion along with the project management tools to apply these concepts. It also introduces various construction equipment and how construction equipment should be selected and used to produce the intended quality in the most effective manner.

Course objectives:

1. To introduce students the concept of project management including network drawing and monitoring.
2. To introduce the various equipment related to construction like earth work equipment, hauling equipment, handling equipment, aggregate and concrete production equipment and machinery.
3. To introduce the importance of quality and safety in construction projects.

Course Outcomes:

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

	Course Outcome	Bloom's taxonomy	Bloom's taxonomy Level	PO
CO1	Apply the concept to plan, schedule of project and to review with techniques of CPM and PERT.	Applying	L3	1,2,11
CO2	To Carryout manpower resources levelling and smoothening	Analyzing	L4	1,2,11
CO3	Demonstrate basic knowledge about construction equipment and machinery	Understanding and applying	L2, L3	1,5
CO4	Know the methods of production of aggregate products and concreting	Understanding and applying	L2, L3	1,5
CO5	Understand the quality and safety aspects of construction.	Understanding and applying	L2, L3	1,6

UNIT- I

Introduction to construction project management – qualities of a project manager – project planning –scheduling – controlling – bar charts – milestone charts – elements of networks- network construction guidelines- numbering- Critical path method- event times, activity times- floats- critical path.

Unit-I outcome:

- Able to plan and schedule activities using bar charts and critical path method.

Activity/event on unit-I:

- List the activities and draw a network diagram for the project of casting a concrete beam over verandah opening.

UNIT –II

Project evaluation and review technique- time estimates- event times - critical path- probability of completion of project. cost analysis- crashing- cost and time optimization-updating – allocation of resources- resource smoothing- resource levelling.

Unit-II outcome:

- Able to schedule activities using PERT and carry out cost analysis and resource allocation.

Activity/event on unit-II:

- List the software's used for project management.

UNIT- III

Construction equipment – economic considerations – earthwork equipment– excavation equipment- power shovels, back hoe, drag line, clamshell bucket-excavating and earthmoving equipment- scrapers, bulldozers, graders, tractors-hauling equipment – dump trucks , dumpers – capacities of trucks – calculation of truck production – compaction equipment – types of compaction rollers.

Unit- III outcome:

- Able to understand the operation of various construction equipment.

Activity/event on unit-III:

- Make a visit to nearby construction to explain about various construction equipment

UNIT –IV

Hoisting equipment- cranes- types of cranes- aggregate producing equipment– different crushers- selection of crushing equipment – screening equipment Concreting equipment – concrete mixers – mixing and placing of concrete – consolidating and finishing.

Unit-IV outcome:

- Able to know the methods of production of aggregate products and concreting.

Activity/ event on unit-IV:

- Make a visit to nearby construction to explain about cranes and concreting equipment.

UNIT –V

Construction methods – earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering.

Unit-V outcome:

- Able to understand the quality and safety practices in construction industry

Activity/event on unit-V:

- Highlight various aspects of construction quality and safety with a case study.

Text books:

1. Project planning and control with PERT and CPM by B.C.Punmia and K.K.Khandelwal
2. Construction Planning, Equipment and Methods by Peurifoy and Schexnayder ,Shapira, Tata Mcgrawhill.
3. Construction engineering and management by Dr. S. Seetharaman

Reference textbooks:

1. Construction Project Management Theory and Practice'by Kumar NeerajJha (205), Pearson.
2. Construction Technology' by Subir K. Sarkar and SubhajitSaraswati, Oxford University press.

Course Code		L	T	P	Credits
1001174203	**PRESTRESSED CONCRETE**	3	1	**0**	**3**

Course Overview:

Prestressed Concrete is an advancement of reinforced concrete structures and mostly dealt with long span bridge structures, precast structural members and slender sections. This course provides the understanding, ability to analyze the stresses and design of prestressed concrete structural elements.

Course Objectives:

The students will be taught:

1. To understand the basic concepts in prestressed concrete
2. To familiarize the concept of losses as per IS Code
3. To understand the concept and methods of analysis of prestress
4. To understand the design of flexural members and shear reinforcement provision
5. To comprehend the students about torsional reinforcement as per IS Codal provisions, anchorage zones and it's reinforcement.

Outcomes: By the end of the course the student will be able to

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO1	Understand the basic concepts in prestressed concrete	Understanding	L2	PO1, PO2, PO5
CO2	Familiarize the concept of losses as per IS Code	Understanding Applying	L2 L2	PO1, PO2
CO3	Understand the concept and methods of analysis of prestress	Understanding Analyzing	L2 L3	PO1, PO2
CO4	Understand the design of flexural members and shear reinforcement provision	Understanding Analyzing	L2 L3	PO1, PO2, PO3, PO6
CO5	Comprehend the torsional reinforcement, anchorage zones and its reinforcement	Understanding Analyzing	L2 L3	PO1, PO3, PO5, PO6

UNIT- I

Basic concepts of Prestressing- Advantages and Applications of Prestressed Concrete, **Materials:** High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength- Permissible Stresses- Relaxation of Stress, Cover Requirements – Prestressing Systems- Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems

Outcome: Understand the basic concepts in prestressed concrete **.**

Activity/Event:

Use of PPT's with practical examples and live structure visualization.

UNIT II

Losses of Pre-stressing- Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation stress in steel, slip in anchorage, differential shrinkage- bending of members and frictional losses- Total losses allowed for design.

Outcome:
Know the losses in prestressed concrete members.

Activity/Event: Seminar on understanding multiple losses in different situations.

Unit-III

Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons as per IS 1343, Cracking moment – Cable Profile, Kern Distance.

Outcome:
Know the methods of calculation of stresses in prestressed concrete members.

Activity/Event :

Analyze the stresses in tendons for a practical case as per IS Code.

Unit-IV

Design for Flexural resistance- Types of flexural failure – Code procedures- Design of sections for flexure – Control of deflections- Factors influencing Deflection - Prediction of short term and long-term deflections – Design for shear reinforcement as per IS Codal provisions

Outcome:
Able to design the flexural members as per IS 1343:2012

Activity/Event on Unit-IV:

Design for Flexural resistance in a prestressed beam

Unit-V

Design for torsional reinforcement as per IS Codal provisions - Transfer of Prestress in pre tensioned members- Transmission length- Bondstresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

Outcome:

Able to design the anchorage reinforcements as per IS 1343:2012
Activity/Event : Design anchorage reinforcement in prestresses members.

Text Books:

1. Prestressed Concrete, N. Krishna Raju, Tata McGraw hill
2. Prestressed Concrete, T. Y. Lin & Burns, Wiley Publications

Reference Books:

1. Prestressed Concrete, S. Ramamrutham, Dhanpat Rai Publications
2. Prestressed Concrete, P. Dayaratnam.
3. Prestressed Concrete, N.RajaGopalan.Narosa Book Distributors

Course Code	Bridge Engineering	L	T	P	C
1001174204	Elective - III	3	1	0	3

Course overview:

The design of different types of bridges such as slab bridges, T-Beam bridges, plate girder bridges, Box culvers are the key point of this course. Bridges are generally designed in working stress method due to its high fatigue effect. IRC (Indian Road Congress) and AASHTO (American Association of State Highway and Transportation Officials) are used to consider the different types of loading and design. After this course one can perceive the applicability of different types of bridges depending upon the site condition.

Course objectives:

1. To familiarize Students with different types of Bridges and IRC standards.
2. To equip student with concepts and design of Slab Bridges, T Beam Bridges, Box Culverts.
3. To understand concepts of design of Plate Girder Bridges.
4. To familiarize with different methods of inspection of bridges and maintenance.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Explain different types of Bridges with diagrams and Loading standards	Understanding	1,2,3
CO2	Carry out analysis and design of Slab bridges, T Beam bridges, Box culvers and suggest structural detailing.	Understanding, Analyzing	2,3
CO3	Carry out analysis and design of Plate girder bridges.	Understanding, Analyzing	2,3
CO4	Understand the stability analysis of Piers. Organize for attending inspections and maintenance of bridges and prepare reports.	Understanding, Analyzing	1,2,3,5
CO5	Understand the design of abutments.	Analyzing	2,3,5

UNIT – I

Introduction- different parts of Bridges- Types- Slab bridges, T Beam, Arch bridges, Cable Stayed bridges, prestressed concrete bridges, Truss Bridges, Culverts, - Nomenclature- Selection of Bridge Site- Economical span- Abutments pier and end connections- types of foundations- Open, Pile, Well Foundations, Bearings – Types- Introduction to Loading standards- Railway and IRC Loading.

- **Unit-I Outcome:** Student should be able to know the type of bridges and their loadings.
- **Activity/event on unit-I:** Visit a nearby RCC and steel bridge construction site to understand the physical importance of different bridges.

UNIT – II

Slab bridges- Basic concept of slab bridges- Wheel load on slab- effective width method- slabs supported on two edges- cantilever slabs- dispersion length- Design of interior panel of slab- Guyon's – Massonet Method –Hendry- Jaegar Methods- Courbon's theory- Pigeaud's method.

- **Unit-II Outcome:** Student should be able to know the design of Slab Bridge.

- **Activity/event on unit-II:** Visit a nearby Slab Bridge for better understanding.

UNIT – III

T-Beam bridges- Introduction to T-Beam bridges- Analysis and design of various elements of bridge –Design of deck slab, longitudinal girders, Secondary beams- Reinforcement detailing- Basic concept of skew bridges.

Unit-III Outcome: Able to calculate the design of T-beam bridge.

Activity/event on unit-III: Make a visit to a T-beam bridge for better visualization.

UNIT – IV

Plate Girder Bridges: Elements of plate girder and their design-web- flange-intermediate stiffener- vertical stiffeners- bearing stiffener- Splices, Design problem with detailing.

Unit-IV Outcome: Students should be able to calculate the design of plate girder bridge.

Activity/event on unit-IV: Visit a nearby plate girder bridge to visualize the structure.

UNIT – V

Box Culverts and Sub structure: Different parts of box culverts- Analysis and Design of box culvert- Reinforcement detailing. Abutments- Stability analysis of abutments- Piers- Pier Shaft- Abutment Pile Cap- loads on piers- Analysis of piers- Wing walls- Design problems.

Unit-V Outcome: Able to calculate the design of box culvert and abutments.

Activity/event on unit-V: Visit a nearby box culvert to visualize the physical purpose.

TEXT BOOKS:

1. Essentials of Bridge Engineering, Jhonson Victor D. Oxford & IBH Pub. Co.
2. Design of Bridge Structures, T. R. Jagadeesh, M.A. Jayaram, PHI.
3. Design of Bridges, N. Krishna Raju, Tata McGraw Hill.
4. A Text Book of Bridge Engineering, K.S. Rakshit, Oxford & IBH Publishing Co

REFERENCES:

1. Design of Concrete Bridges, Aswini, Vazirani, Ratwani.
2. Design of Steel Structures, B. C. Punmai, Jain & Jain, Lakshmi Publications.
3. Design, Construction & Practice in Bridge Engineering, S. Ponnaswamy, Tata McGraw Hill Pub., New Delhi.

Course Code	ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT	L	T	P	Credits
1001174205	Elective - III	3	1	0	3

Course Overview:

This course introduces the methodology of environmental impact assessment (EIA) as a vital tool for sound environmental management and decision making. The course provides an overview of concepts, methods, issues and various forms and stages of EIA process. It examines the development of EIA, different levels and systems of EIA are examined to highlight the diversity of approach and impact of EIA process.

Course Objectives

Theobjectiveofthiscourseisto:

1. TostudyaboutthebasicsmethodsofassessmentandimportanceofEnvironmentalImpactAssessment.
2. ToknowabouttheEnvironmentalManagementandPredictionMethods
3. TostudyabouttheEnvironmentalManagementPlan
4. Thebroadeducation isnecessarytounderstandtheimpactofengineeringsolutionsin a globaleconomic,environmentalandsocialcontext.
5. To expose the students with the methods of qualitative and quantitative assessment of environmental impacts due to developmental activities.

Course Outcomes:

	Course outcome	Bloom's taxonomy	Bloom's Taxonomy Level	PO
CO 1	Understand evaluate and create the basic concept of environmental impact assessment, Flow of EIA, Types of environmental Impacts	Understanding	L2	PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-8, PO-11, PO-12
CO 2	ImplementdifferentmethodsinpreparinganEnvironmentalImpactStatement	Understanding Applying	L2 L3	PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-8, PO- 10, PO-11, PO-12
CO 3	IdentifyvariousmitigationmeasuresthatcanbeUsed.	Understanding Applying	L2 L3	PO-1, PO-3, PO-4, PO-5, PO-6, PO-7, PO- 10, PO-11 PO-12
CO 4	Select methodology for identification of environmental impacts, environmental indices and indicators	Applying	L3	PO-1, PO-3, PO-4, PO-5, PO-6, PO-7, PO- 10, PO-11, PO-12

Unit-I

Introduction: IntroductiontoEIA.DefinitionofEIAandEIS,preparationofEIS,ElementsofEIA,AgencyActivities,Environmentalsetting.

Outcome: To critically examine assumptions inherent in impact assessment

Activity: Study the evolution of EIA

UNIT II

Environmentalattributes: Environmentalattributes,air,water,soil,ecology,noiseSocio-Economicaspects,Cultureandhumanaspects(Humansettlements-Rehabilitations)

Outcome: To provide students with the knowledge to enable them to explore EIA

Activity: Uderstand the process of EIA

UNIT- III

Environmental impacts: Identification, measurement, Aggregation, Secondary and Cumulative Impacts.

Outcome: To examine the reange of Environmental Impact Assessment

Activity: Study the basic steps of EIA

Unit-IV

Impact Assessment Methodologies: Criteria for selection of methodology, impact assessment methodologies, procedure for reviewing environment impact statement.

Outcome: To enable students about the various methodology used in Impact Assesment

Activity: Study the forms of impact assessment

Unit-V

Casestudies: Economic impact analysis, energy production impact analysis, cost benefit analysis, Environment alimpact mitigation and control measures.

Outcome: To familiarise students with a variety of professionals tools used in predicting environmental impact

Activity: Comparative review of EIA procedures and practices

Text Books:

1. Ravi Jain, Urban, L.V Gary S.Stacey and Hard Balbach (2001),"EnvironmentalImpactAnalysis",McGrawHillProfessional,NewYork,2nd Edition.

2.Anjaneyulu, Y Valli Manickam, 2011"EnvironmentalImpactAssessmentMethodologies",B.S.Publication,NewDelhi,2nd Edition.

Reference Books:

1.LarryW.C.(1996),"EnvironmentalImpactAnalysis",Mc.GrawHillPublishers,NewYork,2nd Edition.

2.John Glasson, Riki Theriveland Andrew Chadwick.(2005), "Introduction to Environmental Impact Assessment" Routledge Publication, London, 3rd Edition.

3.RelevantNPTELCourses and www.cseidia.org

Course Code	Solid and Hazardous Waste Management	L	T	P	Credits
100117206	Elective - III	3	1	0	3

Course Overview:

This course covers the principles of integrated solid waste management. Provides an overview of municipal solid waste (MSW), industrial waste and hazardous waste management. Covers the planning and engineering principles needed to address the growing and increasingly intricate problem of controlling and processing the refuse (solid waste) created by urban societies. Discusses options such as land filling, composting and incineration from engineering, social, and regulatory perspectives. Reviews physical, chemical, and biological treatment of hazardous waste.

Course Objectives

From this course students will learn the following

1.To provide a knowledge about generation, characteristics and composition of urban solid waste, hazardous waste and biomedical waste

2. Develop insight into the collection, transfer, and transport of municipal solid waste.

3. Explain the design and operation of a municipal solid waste landfill and integrated waste management system

4. Examine the design and operation of a resource recovery facility.

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the implications of the production, resource management and environmental impact of solid waste management;	Understanding	2,6
CO2	Assimilate the significance of recycling, reuse and reclamation of solid wastes;	Understanding	1,2
CO3	Familiar with relationships between inappropriate waste management practices and impacts on water, soil and sediment quality	Understanding	1,2
CO4	To quantify and categorize solid wastes for any region and design the techniques for efficient solid waste disposal.	Applying	1,2

UNIT- I

Introduction: Definition of solid waste, garbage, rubbish-Sources and Types of solid wastes. Characteristics of Solid Wastes: Physical, chemical and biological characteristics- Problems due to improper disposal of solid waste.

Outcome: Understand the implications of the production, resource management and environmental impact of solid waste management.

Activity/Event: Prepare a note on how the resource management can be improvised

UNIT II:

Basic Principles: Definition of Solid Waste Management - Reduction, reuse, recycling and recovery principles of waste management - Waste generation and handling at source Functional elements of solid waste management.

Outcome: Assimilate the significance of recycling, reuse and reclamation of solid wastes.

Activity/Event: List out the matrial which can be reduce ,reuse,recyle

Unit-III

Collection, Transfer and Transport of Wastes: Collection of solid wastes- Collection methods and service. Transfer station-Processing and segregation of the solid waste- various methods of material segregation.

Outcome: Familiar with relationships between inappropriate waste management practices and impacts on water, soil and sediment quality.

Activity/Event: Illustratate how the segregaiont of waste place an important role..

Unit-IV

Processing and Transformation of Solid Wastes: Composting: definition-methods of composting-advantages of composting- Incineration: definition- methods of incineration advantages and disadvantages of incineration.

Outcome: To quantify and categorize solid wastes for any region

Activity/Event : Write a brief note on the materials to be incinerated and to be composting

Unit-V:

Disposal of Solid Waste: Volume reduction, Open dumping, land filling techniques. Landfills: classification-Design and Operation of landfills, Land Farming, Deep well injection.

Outcome: Design the techniques for efficient solid waste disposal.

Activity/Event: Detailing of the different layers of landfills

Reference Books:

1. Solid waste Engineering by William A. Worrel, and P. AarneVesilind Cengage Learning 2012.
2. Criteria for hazardous waste landfills – CPCB guidelines 2000.
3. Standard handbook of Hazardous waste treatment and disposal by Harry M. Freeman, McGraw Hill 1997.
4. Management of Solid waste in developing countries by Frank Flintoff, WHO regional publications 1976.

Course Code	WATER RESOURCESSYSTEM PLANNING ANDMANAGEMENT	L	T	P	Credits
1001174207	Elective - III	3	1	0	3

Course Overview:

This course embraces various optimization techniques for water resource structures. It also gives the students a knowledge about linear programming and dynamic programming techniques that are useful in solving various real-life problems in hydraulic structures.

Course Objectives:
The course is designed to

1. Introduce the concepts of system analysis in the planning, design, and operation of water resources.
2. Appreciate mathematical optimization methods and models.
3. Learn and apply basic economic analysis tools to water resources projects.
4. Understand linear, nonlinear and dynamic programming techniques and apply them to various water resources systems planning and design problems.
5. Appreciate simulation and management techniques in water resources systems.

Course Outcomes:

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

	Course Outcome	Bloom's Taxonomy	Bloom's Taxonomy level	PO
CO1	**Apply** optimization methods to solve problems related to water resource systems	Apply Analyze	L2, L3, L4	PO1, PO2, PO3, PO4, PO6, PO11,
CO2	**Perform** basic economic analysis to evaluate the economic feasibility of water resources projects	Apply Analyze	L2, L3, L4	PO1, PO2, PO3, PO4, PO6, PO11
CO3	**Formulate** optimization models for decision making in water resources systems.	Understanding Apply Analyze	L2, L3, L4	PO1, PO2, PO3, PO4, PO5, PO6, PO11
CO4	**Apply** simulation models for planning and design of Water Resources Systems	Understanding Apply Analyze	L2, L3, L4	PO1, PO2, PO3, PO4 ,PO5, PO6, PO11

UNIT-I:

INTRODUCTION:

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

Unit-I Outcome:
Students will be able to understand the need of planning water resources.

Activity/Event on Unit-1:
To give a seminar on optimization techniques in real life problems

UNIT-II:

LINEAR PROGRAMMING:

Formulation of linear programming models, methods for optimum design-graphical method, simplex method, application of linear programming in water resources, revised simplex method, sensitivity analysis, application of LPP models in design.

Unit-II Outcome:
Students will be able to understand and apply linear programming

Activity/Event on Unit-II:
To do a Linear programming using excel

UNIT-III:

DYNAMIC PROGRAMMING:

Principles of optimality, forward and backward recursive dynamic Programming, curse of dimensionality, application for resource allocation.

Unit-III Outcome:
Students will be able to understand the concept of resource allocation in optimization

Activity/Event on Unit-III:
To do a Recursive programming using R software

UNIT-IV:

NON-LINEAR OPTIMIZATION TECHNIQUES:

Classical optimization techniques, unconstrained optimization- elimination methods, steepest descent method, constrained optimization- Lagrange methods, Kuhn-Tucker conditions, optimality conditions, overview of Genetic Algorithm

Unit-IV Outcome:
Students will be able to explain optimization techniques

Activity/Event on Unit-IV:
To give a seminar on non-linear programming.

UNIT-V:

WATER RESOURCES ECONOMICS:
Basics of engineering economics, economic analysis, conditions of project optimality, benefit and cost analysis

Unit-V Outcome:
Students will be able to understand cost optimization in water resources engineering.

Activity/Event on Unit-V:
To carry out a Cost optimization of a hydraulic project using excel.

Text Books:

1. 'Water Resources System Analysis' by Vedula S and P P Mujumdar, McGraw Hill Company Ltd, 2005.
2. 'Water Resources Economics' by James D and R. Lee, Oxford Publishers, 2005.

Reference Books:

1. 'Water Resources Systems Planning and Management - An Introduction to Methods, Models and Applications'by Loucks D P and E V Bee,UNESCO Publications, 2005.
2. 'Optimal design of water distribution networks' by Bhave, P. R, Narosa Publishing house, 2003.

Course Code 1001174208

TRANSPORTATION PLANNING

Elective - III

L	T	P	Credits
3	1	0	3

Course Overview:

Transport Planning Engineering introduces you to the role of engineers in planning and managing the transport system and infrastructure. You will be exposed to various aspects of the transport system such as planning and four step transport model. These aspects represent integral components of civil and transport infrastructure. The importance of sustainability will be emphasized as you discover the impacts the transport task have on the environment and measures to ameliorate them. The course comprises both theoretical components and application of theoretical knowledge into four step planning practice.

Course Objectives:

The student will be taught

1. To learn mode of travel and route choice behaviour
2. Recall basic concepts and methods of urban transportation planning in the India.
3. Summarize methods of designing, conducting and administering surveys to provide the data required for transportation planning.
4. Examine and apply travel demand modelling, Mode Choice Modelling and Traffic Assignment Modelling.
5. Formulate the need of land use modelling and illustrate land use models for urban transportation planning.

Course Outcomes:

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

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand travel and route choice behaviour	Understanding	1
CO2	Recall basic concepts and methods of urban transportation planning in the India.	Understanding	1,2
CO3	Summarize methods of designing, conducting and administering surveys to provide the data required for transportation planning.	Understanding & Applying	1,2
CO4	Examine and apply travel demand modelling, Mode Choice Modelling and Traffic Assignment Modelling.	Understanding & Applying	2,3
CO5	Formulate the need of land use modelling and illustrate land use models for urban transportation planning.	Applying	2,3,5

COURSE CONTENT

Unit-I:

Introduction and Urban Transportation System Planning- Conceptual Aspects: Transport and Socioeconomic Activities, Historical Development of Transport, Transportation in the

Cities, Freight Transportation, and Future Developments. Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation.

Unit-I Outcome:

- Able to understand urban activity system and travel patterns
- Able to understand Freight Transportation and Future Developments

Unit-II:

Transportation Planning Process: Introduction-Definition-Factors to be considered; Land use transportation planning; systems approach-Stages-Inventory of Existing Conditions-Difficulties in implementation

Unit-II Outcome:

- Able to understand fundamentals of transportation planning
- Able to understand the classical methods of urban transportation planning

Unit-III:

Trip Generation and Distribution: Factors governing trip generation and attraction – Application of Regression Analysis- Methods of trip distribution; Growth and Synthetic Models, Calibration and Application of gravity model.-Category analysis. Problems

Unit-III Outcome:

- Able to understand zonal demand generation and attraction regression models.
- Able to understand demand distribution models (gravity models)

Unit-IV:

Modal Split and Assignment: Factors affecting modal split; Modal split in transport planning, Description of transport network, Route Choice Behavior, The, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity- Restrained Traffic Assignment.

Unit-IV Outcome:

- Able to understand Factors underlying traveler choices of mode of travel and route choice
- Able to understand four stage travel demand modelling
- Able to understand modal split models for mode choice analysis.

Unit-V:

Transportation Surveys: Definition of Study Area, Zoning, Types of Movements, Types of Surveys, Home-Interview Survey, Commercial Vehicle Survey, Intermediate Public Transport Survey, Public Transport Survey, Roadside-InterviewSurvey,Cordon-LineSurvey,Post-CardQuestionnaireSurvey, Registration-NumberSurvey,Tag-on-VehicleSurvey.

Unit-II Outcome:

- Able to understand Design and conduct surveys to provide the data required for transportation planning.
- Develop and calibrate trip generation rates for specific types of land use developments

Textbook (s)

1.Kadiyali, L. R., `Traffic Engineering and Transportation Planning' - Khanna Publication, New Delhi, 2009

2. JotinKhisty and B. Kent Lall“ Transportation Engineering –An Introduction- PHI, New Delhi, 3rd Indian Edition, 2006.

3. Hutchinson, B.G., `Principles of Urban Transport System Planning' - McGraw Hill Book Co.,London, UK, 1982.

Reference book (s)

1. AdibKanafani, TransportationDemandAnalysis,First edition, McGrawHill, 1983
2. JohnWDickey, MetropolitanTransportationPlanning,2nd edition, TataMc.GrawHill, 1986
3. JuanDeDiosDiosOrtuzar&LuisGWilumsen(1996),ModelingTransport,SecondEd.,John Wiley, 1996.

Reference (s)

1. NPTEL-VideolecturesfOr“UrbanTransportationPlanning”byDr.V.ThamizhArasan, 2012
2. NPTEL-MaterialfOr“TransportationEngineering”byDr.Tom.V.Mathew, 2010

Course Code	INTERNSHIP	L	T	P	Credits
1001174281		0	0	0	12

Internships help students to acquire in depth knowledge about a particular topic related to the program of study. Such extensive work is expected to create a platform for a job or further research in the chosen area. Interested students may opt for a full semester Internship during the fourth year second semester. Such students shall be exempted for equivalent theory course credits during that semester and the corresponding credits are awarded through the Internship. A self-study report, duly authorized by the industry supervisor / guide, shall be submitted at the end of the fourth year second semester. Internship report is evaluated for 400 marks in total. Internal assessment is done by the academic supervisor/guide for 100 marks based on the work and presentation of the internship report. The assessment for 300 marks is evaluated and awarded by a panel of members consisting of Head of the Department, Senior Faculty and Industry Expert.

Course Code	TECHNICAL SEMINAR	L	T	P	Credits
1001174251		0	3	0	2

For Technical seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his/her understanding over the topic, and submit to the department, which shall be evaluated by the Departmental Committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

Course Code	COMPREHENSIVE VIVA	L	T	P	Credits
1001174261		0	0	0	2

The Comprehensive Viva aims to assess the students' understanding in various subjects he / she studied during the B.Tech course of study. Comprehensive Viva is conducted for a total of 50 marks. It shall be conducted in IV Year II Semester. The Comprehensive Viva–Voce will be conducted by a Committee consisting of Head of the Department, & senior faculty members of the Department.

Course Code	MAIN PROJECT	L	T	P	Credits
1001174231		0	0	0	10

Out of total 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the external assessment. The Internal Evaluation shall be on the basis of two mid-term project reviews conducted during the progress of the project. The End Semester Examination (Viva-Voce) shall be conducted by the committee consists of an External Examiner, Head of the Department (internal examiner) and a senior faculty of the Department. The evaluation of project work shall be conducted at the end of the IV year.