DEPARTMENT OF CIVIL ENGINEERING

ACADEMIC REGULATIONS (R18)

FOR

B. Tech Four Year Degree Programme

(Applicable for the batches admitted from the A.Y. 2018-19)

PACE INSTITUTE OF TECHNOLOGY AND SCIENCES
(Autonomous)

Approved by AICTE and Govt. of Andhra Pradesh, Accredited by NAAC (A Grade)
Recognized under 2(f) & 12(B) of UGC, Permanently Affiliated to JNTUK, Kakinada
NH-16, Near Valluramma Temple, Ongole-523272
Andhra Pradesh, India.

PACE INSTITUTE OF TECHNOLOGY & SCIENCES: ONGOLE

ACADEMIC REGULATIONS R-18 FOR B.Tech (REGULAR)

(CHOICE BASED CREDIT SYSTEM)

Applicable for the students of B.Tech (Regular) from the Academic Year 2018-19
&
B.Tech Lateral Entry Scheme from the Academic Year 2019-20 onwards

1. ELIGIBILITY CRITERIA FOR ADMISSION

The eligibility criteria for admission into B.Tech programme shall be as per the guidelines issued by the Andhra Pradesh State Council of Higher Education (APSCHE) and/or by any other competent authority

2. PROGRAMMES OFFERED (UNDER GRADUATE)

A student shall be offered admission into any one AICTE-approved programme as given below:

S.No	PROGRAMME
01	Civil Engineering (CE)
02	Electrical and Electronics Engineering (EEE)
03	Mechanical Engineering (ME)
04	Electronics & Communication Engineering (ECE)
05	Computer Science and Engineering (CSE)
06	Information Technology (IT)
07	Automobile Engineering (AME)
08	*Computer Science and Information Technology (CSIT)
09	**Computer Science and Engineering (Internet of Things and Cyber Security Including Block Chain Technology) (CSE(IoTCSBT)
10	**Artificial Intelligence and Data Science (AIDS)
11	**Artificial Intelligence and Machine Learning (AIML)

* Notified in AY: 2019-2020

** Notified in AY: 2020-2021

3. AWARD OF DEGREE

A student will be declared eligible for the award of B. Tech. degree, if he/she fulfills the following academic requirements:

i. **4 Year B.Tech Programme:**

a. The Student shall study a course for not less than four academic years and not more than eight academic years.

		b.	The student shall register for 160 credits and secure all the 160 credits.
		c.	The students, who fail to fulfill all the academic requirements for the award of degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech Programme.
		d.	Students shall secure a satisfactory grade (SA) in all Mandatory Courses (Non Credit Courses/Activities).
		e.	No disciplinary action pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against any student, he/she should not be awarded with the degree.
	ii.	**3 Year B.Tech Programme under Lateral Entry Scheme (LES):**	
		a.	The Student shall study a course for not less than three academic years and not more than six academic years.
		b.	The student shall register for 120 credits and secure all the 120 credits.
		c.	The students, who fail to fulfill all the academic requirements for the award of degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.
		d.	Students shall secure a satisfactory grade (SA) in all non-credit courses/ activities. (Non Credit Courses/Activities).
		e.	No disciplinary action pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against the student, he/she should not be awarded with the degree.
4.	**MEDIUM OF INSTRUCTION**		
	The medium of instruction shall be English in all academic activities.		
5.	**MINIMUM INSTRUCTION DAYS**		
	The minimum instruction days for each Semester shall be 90.		
6.	**CATEGORIZATION OF COURSES**		
	1.	**Choice Based Credit System (CBCS)**	
		The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses). The CBCS provides a 'cafeteria' type approach in which students can take courses of their choice, learn at their own pace and adopt an interdisciplinary approach to learning.	
	2.	The curriculum of each programme shall contain various courses indicated in the following categories to train the students for employment, higher learning & research and entrepreneurship.	
		Humanities and Social Sciences (HS): These courses include Technical English, Environmental Science and Engineering, Industrial Management, Communication skills etc.	
		Basic Sciences (BS): These courses include Mathematics, Physics, Chemistry,	

		Biology etc.	
		Engineering Sciences (ES): These courses include Workshop, Drawing, and Basic Electrical/Mechanical/Computer etc.	
		Professional Core (PC): These courses are the core courses that provide the requisite foundation in the chosen Branch of Engineering.	
		Professional Elective (PE): These courses are the elective courses opted by the students relevant to the chosen branch of engineering that provides the requisite foundation in a specific area of specialization.	
		Open Elective (OE): These courses are inter-disciplinary in nature offered by other departments and/or any emerging subjects.The department offers an elective course (PE/OE), if the number of students registered in such a course is a minimum of 20.	
		Add-on Courses: Add-on courses are Skill enhancement courses for the students in the respective branch of engineering.	
		MOOCS/Self Study Courses: An opportunity is given to the students to choose one online course offered by SWAYAM-NPTEL / Foreign institutions/ reputed universities to enhance the learning skills or a self-study course under the guidance of the faculty advisor to enhance the self-learning capabilities which are having Global acceptance.	
		Personality Development (PD): These courses include Integrated Learning Practices (ILPs), Mandatory Courses (MCs) & Extra-curricular/Co-curricular activities and help the students into a well-trained professionals and good human beings with a high employability potential, good communication skills, soft skills, good engineering practices, personality transformation, professional presentation skills and networking skills	
		Mandatory Courses (MC): The Professional Ethics & Human Values, Employability Enhancement Skills. Environmental Sciences, Indian Constitution, Biology, Essence of Indian Traditional Knowledge, Problem-assisted learning and Problem-based learning are non-credit courses relevant to the value education and also for enhancing employability skills.	
			In addition to the above courses to enhance the overall personality & character of students and make them aware of social needs, the extra-curricular/co-curricular activities are included, which do not carry any credits. These activities include National Service Scheme (NSS), National Cadet Corps (NCC), Sports & Games and Professional Club Activities.
			The Students shall undergo Industrial /In-house training to expose them to the practical environment as **Community Service Project*****.

			***Notified in AY: 2020-2021
			A faculty advisor or counselor shall be assigned to a group of 20 students, and he/she will advise the students about the under graduate programme, its course structure and curriculum, choice/option for course based on their competence, progress, pre-requisites and interest.
		Mini-Project: A student is required to undergo a mini project of his/her choice by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis.	
		Summer School Practices: Industry Internship: Internship must involve practical work related to systems engineering, industry practices etc. The internship can be carried out at premier institutions/ research laboratories/industries.	
7.	**CREDIT ASSIGNMENT**		
	Each course is assigned a certain number of credits based on the following criteria.		

Contact hours per week			Credits
L	T	P	
1	0	0	1
0	1	0	1
0	0	2	1

8.	**REGISTRATION OF COURSES**
	The entire programme of study is for four academic years (three academic years in case of LES), all the years are on semester pattern. As per the curriculum the student shall register for 160 credits from all the courses as specified for the programme of study under regular four years. As per the curriculum the student shall register for 120 credits from all the courses as specified for the programme of study under regular four years
9.	**ASSESSMENT AND EVALUATION**
	The performance of a student in each course shall be evaluated based on Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) or only Continuous Internal Evaluation.

S.No	Category of Course	Marks	
		CIE	SEE
1	Theory Courses	40	60
2	Laboratory Courses	40	60
3	Mandatory Courses	100	-
4	Mini Project	100	-
5	Seminar	100	-
6	Internship	100	-
7	Project Work	80	120

9.1 **THEORY COURSE**

1 **Continuous Internal Evaluation (CIE):**

The CIE of a theory course consists of four components as indicated in the following table.

S.No	Component	Marks
1	Mid-Term- Descriptive Examinations	20
2	Online Quiz Examinations	10
3	Assignments with Viva Voce	05
4	Class Room Test	05
	Total	**40**

a. **Mid Term Descriptive Examinations (20 Marks):**

There shall be two mid-term descriptive examinations of 120 minutes each. The mid-term examinations shall be conducted with syllabi from units I,II & first half of III for the first mid and second half of III, IV & V units for the second mid. In each theory course, the question paper for the mid-term descriptive examination consists of four questions. A student is required to answer all four questions for maximum 20 marks

b. **Online Quiz Examinations (10 marks):**

Two online quiz examinations of 20 minutes each shall be conducted with syllabi from units I,II & first half of III for the first mid and second half of III, IV & V units for the second mid. The online quiz examination shall have 20 multiple choice questions for maximum 10 marks.

c. **Assignments with Viva Voce (5 Marks):**

A Student shall submit five Assignments with Viva Voce to the concerned faculty from all five units. The Assignment shall be evaluated by the concerned faculty. The average of best four assignment marks shall be considered for awarding 05 marks.

		d.	**Class Room Test (5 Marks):**
			There shall be conducted 5 Class Room Tests from 5 units. The tests shall be conducted and evaluated by the concerned faculty. The average of best four class room tests considered for awarding 05 marks. Assignment with Viva Voce and Class Room Tests marks will be evaluated at the end of the Semester.
		CIE is Computed as following: Finalized internal marks can be calculated with 80% weightage for the better of the two mid-term examinations and 20% for the other shall be considered for marks of 30 and is added to Assignment with Viva Voce 05 marks, Class Room Tests 05 marks for awarding total 40 marks. There shall be no Assignment with Viva Voce and Class Room Tests for Applied/Engineering Physics Course. Finalized internal marks for Applied/Engineering Physics Course can be calculated with 80% weightage for the better of the two mid-term examinations and 20% for the other shall be considered for marks of 30 and is added to Virtual Lab-Assignments 10 marks for awarding total 40 marks. For the courses like Engineering Graphics, Machine Drawing and Design courses the CIE shall be 40 marks (20 marks for day-to-day work, 20 marks for two mid-term examinations) and 60 marks for SEE. A student is required to answer all 4 questions for maximum 20 marks. The final assessment of mid-term examinations is based on 80% weightage for the better and 20% for the other.		
	1.2		**Semester End Examinations (SEE)**
			The semester end examinations for theory courses (including Engineering Graphics and Engineering Drawing) will be conducted covering all the units for 60 Marks. The question paper consists of two parts. In Part-A There shall be compulsory first question containing 5 two marks questions and these are to be set from the entire syllabus. In Part-B There shall be one question from each unit with internal choice. Each question carries 10 marks. Each theory course shall consist of five units of syllabus. Part-A and Part-B put together are given for 60 Marks. Special Subjects: The SEE question paper for Design courses like Building Planning & Drawing, Design & Drawing of Steel Structures, and Design & Drawing of Steel Structures Reinforced Concrete Structures consists of two parts. In Part-A there shall be one question out of 2 questions is to be answered for 24 marks and in Part-B 3 Questions out of 5 Questions are to be answered of which each carries 12 Marks in 3 hours' time. Part-A and Part-B put together

			are given for 60 Marks.
9.2			**LABORATORY COURSES**
		1.	**Continuous Internal Evaluation (CIE)**
			The continuous internal evaluation for laboratory courses is based on the following parameters:

Day-to-day work	20
Internal test	10
Record	05
Viva voce	05
Total	40

9.2.2			**Semester End Examinations (SEE)**
			The performance of the student in laboratory courses shall be evaluated jointly by internal and external examiners for 3 hours duration as per the parameters indicated below:

Procedure/Algorithm	10
Experimentation/Program Execution	15
Observations/Calculations/Testing	15
Result/Inference	10
Viva Voce	10
Total	**60**

9.3	**MANDATORY COURSES (NON CREDIT COURSES)**	
		Mandatory courses are evaluated by the mode of a Presentation/ Comprehensive-Viva Voce/ Evaluation of Assignments. A student shall secure a minimum 40% of marks to get a satisfactory grade (SA). Otherwise unsatisfactory grade (US) will be indicated. However, a student who secures "US" grade /abstains shall reappear in the subsequent semester(s).
9.4	**MINI-PROJECT**	
		A student is required to undergo a mini project of his/her choice by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis. The performance of a student in the mini project shall be evaluated by a three-member committee constituted by the HoD as per the following parameters:

Mini project Report	30
Innovation	25
Presentation	25
Viva Voce	20
Total	**100**

The performance of a student in mini project shall be evaluated based on two reviews, each carries 100 marks. The average marks of these two reviews will be awarded. However, a student who fails to secure minimum 40% marks or abstains will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

9.5 **SEMINAR**

A student shall deliver a seminar on any emerging topic of his/her choice from the core technical domain. The student shall submit a duly-certified seminar report. A three-member committee constituted by the HoD will finalize the CIE marks based on the following parameters:

Seminar report	30
Innovation	20
Presentation	30
Viva Voce	20
Total	**100**

A student who fails to secure minimum 40% marks or abstains will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

9.6 **INTERNSHIP**

Internship must involve practical work related to industry practices. The students shall undergo internship for a period of minimum 4 weeks continuously after IV semester (Semester Break) and shall be evaluated in V semester. The internship can be carried out at premier institutions/ research laboratories/industries.

A student shall submit a report on the training undergone, along with a certificate from the organization. A three-member committee constituted by the HoD shall finalize the CIE marks based on the following parameters:

Internship Report	50
Presentation	30
Viva Voce	20
Total	**100**

The Internal guide shall monitor the work progress and regularity of the students in periodic intervals. No financial support shall be provided by the Institute for Internship.

A student, who fails to secure minimum 40% marks or abstains, will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

9.7 **Project Work**

A student is required to undertake a project work by using the knowledge acquired by him/her during the course of study. The student is expected to design and build a complete system or subsystem on an area of interest. The project work consists of two parts namely, project literature review and project implementation. A project work shall be carried out by a batch minimum of 4 Student members under a faculty supervisor.

i. Continuous Internal Evaluation:

The CIE for project work shall be based on project survey and project implementation and is evaluated by a three-member committee consisting of two senior faculties and a project supervisor constituted by the HoD.

Project Literature Review:

The performance of a student in project survey shall be evaluated based on the following parameters:

Literature Review	15
Presentation	15
Viva Voce	10
Total	40

Project Implementation:

The performance of a student in project implementation shall be evaluated based on two reviews, each carries 40 marks. The average marks of these two reviews will be considered. The evaluation criterion of each review is based on the following parameters:

Parameter	Marks
Contribution	10
Innovation	10
Presentation	10
Viva Voce	10
Total	**40**

The marks secured by a student in project literature review and project implementation shall be awarded cumulatively as CIE of the project work in VIII semester

ii. **Semester End Examination:**

A batch of students shall submit a duly-certified project report to the department in a specified time. They shall make a presentation on the project work before a three-member committee consisting of external examiner, internal examiner (HoD) and a project supervisor. The performance of each student is evaluated as per the following parameters.

Project report	40
Innovation	30
Presentation	20
Viva Voce	20
Scope of Implementation	10
Total	**120**

A student who fails to secure minimum 40% marks or abstains is permitted to re-appear in the advanced supplementary examinations or when offered next.

9.8 **OTHER COURSES**

Online (MOOCS) / Self Study Course:

Institute encourages the students to register and satisfy for MOOCs Certificate. A student is awarded certificates for 4 weeks programme – 1 credit, 8 weeks programme – 2 credits and 12 weeks programme – 3 credits.

Add-On Courses:

ADD-ON Courses are provided by the Institution with Industry Interaction to enhance skills in the domain of the study.

Extra-Curricular / Co-Curricular Activities:

The participation of a student is compulsory in any one of the extra-curricular/co-curricular activities (non-credit) such as NSS, NCC, Sports & Games, Professional club activities during the semesters I to VII for award a Satisfactory grade (SA). The performance of a student in the extra-

			curricular/co-curricular activities is evaluated during VII semester by a three member committee constituted by HoD. For physically disabled students, the satisfactory grade (SA) will be awarded, if he/she obtains certificate in co-curricular activities such as essay writing, debate competitions, technical & general quizzes, symposium etc. However, a student who secures unsatisfactory grade (US) shall reappear in the subsequent semester(s).
10.			**ATTENDANCE REQUIREMENTS**
	a.	A student is eligible to write the Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.	
	b.	Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in two times upto III Year II Semester and once in IV Year may be granted by the College Academic Committee on medical grounds.	
	c.	A stipulated fee shall be payable towards condonation of shortage of attendance.	
	d.	If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.	
	e.	Shortage of Attendance below 65% in aggregate shall not be condoned.	
	f.	A student who is shortage of attendance in semester may seek re-admission into that semester when offered within one week from the date of the commencement of class work.	
	g.	Students whose shortage of attendance is not condoned in any semester are not eligible to write their Semester End Examination of that class.	
11.	**MINIMUM ACADEMIC REQUIREMENTS**		
	The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.10.		
	a.	A student shall be deemed to have satisfied the minimum academic requirements, if he/she gains the credits allotted to each course and secures not less than a minimum 35% of marks exclusively at the Semester End Examination. However, the student should secure minimum 40% of marks in both CIE and SEE put together to be eligible for passing the course.	
	b.	A student shall be promoted from II Semester to III Semester if he/she fulfills the minimum attendance requirement.	
	c.	A student will be promoted from IV Semester to V Semester if he/she fulfills the academic requirement of 40% of the credits up to either III Semester or IV Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in IV Semester.	

		The students admitted under Lateral Entry Scheme shall be promoted to the V semester, if he/she fulfills the minimum attendance requirement in IV Semester.	
	d.	A student will be promoted from VI Semester to VII Semester if he/she fulfills the academic requirement of 40% of the credits up to either V Semester or VI Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in VI Semester. The students admitted under Lateral Entry Scheme shall be promoted to the VII semester, if he/she fulfills the academic requirement of 40% of the credits up to either V Semester or VI Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in VI Semester.	
	e.	The Students who fail to earn 160 credits as indicated in the course structure within 8 academic years from the year of admission shall forfeit their seat in B.Tech programme and admission stands cancelled.	
	f.	The students admitted under Lateral Entry Scheme, who fail to earn 120 credits as indicated in the course structure within 6 academic years from the year of admission, shall forfeit their seat in B.Tech programme and admission stands cancelled.	
12.	**PROCEDURES FOR SEMESTER END EXAMINATIONS**		
	i.	**Supplementary examinations:** There shall be supplementary examinations along with regular semester end examinations for a student to reappear in the course(s) he/she failed or not attempted.	
	ii.	**Advanced supplementary examinations:** Students who fail in the courses in VIII semester (theory/project work) can reappear for advanced supplementary examinations within one month after the declaration of the revaluation results. However, the students who fail in advanced supplementary examinations shall reappear when offered next along with regular students.	
	iii.	**Recounting:** A student, who wishes to verify the total marks obtained by him/her in any theory course in SEE can apply for recounting in response to the notification along with the prescribed fee. The outcome of the recounting gets reflected in the results sheet and grade card.	
	iv.	**Revaluation:** A student who wishes to apply for revaluation of a theory course in SEE can submit an application along with the prescribed fee as per the notification issued.	
		a.	If the variation in marks of the first valuation and revaluation is ≤ 15% of the total marks, then the better of the two evaluations shall be considered as final marks.

		b.	If the variation of marks between the first valuation and revaluation is >15% of the total marks, there shall be a third evaluation by another examiner. The average marks of two nearer evaluations shall be taken into consideration. In case of any fractional value of marks, it can be rounded off to the next integer value.
		c.	If a student secures a higher grade in the revaluation, that grade will be declared as the final grade. Otherwise, the original grade will remain valid.
13.	**AWARD OF LETTER GRADES**		
	A letter grade and grade points shall be awarded to a student in each course based on his/her performance as per the 10-point grading system given below.		

≥ 90	O	10	Outstanding
80 to <90	S	9	Excellent
70 to <80	A	8	Very Good
60 to <70	B	7	Good
50 to <60	C	6	Fair
40 to <50	P	5	Pass
<40	F	0	Fail
--	AB	0	Absent

	a.	A student who secures from 'O' to 'P' grades in a course is declared to have successfully completed the course, and is deemed to have secured the credits assigned to that course.
	b.	A student who secures "F" grade in any course shall be considered "Failed" and is required to reappear as "Supplementary student" in SEE, as and when offered. In such cases, his/her CIE marks in those courses will remain same as obtained earlier.
	c.	A student, who is absent from any examination shall be treated as "Failed".
	d.	In general, a student shall not be permitted to repeat any course (s) for the sake of "Grade improvement" or "SGPA/CGPA improvement".
	e.	As per AICTE guide lines, If a student acquires additional 20 credits through online Certification (approved MOOCs), he/she will be awarded Graduate degree with Honours with subjected to JNTUK instructions. If a Student from CE,EEE,ME,ECE & AME secures 20 credits from MOOCs courses (apart from Courses mentioned in Course Structure) in Computer Science & Engineering related courses is he/she will be awarded with additional Minor Engineering with Computer Science & Engineering with subjected to JNTUK instructions.
14.	**COMPUTATION OF SGPA & CGPA**		

	a.	**Semester Grade Point Average (SGPA)**
		The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is the ratio of sum of the product of the number of credits and the grade points scored by a student in all the courses to the sum of the number of credits of all the courses. **SGPA (S_i) = Σ (C_i x G_i) / ΣC_i** Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.
	b.	**Cumulative Grade Point Average (CGPA)**
		The CGPA is a measure of the overall cumulative performance of a student. The CGPA is calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme. **CGPA = Σ (C_i x S_i) / ΣC_i** Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.
	c.	The SGPA and CGPA are rounded off to 2 decimal points and reported in grade cards.
15.	**AWARD OF CLASS**	
		A student, who satisfies the minimum requirements prescribed for the completion of a programme, is eligible for the award of B.Tech degree and he/she shall be placed in one of the following four classes on a 10 point scale.
		Class Awarded / **CGPA to be secured** / From the CGPA secured from 160 Credits First Class with Distinction / ≥ 7.75 with no subject failures First Class / ≥ 6.75 with subject failures Second Class / ≥ 5.75 to < 6.75 Pass Class / ≥ 5.00 to < 5.75
		Equivalent percentage = (CGPA – 0.75) x 10
16.	**GAP YEAR**	
	a.	A student is permitted to make use of the gap year facility at the beginning of V / VII semester of the programme and undergo training programs at premier institutions / research laboratories/ industries for a maximum period of one year (two consecutive semesters of academic year), if he/she secures a CGPA of 7.75 and above with no backlog of courses.
	b.	A student is permitted to avail the gap year facility only once during the entire course of study.
	c.	The students are permitted to re-join the programme after availing gap year facility. However, their re-joining is subject to the regulations prevailing at that time

	d.	The total period for completion of the programme reckoned from, the commencement of the first semester to which the student is admitted shall not exceed the maximum period in order that the student is eligible for the award of the degree
	e.	If a student fails to report to the department after the expiry of 2 semesters, his/her readmission will be subject to the decision of competent authority.
	f.	A student seeking a gap year needs to apply in the prescribed format before the last working day of the running semester. The application submitted by the student shall be evaluated by Department Academic Committee and forwarded to the head of the institution for approval.
	g.	The duration of the gap year shall be reflected in the consolidated grade card.
17.	**DISCIPLINE**	
	a.	A student is required to observe discipline and decorum both inside and outside the college and not to indulge in any activity that may tarnish the prestige of the college. The head of the institution shall constitute a disciplinary committee to enquire into acts of indiscipline and notify the college about the disciplinary action taken. In case of any serious disciplinary action, which leads to suspension or dismissal, a committee shall be constituted by head of the institution for taking final decision.
	b.	Those students who indulge in examination related malpractices shall be punished as per the scale of punishment notified in Annexure-I.
	c.	Those students involved in the illegal acts of ragging shall be punished as per the provisions of Act 26, 1997 of Govt. of Andhra Pradesh (Annexure-II).
18.	**REVISION OF REGULATIONS, CURRICULUM AND SYLLABI**	
	The college may revise, amend or change the regulations, curriculum, syllabus and scheme of examinations from time to time subject to decisions/recommendations of Board of Studies and the College Academic Council.	
19.	**WITHHOLDING OF RESULTS**	
	If a student fails to clear dues, if any, payable to the institution or any case of indiscipline is pending against him, the result of the student will be withheld, and also the award of his/her degree shall be withheld in such cases.	
20.	**TRANSITORY REGULATIONS**	
	a.	A student, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those students who have already passed the courses in the earlier semester(s) he/she is originally admitted into and substitute courses/additional

		courses are offered in place of them as approved by the Board of Studies.
	b.	In general, after transition, there will be a fitment formula approved by the competent authority in order to balance course composition and the number of credits.
	c.	Students admitted by transfer from other institutions shall follow transitory regulations with suitable fitment formulae approved by the competent authority.
	d.	A student who is seeking readmission shall apply in the prescribed format within one week after the commencement of the class work. However, the readmission of a student shall be approved by the competent authority.
21.	**COURSE CODE**	
	The Course Codes will be given by the departments concerned to the course. Each course code contains 8 characters. The 8 characters for each subject will be filled as per the following description.	
		<table><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr></table>
		1 Character : Institute Name as '**P**' 2,3 Characters: Year of Commencement of Regulations as '**18**' 4,5 Characters: Subject/Branch Category such as **HS** for Humanities and Social Science Courses **BS** for Basic Science Courses **ES** for Engineering Science Courses **CE** for Civil Engineering Courses **EE** for Electrical & Electronics Engineering Courses **ME** for Mechanical Engineering Courses **EC** for Electronics & Communication Engineering Courses **CS** for Computer Science & Engineering Courses **IT** for Information Technology Courses **AE** for Automobile Engineering Courses **MC** for Mandatory Courses **PD** for Personality Development 6 Character: Mode of Subject Learning and Evaluation such as **T** for Theory Courses **L** for Laboratory Courses **S** for Seminar **P** for Project **M** for Mini Project **V** for Viva Voce **E** for Professional Elective Courses **O** for Open Elective Courses **I** for Internship 7,8 Characters: Serial number of the course taught by the department in that Semester such 01, 02, 03, ...etc
21.	**GENERAL**	
	i.	Wherever the words "he", "him", "his", occur in the regulations, they include "she",

		"her", "hers".
	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, decision of the competent authority is final and binding.
	iv.	The college may change or amend academic regulations or syllabi at any time subject to approval of the competent authority and the changes or may be apply the amendments made to all students with effect from the dates notified.
23.	**STATUTORY DECLARATION**	
	In case the regulations do not specify application of an appropriate rule in a unique case, the decision of the competent authority of the college shall be final.	
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ANNEXURE-I

MALPRACTICE RULES

DISCIPLINARY ACTION FOR MALPRACTICE/IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper Conduct	Punishment
1 (a)	If a student possesses or tries to access any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If a student 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 subject 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 a student is found to have copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work, and shall not be permitted to appear for the remaining examinations of the subjects of that Semester. The Hall Ticket of the candidate is to be cancelled.
3.	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 subjects of the Examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester End 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 to be registered against him.

4.	If a student smuggles inside the exam hall an Answer book or additional sheet or takes out or Arranges to send out the question paper or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	If a student 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 the subject.
6.	If a student refuses to obey the orders of the Chief Superintendent/Controller of Examinations / any officer on duty or misbehaves or creates disturbance of 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.	Such a student(s) shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are to be debarred and forfeited their seats. In case of outsiders, they will be handed over to the police and a police case is to be registered against them.
7.	If a student leaves the exam hall taking away answer script or intentionally tears the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and Semester End Examinations. The continuation of the course by the candidate is subjected to the academic

		regulations in connection with forfeiture of the seat .
8.	If a student possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also to be debarred and forfeited the seat.
9.	If a 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 shall be expelled from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also to be debarred and forfeited the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
10.	If a student comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
11.	If copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester examinations.

ANNEXURE-II

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

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B.TECH COURSE STRUCTURE

R-18 REGULATIONS

I YEAR I SEMESTER								
S.No.	Course Code	Course	L	T	P	Credits	Internal	External
1	P18MCT01	Induction Program	3 Weeks			0	-	-
2	P18HST01	English-I	3	0	0	3	40	60
3	P18BST01	Mathematics-I	3	0	0	3	40	60
4	P18BST06	Engineering Chemistry	3	0	0	3	40	60
5	P18EST01	Basic Electrical & Electronics Engineering	3	0	0	3	40	60
6	P18EST03	C-Programming for Problem Solving	3	0	0	3	40	60
7	P18BSL04	Engineering Chemistry Lab	0	0	3	1.5	40	60
8	P18ESL01	Basic Electrical & Electronics Engineering Lab	0	0	3	1.5	40	60
9	P18ESL03	C-Programming for Problem Solving Lab	0	0	3	1.5	40	60
Total			15	0	09	19.5	320	480

I YEAR II SEMESTER								
S.No.	Course Code	Course	L	T	P	Credits	Internal	External
1	P18HST02	English-II	3	0	0	3	40	60
2	P18BST02	Mathematics-II	3	0	0	3	40	60
3	P18BST04	Engineering Physics	3	0	0	3	40	60
4	P18EST04	Engineering Mechanics	3	1	0	4	40	60
5	P18EST02	Engineering Graphics	1	0	3	2.5	40	60
6	P18BSL02	Engineering Physics Lab	0	0	3	1.5	40	60
7	P18HSL01	English communication skills Lab	0	0	4	2	40	60
8	P18ESL02	Engineering Workshop	0	0	3	1.5	40	60
9	P18MCT02	Environmental Science	3	0	0	0	-	-
Total			16	1	13	20.5	320	480

II YEAR I SEMESTER								
S.No.	Course Code	Course	L	T	P	Credits	Internal	External
1	P18BST07	Mathematics-III	3	0	0	3	40	60
2	P18CET01	Strength of Materials-I	3	1	0	4	40	60
3	P18CET02	Building Materials and Constructions	3	0	0	3	40	60
4	P18CET03	Surveying	3	0	0	3	40	60
5	P18CET04	Fluid Mechanics	3	1	0	4	40	60
6	P18CEL01	Surveying Field Work Lab-I	0	0	3	1.5	40	60
7	P18CEL02	Strength of Materials Lab	0	0	3	1.5	40	60
8	P18CEL03	Engineering Geology Lab	1	0	2	2	40	60
9	P18MCT03	Professional Practice, law & Ethics	2	0	0	0	-	-
Total			18	2	8	22	320	480

II YEAR II SEMESTER								
S.No.	Course Code	Course	L	T	P	Credits	Internal	External
1	P18CET05	Structural Analysis-I	3	0	0	3	40	60
2	P18CET06	Concrete Technology	3	0	0	3	40	60
3	P18CET07	Water Resources Engineering-I	3	0	0	3	40	60
4	P18CET08	Hydraulics & Hydraulic Machinery	3	1	0	4	40	60
5	P18CET09	Strength of Materials-II	3	1	0	4	40	60
6	P18CEL04	Surveying Field Work Lab-II	0	0	2	1	40	60
7	P18CEL05	Fluid Mechanics & Hydraulic Machinery Lab	0	0	3	1.5	40	60
8	P18CEL06	Concrete Technology Lab	0	0	3	1.5	40	60
9	P18MCT05	Indian Constitution	2	0	0	0	-	-
Total			17	2	8	21	320	480

III YEAR I SEMESTER								
S.No.	Course Code	Course	L	T	P	Credits	Internal	External
1	P18CET10	Building Planning & Drawing	2	0	2	3	40	60
2	P18CET11	Design & Drawing of Reinforced Concrete Structures	3	1	0	4	40	60
3	P18CET12	Transportation Engineering-I	3	0	0	3	40	60
4	P18CET13	Structural Analysis-II	3	0	0	3	40	60
5	P18CET14	Water Resources Engineering-II	3	0	0	3	40	60
6		**Open Elective-I**	2	0	0	2	40	60
7	P18MCT08	Design Thinking for Innovation	0	0	4	2	100	-
8	P18CEL07	Computer Aided Civil Engineering Drawing Lab	0	0	2	1	40	60
9	P18MCT09	Biology	2	0	0	0	-	-
Total			18	1	8	21	320	480

S.No	Course Code	Open Elective-I
1	P18CEO01	Land surveying
2	P18CEO02	Basics of Environmental Engineering
3	P18CEO03	Introduction of building materials

III YEAR II SEMESTER								
S.No.	Course Code	Course	L	T	P	Credits	Internal	External
1	P18CET15	Design & Drawing of Steel Structures	3	1	0	4	40	60
2	P18CET16	Geotechnical Engineering-I	3	0	0	3	40	60
3	P18CET17	Transportation Engineering-II	3	0	0	3	40	60
4		**Professional Elective-I**	3	0	0	3	40	60
5		**Open Elective-II**	2	0	0	2	40	60
6	P18CEL08	Geotechnical Engineering Lab	0	0	3	1.5	40	60
7	P18CEL09	Transportation Engineering Lab	0	0	3	1.5	40	60
8	P18CEM01	Mini Project	0	0	4	2	100	0
Total			17	1	10	21	420	480

S.No	Course Code	Professional Elective-I
1	P18CEE01	Repair and Rehabilitation of Structures
2	P18CEE02	Advanced Structural Engineering
3	P18CEE03	Advanced Surveying
4	P18CEE04	Urban Transportation Planning
5	P18CEE05	Ground Water Engineering

S.No	Course Code	Open Elective-II
1	P18CEO04	Introduction of irrigation engineering
2	P18CEO05	Hydrology
3	P18CEO06	Natural disaster management

IV YEAR I SEMESTER								
S.No.	Course Code	Course	L	T	P	Credits	Internal	External
1	P18CET18	Geotechnical Engineering-II	3	1	0	4	40	60
2	P18CET19	Environmental Engineering	3	0	0	3	40	60
3	P18CET20	Estimating, Specifications & Contracts	3	1	0	4	40	60
4	P18CET21	Remote Sensing And GIS	3	0	0	3	40	60
5		**Professional Elective-II**	3	0	0	3	40	60
6		**Open Elective-III**	2	0	0	2	40	60
7	P18CEL10	Environmental Engineering lab	0	0	3	1.5	40	60
8	P18CEL11	Structural Analysis & Design Programming Lab	0	0	3	1.5	40	60
9	P18MCT14	Employability Skills	2	0	0	0	0	0
Total			17	2	6	22	320	480

S.No	Course Code	**Professional Elective-II**
1	P18CEE06	Pre- Stressed Concrete
2	P18CEE07	Air Pollution Control
3	P18CEE08	Construction Technology & Management
4	P18CEE09	Physico-Chemical Processes for Water Waste Treatment
5	P18CEE10	Irrigation Design and Drawing

S.No	Course Code	**Open Elective-III**
1	P18CEO07	Introduction to Buildings Drawing
2	P18CEO08	Green Buildings
3	P18CEO09	Basics of Structural Design

IV YEAR II SEMESTER								
S.No.	**Course Code**	**Course**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1		Professional Elective-III	3	0	0	3	40	60
2		Open Elective-IV	2	0	0	2	40	60
3	P18CEP02	Project	0	0	12	6	80	120
Total			5	0	12	11	160	240

S.No	Course Code	Professional Elective-III
1	P18CEE11	Conservation Building Technology
2	P18CEE12	Advanced Environmental Engineering
3	P18CEE13	Pavement Analysis and Design
4	P18CEE14	Solid Hazardous Waste Management
5	P18CEE15	Environmental Geo-Technology

S.No	Course Code	Open Elective-IV
1	P18CEO10	Basics of Structural Health Monitoring
2	P18CEO11	Principles of Soil Mechanics
3	P18CEO12	Basics of Town Planning Design

B.Tech. I Year I Semester

Course Structure

L	T	P	C
3	0	0	3

English-I

(Common to all Branches)

Internal Marks: 40

Course Code: P18HST01 **External Marks: 60**

Course Prerequisite: The students should have basic knowledge of English grammar and LSRW skills.

Course Objectives:

1. To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To inculcate the skills of listening, reading and critical thinking.
4. To integrate English Language learning with employability skills and training.
5. To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

Course Outcomes:

On completion of this course, the student is able to:

1. Use English Language effectively in spoken and written forms
2. Interpret the contextual meaning of words
3. Comprehend the given texts and respond appropriately
4. Recall and reproduce the theme in a given context
5. Communicate confidently in formal and informal contexts

UNIT – I (9 Lectures)

The Happy Prince – Oscar Wilde

a. Vocabulary: Synonyms and Antonyms (http://www.magickeys.com/books/riddles/words.html)

b. Grammar: Prepositions, Sentence structure & Types of sentences

c. Writing: Note Making and Note Taking

UNIT – II (8 Lectures)

Technology With a Human Face – E.F.Schumacher

a. Vocabulary: One word substitutes & Idioms

b. Grammar: Subject–verb Agreement (Concord), Question tags and Modal Auxiliaries

c. Writing: Information Transfer

UNIT –III (9 Lectures)

Presidential Address – APJ Abdul Kalam

a. Vocabulary: Word formation, Root Words
(www.englishhints.com,www.enchantedlearning.com,
www.learnenglish.de/grammar/prefixtext.html)

b. Grammar: Parts of Speech, Punctuation

c. Writing: Paragraph Writing

UNIT- IV (9 Lectures)

The Road Not Taken – Robert Frost

a. Vocabulary: Prefixes, Suffixes and Affixes

(http://www.magickeys.com/books/riddles/words.html)

b. Grammar: Articles

c. Writing: Letter Writing

UNIT – V (10 Lectures)

Good Manners – J.C Hill

a. Vocabulary: Homonyms, Homophones and Homographs
(http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)

b. Grammar: Tenses

c. Writing: E- mail Writing

Text books:

1. New Horizons – Pearson Publishers
2. Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
3. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.

References Books:

1. Meenakshi raman, Sangeetha, Sharma Fundamentals of technical communication, Pg:19-153 Oxford University press, 2015
2. Rutherford, Andhrea. J, Communication skills for technology. Pearson, New Delhi.2001
3. Raymond Murphy, Murphy's English Grammar, Cambridge University Press 2004
4. Meenakshi raman, Sangeetha, Sharma,Technical communication: English Skills for Engineers, Oxford University press, 2009
5. Michael Swan, Practical English Usage, Oxford University press, 1996

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Web References:

1. www.englishhints.com
2. www.enchantedlearning.com
3. www.learnenglish.de/grammar/prefixtext.html
4. http://www.magickeys.com/books/riddles/words.html
5. http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf
6. http://www.yourdictionary.com
7. http://www.learnenglish.com
8. http://www.cambridge.org
9. http://www.eslcafe.com
10. http://www.eslgames.com
11. http://www.penguin.co.uk
12. http://www.edufind.com/english/practice

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B. Tech- I Year I Semester

Course structure

L	T	P	C
3	0	0	3

MATHEMATICS-I
(Differential equations and Laplace Transforms)

(Common to All Branches)

Internal Marks: 40

Course code: P18BST01 **External marks: 60**

Course Prerequisite: The basic knowledge of Matrices, Trigonometry, Differentiation and Integration.

Course Objectives:

Course Objectives:

1. To learn the solving methods of the differential equations of first order with their applications.
2. To learn the solving methods of differential equations of second and higher order with their applications.
3. To learn to find the Laplace transform of different functions and obtained the solution of Design.
4. To understand the concepts Partial Differential.

Course Outcomes:

After learning the contents of this paper the student must be able to

1. Solve first order differential equations and their applications.
2. Usage of higher order differential equations that are applied to real world problems.
3. Find the Laplace transform of derivatives, integrals and periodic functions.
4. Use the method of Laplace transforms to solve systems of linear first-order differential equations.
5. Calculate total derivative, Jacobian, Maxima and minima of functions oftwo variables.

UNIT-I: (11 Lectures)

Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories.

UNIT-II: (9 Lectures)

Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax},sin ax, cos ax, polynomials in x, e^{ax}V(x), xV(x)- Method of Variation of parameters.

Applications: LCR circuit.

UNIT-III: (10 Lectures)

Laplace Transforms:

Laplace transforms of standard functions– First shifting Theorem, Change of scale property, Multiplication by t^n, division by t, Transforms of derivatives and integrals – Second shifting theorem– Laplace transform of Periodic functions.

UNIT IV: (8 Lectures)

Inverse Laplace Transforms:

Inverse Laplace transforms – Convolution theorem.

Application of Laplace transforms to ordinary differential equations of first and second order.

UNIT V: (10 Lectures)

Partial Differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence-Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
4. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

Web References:

1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. http://mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

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B.Tech I Year - I Semester

Course structure

L	T	P	C
3	0	0	3

C - Programming for Problem Solving

(Common to all Branches)

Course Code: P18EST03 **Internal Marks: 40**

External Marks: 60

Course Prerequisite: NIL

Course Objectives:

1. To impart adequate knowledge on the need of programming languages and problem solving techniques.
2. To impart problem solving skills.
3. To enable student to write programs in C and to solve the problems.

Course Outcomes:

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

1. Design algorithms and flowchart / Pseudo code for a given problem.
2. Design programs involving decision structures and loops.
3. Implement different operations on arrays and solve problems using functions.
4. Understand pointers and strings.
5. Implement structures, unions and file operations in C programming for a given application problem.

Unit-I: (8 Lectures)

Introduction to Programming: Computer hardware, Bits and Bytes, programming languages, application and system software, the software development process.

Idea of algorithm: steps to solve logical and numerical problems. Representation of algorithm: flowchart/pseudo code with examples, from algorithms to programs.

Unit-II: (9 Lectures)

Introduction to C: Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing Input and Output. Decision Making - Branching and Looping. Enumerated Data type, Renaming Data type with typedef, Type Casting.

UNIT-III (12 Lectures)

Arrays: Definition, Declaration, Initialization, Assignment, Processing array, Passing array to a function, Two and multi dimensional array.

Functions: Defining a function, Accessing a function, Passing argument to functions, Function prototypes, Nested function call, Storage classes.

UNIT-IV (10 Lectures)

Pointers: Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memoryallocation.

Strings: C Strings, String Input / Output functions, arrays of strings, string manipulation functions.

UNIT-V (9 Lectures)

Structures: Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions.

File Handling: Types, operations on files, modes, file I/O functions, Random Access Functions.

Text Books:

1. Byron S Gottfried, —Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.
3. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. Yashavant P. Kanetkar. —Let Us C, BPB Publications, 2011.

Web References:

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

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B.Tech I Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

ENGINEERING CHEMISTRY
(Common to CE, ME, AME)

Internal Marks: 40

Course Code: P18BST06 **External Marks: 60**

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.

Course Objectives:

1. Atomic and molecular structure is the basic concept to understand the structure of different complex molecules.
2. 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.
3. The basics for the construction of galvanic cells are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
4. 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.
5. Spectroscopic techniques are a basic need of any analytical industry to analyze chemical compound.

Course Outcomes:

After completion of course student will be able to

1. To understand the color and magnetic properties of the metal complexes.
2. Fuels which are used commonly and their economics, advantages and limitations
3. Analyze the different types of electrodes and batteries for technological applications.
4. Identify the troubles due to hardness of water and its maintenance in industrial applications
5. Analyze the structure of the chemical compounds.

UNIT-I: (10 Lectures)

Atomic And Molecular Structure: Atomic and Molecular orbitals**.** Linear Combination of Atomic Orbital (LCAO), molecular orbitals of diatomic molecules, molecular orbital energy level diagrams of N2, O2 and F2 molecules. Π molecular orbitals of butadiene and benzene.

Crystal Field Theory (CFT)**,** salient features of CFT-Crystal Field Splitting of transition metal ion d-orbitals in Tetrahedral, Octahedral and square planar geometries. Band structure of solids.

UNIT-II (10 Lectures)

Chemistry Of Combustion: Fuel: classification of fuels- calorific value- higher and lower calorific values.

Liquid fuels: Petroleum- manufacture of synthetic petrol (Bergius process) - knocking- octane number - diesel oil- cetane number.

Gaseous fuels: Combustion of fuels: Introduction- theoretical calculation of calorific value- calculation of stoichiometry of fuel and air ratio- ignition temperature- flue gas analysis by Orsat's apparatus. Problems on combustion.

UNIT III: (10 Lectures)

Electrochemistry And Corrosion:

Introduction, Single electrode potential**,** EMF, Galvanic cell, Nernst equation and applications. Reference Electrodes - SHE, calomel electrode. Electro chemical series and uses of this series, Concentration cells

Batteries: Introduction, reversible and irreversible cells, Dry Cell, Ni - Cd Cells, Pb-acid storage cells, Li ion cells.

Corrosion: causes, Theories of Corrosion (chemical and Electro chemical), types-galvanic, differential aeration, stress corrosion, corrosion control methods– material selection and designing aspects - Cathode protection – sacrificial anodic protection and impressed current cathode. Galvanizing, Tinning, Electroplating of Copper and electro less plating of nickel.

UNIT IV: (10 Lectures)

Water Chemistry:

Introduction: Source of water and quality.

Hardness: Reasons for hardness -units of hardness - Water for drinking purposes-Purification – Sterilization and disinfection: Chlorination, Break point chlorination.

Boiler troubles: Reasons, Priming and Foaming, Scale &Sludge formation, Boiler corrosion, Caustic embrittlement - Internal treatments.

Softening of Hard water: Zeolite process, Ion Exchange processes.

Desalination of Brackish water: Reverse Osmosis and Electro Dialysis.

UNIT-V: (8 Lectures)

Spectroscopic Techniques And Organic Synthesis Of Drug Molecule

Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

Synthesis of commonly used drug molecules- Ibuoprofen, Aspirin, Paracetmol

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication& Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press.

3. Physical chemistry by K.Bahl and Tuli
4. Elementary organic spectroscopy by Y.R. Sharma ,S.Chand publications
5. Spectroscopic techniques by H.Kaur. Pragati Prakashan publications

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others.
2. Engineering Chemistry by Prasanth Rath, Cengage Learning.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
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.

Web References:

1. http://jntuk-coeerd.in/
2. http://en.wikipedia.org/wiki/title
3. http://nptel.ac.in/coures/105106/.com
4. https://en.wikipedia.org/wiki/Electrochemistry
5. https://www.youtube.com/watch?v=WLyaZbT97EI&list=PLzW3l18TEXrpqo3jRarGr9ao-61tB2184
6. http://encyclopedia.che.engin.umich.edu/Pages/Polymers/PolymerProduction/PolymerProduction.html
7. http://encyclopedia.che.engin.umich.edu/Pages/ProcessParameters/Spectrometers/Spectrometers.html

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B.Tech. I Year II Semester

Course Structure

L	T	P	C
3	0	0	3

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to ECE,CSE,IT,EEE)

Internal Marks: 40

Course Code: P18EST01 **External Marks: 60**

Course Prerequisite: Physics.

Course Objective:

1. To study the concept of passive elements, and understand the applications of network theorems for analysis of electrical networks.
2. To Analyze the single-phase ac circuits consisting of R,L, C, RL, RC, RLC combinations.
3. To understand the faraday's laws and basic Principle of transformer.
4. To understand the working principle of various rotating machines.
5. To study the operation of PN junction diode, half wave, full wave rectifiers, Transistors and OP-AMPs.

Course Outcomes:

After completion of this course, the student is able to:

1. Solve various electrical networks in presence of active and passive elements and by using principles of network theorem.
2. Analyze the single-phase ac circuits consisting of R,L, C, RL, RC, RLC combinations.
3. Understand the faraday's laws and basic Principle of transformer.
4. Understand the working principle of various rotating machines.
5. Study the operation of PN junction diode, half wave, full wave rectifiers, Transistors and OP-AMPs

UNIT – I (10 Lectures)

Electrical Circuits

Basic definitions – Types of network elements- Types of sources - Ohm's Law - Kirchhoff's Laws –Inductive networks - Capacitive networks – Series - Parallel circuits- Star-delta and delta-star transformations - Source transformation - nodal analysis and mesh analysis - Super position theorem.

UNIT – II (9 Lectures)

AC Circuit Analysis

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R,L, C, RL, RC, RLC combinations. Three phase balanced

circuits, voltage and current relations in star and delta connections.

UNIT –III (9 Lectures)

Magnetic Circuits and Transformers

Basic definition of Magnetic quantities - Faraday's laws of electromagnetic induction- Analogy between electrical and magnetic circuits. Concept of self and mutual inductance. Principle of operation and construction of single phase transformer–EMF equation – Applications.

UNIT- IV (11 Lectures)

Rotating Machines

Construction and Principle of operation of DC Machines - EMF equation – Torque equation –Speed control of DC Shunt Motor- power losses and efficiency - Principle of operation and construction of 3-phase Induction motor - Principle of operation and construction of alternators.

UNIT – V (9 Lectures)

Introduction to Semiconductor Devices

PN junction diode - Diode applications -Half wave -Full wave rectifiers – Types of Transistors - PNP and NPN junction transistors, transistor as an amplifier- Frequency response of CE Amplifier- Characteristics of Operational Amplifiers.

Textbooks:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,6 th Edition
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th Edition, PEI/PHI 2006.
4. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill

Reference Books:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Electrical Machines by D. P.Kothari, I .J .Nagarth, Mc Graw Hill Publications, 4th Edition
3. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th Edition.
4. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
5. Electronic Devices and Circuits by David A. Bell, Oxford University Press
6. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA MC Graw Hill, Second Edition

Web References:

1. https://embeddedengineers.files.wordpress.com/2015/09/electronic-devices-and-circuits-by-salivahanan.pdf
2. https://electricalanswers.files.wordpress.com/2014/09/a-textbook-of-electrical-technology-volume-i-basic-electrical-engineering-b-l-theraja.pdf

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B.Tech. I Year I Semester

L	T	P	C
0	0	3	1.5

C - Programming for Problem Solving Lab
(Common to all Branches)

Course Code: **P18ESL03**

Internal Marks: 40

External Marks: 60

Course Prerequisite: None

Course Objectives:

1. To understand the various steps in program development.
2. To understand the basic concepts in C Programming Language.
3. To understand different modules that includes conditional and looping expressions.
4. To understand how to write modular and readable C Programs.
5. To write programs in C to solve problems using arrays, structures and files.

EXPERIMENT WISE PROGRAMS

Experiment-1

a) Write a simple C program to Print "Hello World"
b) Write a simple C Program to Calculate Area and Circumference of Circle
c) Write a simple C program to implement basic arithmetic operations - sum, difference, product, quotient and remainder of given numbers.

Experiment-2

Write C programs to demonstrate the following operators

a) Assignment Operator.
b) Relational and Logical Operator.
c) Increment and decrement operator.
d) Bitwise operators.
e) Ternary operator.

Experiment-3

a) Write a C programs - to find the largest and smallest of 2 numbers(if – else), to find the largest and smallest of 3 numbers(Nested if – else), roots of quadratic equation(else – if ladder).
b) The total distance travelled by vehicle in't' seconds is given by distance=ut+1/2at2 where 'u' and 'a' are the initial velocity and acceleration. Write a c program to find the distance travelled at regular intervals of time given the Values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.

c) Write a c program, which takes two integer operands and one operator from the user, performs the operation and the prints the result. (consider the operators +,-,*,/,% and use switch statement).

Experiment-4

a) Write a C program to find the sum of individual digits of a positive integer
b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence .Write a c program to generate the first n terms of the sequence.
c) Write a c program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Experiment-5

a) Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:
$1+x+x^2+x^3+ \ldots\ldots\ldots\ldots +x^n$.
b) Write a C program to generate Pascal's triangle.
c) Write a C program to construct a pyramid of numbers

Experiment-6

a) Write a c program to find both the largest and smallest number in a list of integers.
b) Write a c program that uses functions to perform the following:
   i) Addition of Two Matrices.
   ii) Multiplication of Two Matrices.

Experiment-7

a) Write a programs that use both recursive and non-recursive functions
b) To find the factorial of a given integer.
c) To find the GCD of two given integers.

Experiment-8

a) Write a c program that uses functions to perform the following operations:
   i) To insert a sub-string in given main string from a given position.
   ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.

Experiment-9

a) Write a C program that displays the position or index in the string S Where the string T begins, or - 1 if S doesn't contain T.
b) Write a C program to count the lines, words and characters in a given text .

Experiment-10

a) Write a program to print the details of a student like(Name, Rollno, marks) using nested structures.

b) Write a C Program to Calculate Difference Between Two Time Period.

Experiment-11

a) Write a C program that uses functions to perform the following operations:

   i) Reading a complex number

   ii) Writing a complex number

   iii) Addition of two complex numbers

   iv) Multiplication of two complex numbers

   (Note: represent complex number using a structure.)

Experiment-12

a) Write a C program which copies one file to another and display the contents of a file

b) Write a C program to reverse the first n characters in a file.

c) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

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B.Tech I Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

APPLIED/ENGINEERING CHEMISTRY LAB

(Common to CE,EEE,ME,AME)

Internal Marks: 40

Course Code: P18BSL03 **External Marks: 60**

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.

Course Objectives:

The purpose of this course to provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

Course Outcomes:

After completion of this course, the students should be able to

1. Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.
2. Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

List of Experiments:

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

Volumetric Analysis:

1. Estimation of Na_2CO_3 using standard HClsolution
2. Estimation of Mohr's salt using potassium dichromate ($K_2Cr_2O_7$) solution
3. Estimation of $CuSO_4$ using sodium thio sulphate ($Na_2S_2O_3$) solution.

Water Analysis:

4. Determination of hardness of water sample by EDTA method
5. Determination of alkalinity of water sample
6. Determination of free chlorine in bleaching powder

Instrumental Titrations:

7. Conduct metric Titrations between strong acid and strong base.
8. Conduct metric Titrations between strong acid and weakbase.
9. Potentio metric Titration between Ferrous iron and potassium dichromate

($K_2Cr_2O_7$) solution

Food Analysis & Separation Of Compounds:

11. Estimation of Vitamin-c
12. Thin layer chromatography

Preparation Of Polymeric Resin:

13. Preparation of phenol formaldehyde resin
14. Preparation of urea formaldehyde resin

Lab Manual: Engineering/Applied Chemistry Lab Manual, Dept. of Chemistry, Pace Institute of Technology and Science, Vallur, Prakasam Dist., Andhra Pradesh, India.

Reference Books:

1. Dr. Jyotsna Cherukuris (2012) Laboratory Manual of engineering chemistry-II,
2. VGS Techno Series 3. Chemistry Practical Manual, Lorven Publications

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B.Tech. I Year II Semester

Course Structure

L	T	P	C
0	0	3	1.5

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

(Common to ECE,CSE,EEE.IT)

Internal Marks: 40

Course Code: P18ESL01 **External Marks: 60**

Course Prerequisite: None

Course Objective:

1. To verify and demonstrate on safety precautions and Kirchhoff's laws.
2. To demonstrate various protective devices, construction of transformer and rotating machines.
3. To verify superposition theorem and control of dc shunt motor using speed control methods.
4. To analyze the characteristics of CE amplifier, Half & Full wave rectifiers.
5. To analyze the characteristics of OP –Amp and CE amplifier

Course Outcomes:

After completion of this course, the student is able to:

1. Get an exposure on safety precautions and verify Kirchhoff 'slaws.
2. Get an exposure on construction of transformer and various protective devices.
3. Verify superposition theorem and control the speed of DC shunt motor using speed control methods.
4. Analyze the characteristics of CE amplifier, Half & Full wave rectifiers.
5. Analyze the characteristics of OP –Amp and CE amplifier

The following experiments are required to be conducted as compulsory experiments:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff's laws.
3. Demonstration of construction of Transformer and Rotating machines.
4. Demonstration on various protective devices.
5. Verification of superposition theorem
6. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method

7. PN junction diode characteristics
    a. Forward bias
    b. Reverse bias (Cut in voltage and resistance calculations)
8. Transistor CE characteristics (Input and output)
9. CE Amplifier Characteristics
10. Half Wave rectifier and Full Wave Rectifier without filters

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B.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

English-II

(Common to all Branches)

Internal Marks: 40

Course Code: P18HST02 **External Marks: 60**

Course Prerequisite:

The students should have basic knowledge of English grammar and LSRW skills.

Course Objectives:

1. To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
2. To equip the students with appropriate oral and written communication skills.
3. To inculcate the skills of listening, reading and critical thinking.
4. To integrate English Language learning with employability skills and training.
5. To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

Course Outcomes:

On completion of this course, the student is able to:

1. Use English Language effectively in spoken and written forms
2. Interpret the contextual meaning of words
3. Comprehend the given texts and respond appropriately
4. Recall and reproduce the theme in a given context
5. Communicate confidently in formal and informal contexts

UNIT – I (8 Lectures)

My Struggle for an Education – Booker T. Washington

a. Vocabulary: Collocations

b. Grammar: Finite verbs, Non- finite verbs, Gerund, Transitive and Intransitive Verbs

c. Writing: Precis Writing

UNIT – II (9 Lectures)

In London – M.K.Gandhi

a. Vocabulary: Commonly confused words

b. Grammar: Active voice and Passive voice

c. Writing: Technical Report Writing

UNIT –III (10 Lectures)

Principles of Good Writing – L A Hill

a. Vocabulary: Commonly Misspelt Words

b. Grammar: Direct & Indirect Speech

c. Writing: Essay Writing

UNIT- IV (9 Lectures)

The Secret of Work – Swami Vivekanada

a. Vocabulary: Technical vocabulary

b. Grammar: Degrees of Comparison

c. Writing: Curriculum vitae, Cover Letter and Resume Writing. (Functional, Chronological and standard Resumes)

UNIT – V (9 Lectures)

Oh Father Dear Father – Raj Kinger

a. Vocabulary: Phrasal verbs

b. Grammar: Simple, Compound and Complex Sentences

c. Writing: Hints Development

Textbooks:

1. Board of Editors, "Sure Outcomes"– Orient Blackswan, Hyderabad, 2013
2. "Panorama" – Oxford University Press, New Delhi, 2016
3. "Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
4. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.

Reference Books:

1. Murphy, "English Grammar with CD", Cambridge University Press, New Delhi, 2004.
2. Rizvi Asheaf M, "Effective Technical Communication", Tata McGraw Hill, New Delhi, 2008
3. Baradwaj Kumkum, Professional Communication", I.K. International- Principles and Practice". Third Edition. New Delhi: Oxford University Press.2015
4. Trailblazers – Board of Editors – Orient Blackswan New Delhi).

Web References:

1. (www.englishhints.com,www.enchantedlearning.com, www.learnenglish.de/grammar/prefixtext.html)
2. (http://www.magickeys.com/books/riddles/words.html)
3. (http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
4. http://www.yourdictionary.com
5. http://www.learnenglish.com
6. http://www.cambridge.org

7. http://www.eslcafe.com
8. http://www.eslgames.com
9. http://www.penguin.co.uk
10. http://www.edufind.com/english/practice

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B. Tech- I Year II Semester **Course structure**

L	T	P	C
3	0	0	3

MATHEMATICS-II
(Linear algebra and Vector calculus)
(Common to All Branches)

Internal Marks: 40

Course code: P18BST02 **External marks: 60**

Course Prerequisite: Mathematics-I (P18BST01)

Course Objectives:

To learn

1. The subject gives the knowledge about matrices and applications to solve linear equations.
2. The course intends to provide an overview of Eigen values and Eigenvectors which occur in Physical and engineering problems.
3. To integration over the regions.
4. The concepts of vector differentiation.
5. Line integral, Surface and volume integrals, Vector integral theorems.

Course Outcomes:

After learning the contents of this paper the student must be able to

1. Apply this knowledge to solve linear equations.
2. Eigen values and Eigen vectors of a given matrix and solve simultaneous linear equations.
3. Determine double integral over a region and triple integral over a volume.
4. Analyze the Vector differentiation in various domains.
5. Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT I: Linear systems of equations: (10 Lectures)

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination – Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.

Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms: (10 Lectures)

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms-Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

UNIT III: Multiple integrals: (9 Lectures)

Double and triple integrals – Change of variables – Change of order of integration.
Applications: Finding Areas, surface areas and Volumes.

UNIT IV: Vector Differentiation: (10 Lectures)

Gradient-Directional derivative, Divergence- Solenoidal vector, Curl –Irrotational Vector, Vector identities.
Applications: Equation of continuity, potential surfaces.

UNIT V: Vector Integration: (9 Lectures)

Line integral – Work done – Potential function – Area- Surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.
Applications: Work done, Force.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
2. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
4. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

Web References:

1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. http://mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

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B.Tech. I Year II Semester

Course Structure

L	T	P	C
3	0	0	3

ENGINEERING PHYSICS
(Common to CE, ME & AME)

Internal Marks: 40

Course code: P18BST04 **External Marks: 60**

Course Prerequisites: The basics of analytical and conceptual understanding of physics.

Course Objectives

1. To impart the concepts of wave optics.
2. Learn the concepts of Polarization and Lasers.
3. To study the solid state physics through Crystallography and X-raydiffraction.
4. To explore the knowledge of Oscillations and vibrations in engineering fields.
5. To learn the basic concepts in Acoustics, Magnetism and Dielectrics.

Course Outcomes:

1. Understand the basic concepts in optics and apply for engineering applications.
2. Gain knowledge of Lasers and enable the students to develop Laser devices to apply the knowledge various systems like Industries and medicine.
3. Enable to apply the concept of crystal structure and x-ray diffraction for new materials.
4. Understand the basic concepts oscillations and vibrations to apply in Engineering fields
5. Acquire the knowledge of Acoustics, Magnetism and Dielectrics.

UNIT-I

Wave Optics (10 lectures)

Interference: Introduction, Superposition of waves, Interference of light by wave front splitting and amplitude splitting, interference in thin films, Newton's rings.

Diffraction: Introduction, differences between interference and diffraction, difference between Fraunhoffer and Fresnel diffraction, Fraunhoffer diffraction at single slit, Diffraction grating (N-slits qualitative), diffraction at circular aperture, resolving power of microscope, and telescope.

UNIT-II

Polarization And Lasers (10 lectures)

Polarization: Introduction, types of polarization, methods of production, working principle of polarimeter.

Lasers: Introduction, Characteristics of laser, Absorption, spontaneous emission, stimulated emission, Principle Laser, Einstein's coefficients, Population inversion, Pumping, Types of Lasers: Ruby laser, He-Ne laser, Applications of laser.

UNIT-III (8 lectures)

Crystallography And X-Ray Diffraction

Crystallography: Introduction, Space lattice, Basis, Crystal structure, Lattice parameters, Unit cell, crystal systems and Bravais lattices, structures and packing fraction of SC, BCC, and FCC, Lattice constant.

X-ray diffraction: Introduction, Miller Indices, Important features of Miller indices, separation between successive crystal planes, Bragg's law.

UNIT – IV (10 lectures)

Oscillations and Vibrations

Harmonic oscillations: Introduction, simple harmonic motion, the simple oscillator, equation of motion of a simple oscillator, characteristics, energy of simple harmonic oscillator, damped harmonic oscillator, heavy, critical and light damping, waves (longitudinal, transverse and standing waves)

Transverse vibrations of stretched strings: Velocity of transverse wave along stretched string, Frequency of vibrating string, Harmonics and overtones.

UNIT – V (10 lectures)

Acoustics, Magnetism and Dielectrics

Acoustics: Introduction, sound absorption coefficient, reverberation, reverberation time, Sabine's formula for reverberation time, conditions for good auditorium.

Magnetism and Dielectrics: Classification of magnetic materials, Ferromagnetism, Hysteresis, Electric polarization, Dielectrics in AC and DC fields, internal field, Clausius-Mossoti equation.

Text Books:

1. Engineering physics by M. N. Avadhanulu and P.G.Kshirsagar, S.Chand, New Delhi.
2. Optics by Ajoy Ghatak, McGraw Hill Education.
3. Principle of Lasers by O. Svelto
4. Solid state physics by AJ Dekker.
5. Vibrations and waves in physics by Ian G. Main, 3rd Edn, Cambridge University Press,

6. Engineering physics by D. K. Bhattacharya and Poonam Tandon, Oxford Press

Reference Books:

1. Optics by E.Hecht.
2. The physics of vibrations and waves by H.J. Pain, John Wiley & Sons, Ltd
3. Introduction to Mechanics by M. K. Verma, Universities Press.
4. Engineering physics by Palanisamy (scitech publications).
5. Engineering Physics by RK GAUR & SL GUPTA, DhanpatRai Publication
6. Physics by Halliday and Resnick.
7. Physics for Engineers by M. R. Srinasan, New age International publishers

Web References:

1. http://jntuk-coeerd.in/
2. http://www.youtube.com
3. http://en.wikipedia.org
4. http://nptel.ac.in/syllabus/122106027/

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B.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	1	0	4

ENGINEERING MECHANICS
(Only CE Branch)

Internal Marks: 40
Course Code: P18EST03 **External Marks: 60**

Course Objectives

1. The students are to be exposed to the concepts of force and friction, direction and its application.
2. The students are to be exposed to application of free body diagrams. Solution to problems using graphical methods and law of triangle of forces.
3. The students are to be exposed to concepts of centre of gravity
4. The students are to be exposed to concepts of moment of inertia and polar moment of inertia including transfer methods and their applications.
5. 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.

Course Outcomes:

At the end of the course, the student will be able to:
1. Determine the resultant force and moment for a given system of forces
2. Analyze planar and spatial systems to determine the forces in members of trusses, frames and problems related to friction
3. Calculate the motion characteristics of a body subjected to a given force system
4. Determine the deformation of a shaft and understand the relationship between different material constants
5. Determine the centroid and second moment of area

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.
Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lami's Theorem, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.
Friction: Introduction, limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction

UNIT – II
Centroid: Centroids of simple figures (from basic principles) – Centroids of Composite Figures
Centre of Gravity: Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, Pappus theorems.

UNIT III

Moments of Inertia: Definition – Polar Moment of Inertia, Transfer Theorem, Area Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. Introduction of Mass moment of Inertia.

UNIT – IV

Kinematics: Rectilinear and Curvilinear 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.

UNIT – VI

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

Text Books:

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

Reference Books :

1. Engineering Mechanics statics and dynamics – R.C.Hibbeler, 11th Edn – Pearson Publ.
2. Engineering Mechanics, statics – J.L.Meriam, 6th Edn – Wiley India Pvt Ltd.
3. Engineering Mechanics, statics and dynamics – I.H.Shames, – Pearson Publ.
4. Mechanics For Engineers, statics - F.P.Beer & E.R.Johnston – 5th Edn Mc Graw Hill Publ.
5. Mechanics For Engineers, dynamics - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
6. Theory & Problems of engineering mechanics, statics & dynamics – E.W.Nelson, C.L.Best & W.G.
7. McLean, 5th Edn – Schaum's outline series - Mc Graw Hill Publ.
8. Singer's Engineering Mechanics: Statics And Dynamics, K. Vijay Kumar Reddy,Suresh Kumar, Bs Publications
9. Engineering Mechanics, Fedinand . L. Singer, Harper – Collins.
10. Engineering Mechanics statics and dynamics , A Nelson , Mc Graw Hill publications

Web Resources:

1. https://easyengineering.net/engineering-mechanics-by-s-timoshenko
2. www.academia.edu/Beer_and_Johnston_Vector_Mechanics_for_Engineers_Statics..
3. https://www.scribd.com/doc/Ak-tayal-engineering-mechanics-free-download-pdf
4. https://www.pinterest.com/pin/273101164888552266

B.Tech. I Year II Semester

Course Structure

L	T	P	C
1	0	3	2.5

ENGINEERING GRAPHICS

(Common to CE,ME,AME Branches)

Internal Marks: 40

Course Code: P18EST02 **External Marks: 60**

Course Prerequisite: Nil

Course objectives:

1. To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises.
2. To enable the students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing.
3. To enable the students to construct the layout development of basic solids for practical situations.
4. To enable the students to gain the ability to convert the Isometric views in to Orthographic views.
5. To enable the students to gain the ability to convert the Orthographic views in to Isometric views.

Course Outcomes:

After completion of the course the student will be able to

1. Gain the knowledge of various Geometrical Elements used in Engineering Practice.
2. Understand concepts of all 2 D elements like polygons, Conic Sections.
3. Understand concepts of 3 D Objects like various Prisms, Cylinders, Pyramids and Cones.
4. Draw and represent the Projections of variousobjects.
5. Convert the 3 D views in to 2 D views and vice versa.

UNIT-I: (12 Lectures)

Introduction to Engineering Graphics

Introduction to Drawing instruments and their uses, construction of regular polygons, Conic sections- ellipse, parabola, hyperbola using general method, Scales- Diagonal scale, Vernier scale.

UNIT-II: (12 Lectures)

Projections of Points & Lines

Principle of orthographic projection-Method of Projection – First and third angle projection methods- Projections of Points –Projection of straight lines- parallel to one plane and inclined to the other plane.

UNIT-III: (16 Lectures)

Projections of Lines & Planes

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

Projections of Planes: Projections of plane figures: triangle, square, rectangle, pentagon and hexagon, circle with surfaces inclined to both the reference planes.

UNIT-IV: (12 Lectures)

Projections of Solids & Surface Development

Projections of Solids: Projections of regular solids with the axis inclined to only one reference plane.

Development of surfaces for basic solids- prisms, pyramids, cylinder and cone.

UNIT – V: (12 Lectures)

Projections of Pictorial Views

Conversion of isometric views into orthographic views and conversion of orthographic views in to isometric views.

Text Books:

1. Engineering Drawing by N.D. Bhatt & V.M. Panchal, Charotar Publications, 2014.
2. Engineering Drawing by Basant Agrawal and C.M. Agrawal ,McGraw Hill Education Pvt. Limited, 2013.
3. Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah, Scitech Publications, 2010.

Reference Books:

1. Engineering Graphics with AutoCAD 2002 by James D. Bethune, PHI, 2011.
2. Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd, 2010.
3. Engineering drawing – P.J. Shah .S.Chand Publishers, 2010.
4. Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers, 2010.
5. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson, 2009.

Web References:

1. https://lecturenotes.in/subject/436/engineering-drawing-ed.
2. web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf.
3. https://www.smartzworld.com/notes/engineering-drawing-pdf-1st-year-notes-ppts
4. https://www.researchgate.net/305754529_A_Textbook_of_Engineering_Drawing
5. www.academia.edu/32510080/N_d_bhatt_engineering_drawing_pdf

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B.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	0

ENVIRONMENTAL SCIENCE

(Common to CE,EEE,ME,AME Branches)

Course Code: P18MCT01 **Internal Marks: 100**

Course Prerequisite: Basic knowledge about sciences up to intermediate or equivalent level.

Course Objectives:

1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
4. An understanding of the environmental impact of developmentalactivities
5. Awareness on the social issues, environmental legislation and global treaties

Course Outcomes:

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

1. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
2. The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
3. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
4. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
5. Social issues both rural and urban environment and the possible means to combat the challenges and environmental assessment stages involved in EIA and the environmental audit.

UNIT I (9 Lectures)

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance– Need for Public Awareness. Renewable energy Resources, Solar energy-solar cells, solar batteries, wind energy, wind mills, ocean energy, tidal energy and nonrenewable energy resources: LPG, water gas, producer gas. World food problems, degradation and Soil erosion - overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity.

UNIT II (8 Lectures)

Ecosystems: Concept of an ecosystem. – Structure, Components and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Ecological pyramids - Food chains, food webs and Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem d. Aquatic – River and Lake Ecosystems.

UNIT III (8 Lectures)

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

UNIT IV (9 Lectures)

Environmental Pollution: Definition, Cause, Effects and Control measures of : a. Air Pollution, b. Water pollution, c. Soil pollution, d. Marine pollution, e. Noise pollution, f. Nuclear hazards.

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – **Disaster management:** floods, earthquake, cyclone and landslides.

UNIT V (8 Lectures)

Social Issues and The Environment: From unsustainable to sustainabledevelopment – Urban problems related to energy – Water conservation, rain water harvesting and watershed management –Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Population growth – Impacts on society, variation among nations. Environmental Impact Assessment (EIA) and Environmental Protection Acts.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press, 2005.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi, 2008.

Reference Books:

1. Environmental Science & Engineering by Dr. A. Ravikrishnan, Hitech Publishing Company Pvt. Ltd. 2013.
2. Perspectives in Environmental Studies, Second edition, AnubhaKoushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2004.

Web References:

1. Environmental Science - Oxford Research Encyclopedia
2. Environmental Science - Museum of Science and Industry
3. Collegesat.du.ac.in/UG/Envinromental%20Studies_ebook.pdf

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B.Tech. I Year II Semester **Course Structure**

L	T	P	C
0	0	4	2

English Language Communication Skills Lab

(Only CE Branch)

Internal Marks: 40

Course Code: P18HSL01 **External Marks: 60**

Course Prerequisite:

1. Basic knowledge of English grammar
2. Basic understanding of English vocabulary.
3. Ability to speak simple sentences.
4. Have interest to learn the language

Course Objectives

1. To facilitate computer assisted multimedia instructions enabling individualized and independent language learning.
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
3. To bring about a consistence accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
4. To improve the fluency of students in spoken English and neutralize their mother tongue influence.
5. To train students to use language appropriately for public speaking, group discussion and interviews.

Course Outcomes

1. Better understanding of nuances of English language through audio visual experience and group activities.
2. Neutralization of accent for intelligibility.
3. Speaking skills with clarity and confidence which in turn enhances their employability skills.
4. Better understanding of the production of sounds of language.
5. Suitable body language for employability.

Scope:

The curriculum of the **ELCS Lab** is designed to focus on the production and practice of sounds of language and to familiarize the students with the use of English in everyday situations and contexts.

EXERCISE – I (3 Sessions)

- **A.** Ice – Breaking Activity, Greeting, Introducing and taking leave
- **B.** Introduction to Phonetics
  Vowel sounds – Pure Vowels & Diphthongs
  Consonant sounds

EXERCISE – II (2 Sessions)

- **A.** JAM Session, Situational Dialogues, Giving Directions & Narration
- **B.** Structure of Syllables - Plural markers & Past tense Markers

EXERCISE – III (2 Sessions)

- **A.** Role play, Giving Information and Asking Information
- **B.** Word Stress & Listening Comprehension – Listening for General Details

EXERCISE – IV (2 Sessions)

- **A.** Describing objects, events, places etc. & Presentation Skills – Extempore, Public
  Speaking.
- **B.** Consonant Cluster, Rules of 'r' pronunciation and Neutralization ofMother Tongue Influence

EXERCISE – V (3 Sessions)

- **A.** Interview Skills & Group Discussion
- **B.** Intonation & Listening Comprehension – Listening for Specific Details

Textbooks:

1. Strengthen your Communication Skills - Maruthi Publication, Hyderabad 2013
2. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)

Reference Books:

1. INFOTECH English (Maruthi Publications).
2. Personality Development and Soft Skills (Oxford University Press, New Delhi)
3. Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
4. Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
5. Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
6. Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
7. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad
8. Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
9. Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP

10. Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi : Foundation
11. Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan
12. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
13. English Pronouncing Dictionary Daniel Jones Current Edition with CD.

Web References:

1. http://www.cambridge.org
2. http://www.edufind.com/english/practice
3. http://www.learnenglish.com
4. http://www.penguin.co.uk

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B.Tech. I Year II Semester

Course Structure

L	T	P	C
0	0	3	1.5

ENGINEERING PHYSICS LAB

(Common to CE, ME & AME)

Internal Marks: 40

Course code: P18BSL02 **External Marks: 60**

Course Prerequisites:

The basics of analytical and conceptual understanding of physics.

Course Objective:

1. Deploy scientific method of experiments in the laboratory.
2. Develop the procedures and observational skills for appropriate use of simple and complex apparatus.
3. Enable analytical techniques, statistical analysis and graphical analysis.
4. Reinforce ideas and concepts covered in lecture host of experiments.
5. Train to find the radius of curvature of a Plano-convex lens forming Newton's rings.

Course Outcomes:

1. Apply the phenomenon of interference and diffraction of light waves.
2. Implement the concept of resonance in LCR circuit and sonometer.
3. Analyze the SHM to determine its dependent properties.
4. Evaluate the behavior of electronic components and its characteristics

List of Experiments

(Any eight of the following to be done)

1. Determination of Radius of Curvature of Plano - Convex lens by forming Newton's Rings.
2. Determination of Wavelengths of various spectral lines using grating with the normal incidence method.
3. Determination of wavelength of laser radiation.
4. Determination of Refractive index of a given prism.
5. Study of magnetic field along the axis of a current carrying coil and to verify stewart Gee's method.
6. Determination of energy gap of PN junction Diode.
7. Determination of hall coefficient and carrier concentration using HALL EFFECT
8. Study V-I characteristics of Zener diode.
9. Study V-I characteristics of PN junction diode.
10. Determination of frequency of a vibrating bar or electrical tuning

fork using Melde's apparatus.

11. Determination of acceleration due to gravity using compound pendulum
12. Verification of laws of transverse waves by Sonometer.
13. Velocity of sound by volume resonator.
14. Determination of rigidity modulus by Torsional pendulum.

Text Books:

1. Madhusudhanrao, "Engineering Physics lab manual" Ist edition,Scietech Publication, 2015.
2. Ramarao Sri, Choudary Nityanand And Prasad Daruka, "Lab Manual of Engineering physics" Vth ed, Excell books, 2010.
3. Physics lab manual, Department of Physics,PACE Institute of Technology and Sciences.

B.Tech. I Year II Semester

Course Structure

L	T	P	C
0	0	3	1.5

ENGINEERING WORKSHOP

(Common to CE, ME & AME)

Internal Marks: 40

Course code: P18ESL02 **External Marks: 60**

Course Pre-requisite: NIL

Course Objectives:

1. To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
2. To provide the students hands on experience to make different joints in carpentry with hand tools like jack plane, various chisels & hand saws.
3. To provide the students hands on experience to make different joints in Sheet metal work with hand tools like snips, stacks, nylon mallets etc.
4. To provide the students hands on experience to make different connections in house wiring with hand tools like cutting pliers ,tester ,lamps& lamp holders etc.
5. To develop a right attitude, team working, precision and safety at work place.

Course Outcomes:

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

1. Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
2. Familiarize with the basics of tools and equipment used in Carpentry.
3. Fabricate various basic components using Sheet metal.
4. Apply basic electrical engineering knowledge for house wiring practice.
5. Gain the hands on experience to form different models in Black smithy.

LIST OF EXPERIMENTS:

Minimum two experiments should be conducted from each trade

1. **Carpentry** **(6 Lectures)**
   a) Cross-Lap joint
   b) Dove tail joint
   c) T - Lap joint
   d) Mortise & Tenon joint
2. **Fitting** **(6 Lectures)**
   a) Square fit
   b) V - Fit

c) Half round fit

d) Dovetail fit

3. **Tin Smithy** **(6 Lectures)**
   a) Rectangular Tray
   b) Cylinder
   c) Square box without lid
   d) funnel
4. **Black Smithy** **(6 Lectures)**
   a) Round rod to Square
   b) S-Hook
   c) Round Rod to Flat Ring
   d) Round Rod to Square headed bolt
5. **House wiring** **(6 Lectures)**
   a) One lamp controlled by one switch
   b) Parallel and Series connections
   c) Fluorescent lamp fitting
   d) Stair case wiring

Reference Books:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers, 2015.
2. Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, Vikas publishers, 2009.
3. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House, 2003.

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II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18BST07	**Mathematics - III**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Mathematics-I, Mathematics-II

Course Objectives :

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The Fourier series of a periodic function and its application to the solution of partial differential equations.
3. To calculate the Fourier transform or inverse transform of common functions including Delta , Unit-Step
4. Learn to find Solution of One-dimensional Wave, Heat equation.

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

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators
2. Solve ordinary differential equations numerically using Euler's and RK method.
3. Analyse the spectral characteristics of signals using Fourier analysis. Classify systems based on their properties and determine the response
4. Find Fourier series and Fourier transforms functions.
5. Identify/classify and solve the different types of partial differential equations

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	-	3	-

UNIT - 1 Lecture Hours: 10

Solution of Algebraic and Transcendental Equations and Interpolation: Introduction- Bisection method – Method of false position – Newton- Raphson method. Interpolation: Introduction- Forward differences- Backward differences. Newton's formula for interpolation - Lagrange's interpolation formula.

UNIT - 2 Lecture Hours: 09

Numerical Integration and solution of Ordinary Differential equations: Trapezoidal rule - Simpson's1/3rd and 3/8th rule solution of ordinary differential equations by Taylor's series - Euler's method – Modified Euler's method, Runge – Kutta method of fourth order.

UNIT - 3 Lecture Hours: 09

Fourier series: Introduction- Determination of Fourier coefficients – even and odd functions – change of interval – Half – range sine and cosine series

UNIT - 4 Lecture Hours: 08

Fourier Transforms: Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier Transforms.

UNIT - 5 Lecture Hours: 09

First order Partial differential equations: Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations. Methods of separation of Variables- Solution of One-dimensional Wave, Heat equation.

Textbooks :

1. Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, Wiley-India, 2011.
2. Engineering Mathematics, N.P.Bali, Lakshmi Publications, 2011.

Reference Books:

1. Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, Wiley-India, 2011.
2. Advanced Engineering Mathematics, Micheael Greenberg, 9th edition, Pearson edn, 2012.

Web References:

1. 1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. 2. http://mathworld.wolfram.com/topics

II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET01	**Strength of Materials - I**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering Mechanics

Course Objectives :

1. To impart preliminary concepts of Strength of Material and Principles of Elasticity and Plasticity Stress strain behaviour of materials and their governing laws. Introduce student the moduli of Elasticity and their relations.
2. To impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions and to draw the diagrams of variation across the length.
3. To give concepts of stresses developed in the cross section and bending equations calculation of section modulus of sections with different cross sections
4. The concepts above will be utilized in measuring deflections in beam sunder various loading and support conditions.
5. To classify cylinders based on their thickness and to derive equations for measurement of stresses across the cross section when subjected to external pressure.

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

1. Understand the basic materials behaviour under the influence of different external loading conditions
2. Draw the diagrams indicating the variation of the key performance features like bending moment and shear forces
3. Identify bending stresses for various cross-sections
4. Knowledge of deflections due to various loading and support conditions.
5. Assess stresses across section of cylinders and design thick cylinders.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	3	2	-
CO2	2	3	2	3	-	-	-	-	-	-	-	-	2	3	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	2	-
CO4	2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-

UNIT - 1 Lecture Hours: 12

Simple Stresses And Strains And Strain Energy: Elasticity and plasticity – Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars. Strain Energy – Resilience – Gradual, sudden, impact and shock loadings – simple applications.

UNIT - 2 Lecture Hours: 12

Shear Force And Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and

overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam

UNIT - 3 Lecture Hours: 12

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: M/I = f/y = E/R, Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I and T sections. **Shear Stresses**: Derivation of formula – Shear stress distribution across various beam sections like rectangular and circular sections.

UNIT - 4 Lecture Hours: 12

Deflection Of Beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L.

UNIT - 5 Lecture Hours: 12

Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders. Thick Cylinders: Introduction Lame's theory for thick cylinders – Derivation of Lame's formulae –distribution of hoop and radial stresses across thickness – design of thick cylinders – compound cylinders

Textbooks :

1. Introduction to textbook of Strength of Materials, R.K.Bansal, 4th Edition, Laxmi Publications Pvt. Ltd., New Delhi, 2008.
2. Strength of Materials, S.Ramamrutham and R.Narayanan, 11th Edition, Dhanpat Rai publications, 2009.
3. Mechanics of Materials, Timoshenko & Gere, 4th Edition, Mc Grawhill, 2003.
4. Strength of materials, R.K. Raj put, S.Chand & Co, New Delhi, 2012.

Reference Books:

1. Mechanics of Solids, Ferdinand Beer and Johnston, 6th Edition, Tata McGraw hill Publications, 2000.
2. Strength of Materials, R. Subramanian, 1st Edition, Oxford university press, New Delhi, 2011.

Web References:

1. https://nptel.ac.in/courses/112107146
2. https://unacademy.com/course/strength-of-materials/PPXPY5P5

II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET02	**Building Materials and Construction**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Nil

Course Objectives :

1. Initiating the student with the knowledge of basic building materials and their properties.
2. Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, and walls, sloped and flat roofs.
3. The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes.
4. Imparting the students with the techniques of formwork and scaffolding.
5. The students should be exposed to classification of aggregates, moisture content of the aggregate.

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

1. Distinguish between various types of building stones, bricks and tiles and their structural requirements.
2. Recognize the need and process of manufacture of cement and lime.
3. Identify function of various materials like wood, glass, paints and building components.
4. Find the importance of masonry, finishing and form woks.
5. Assess various building components and principles of building planning.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	3	3	3	-	-	-	-	-	-	-	-	2	2	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CO5	3	-	-	3	-	-	-	-	-	-	-	-	2	3	

UNIT - 1 Lecture Hours: 09

Stones, Bricks 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. Masonry Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry. Cavity and partition walls.

UNIT - 2 Lecture Hours: 09

Tiles &Wood: Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials. **Wood**: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium.

UNIT - 3 Lecture Hours: 09

Lime And Cement 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.

UNIT - 4 Lecture Hours: 09

Aggregates: Classification of aggregate – Coarse and fine aggregates- particle shape and texture – Bond and Strength of aggregate – Specific gravity – Bulk Density, porosity and absorption – Moisture content of Aggregate- Bulking of sand – Sieve analysis. **Concrete:** Various ingredients of cement concrete and their importance – various tests for concrete

UNIT - 5 Lecture Hours: 09

Building Components: Form Works and Scaffoldings. vaults Lintels, arches, stair cases – types. Different types of floors-Roofs, different types of roofs. Damp Proofing and water proofing materials and uses. Plastering Pointing, white washing and distempering. Paints: Constituents of paint – Types of paints – Painting of new/old wood- Varnish.

Textbooks :

1. Building Construction, S. S. Bhavikatti, Vices publications House Private Ltd,2014.
2. Building Materials, B. C. Punmia, Laxmi Publications Private Ltd,2017.

Reference Books:

1. Building Materials, P. C. Varghese, PHI learning Privated Ltd,2015.
2. Building Materials, M. L. Gambhir, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2016.

Web References:

1. www.vssut.ac.in
2. www.nptel.nic.in/buildingmaterials

II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET03	**Surveying**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: NIL

Course Objectives :

1. Understand conventional and modern methods of surveying.
2. Develop ability to transform basic concept of surveying to field practice.
3. Interpret plans and maps for planning and setting out works.
4. Understand modern surveying techniques for mapping.

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

1. Demonstrate the knowledge of basic surveying and measurement of distance using chain
2. Knows the importance of compass and contour surveying
3. Comprehend the principles of levelling and measurement of angles
4. Discuss the measurement of areas and volumes in embankment and filling
5. Design curves and describe total station surveying procedures in field

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	2	2	-	3	-	-	-	-	-	2	-	-	2	3	-
CO3	2	3	-	2	-	-	-	-	-	3	-	-	3	3	-
CO4	3	2	-	2	-	-	-	-	-	3	-	-	2	2	-
CO5	2	3	3	3	-	-	-	-	-	2	-	-	2	2	-

UNIT - 1 Lecture Hours: 09

Surveying Introduction: definition-Uses of surveying- overview of plane surveying , Introduction to chain and tape surveying and their types- Field work with chain - Basic problems in chain surveying -Obstacles in chain and Ranging ,Objectives, Principles and classifications – Errors in survey measurements Introduction to plane table surveying Advantages and disadvantages of plane table surveying

UNIT - 2 Lecture Hours: 09

Distances And Direction: Compass survey-Meridians, Azimuths and Bearings, declination, computation of angle. Traversing-Purpose-types of traverse-traverse computation-traverse adjustments Characteristics and Uses of contours- methods of conducting contour surveys.

UNIT - 3 Lecture Hours: 09

Levelling and Theodolite:- Concept and Terminology, Levelling Instruments and their Temporary and permanent adjustments- method of levelling. Description, principles-uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite – Introduction to Trigonometrical levelling

UNIT - 4 Lecture Hours: 09

Tachometric Surveying: Stadia and tangential methods of Tachometry. Distance and Elevation formulae for Staff vertical position. **Measurement of areas and volumes:** Introduction to areas and volumes general methods of determining areas and volumes Embankments and cutting for a various sections (Level section and two level section) determination of the capacity of reservoir, volume of barrow pits.

UNIT - 5 Lecture Hours: 09

Curves: Types of curves, design and setting out – simple and compound curves. **Total Station:** Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey. Introduction to geodetic surveying and Global positioning system

Textbooks :

1. Surveying, Vol No.1, 2 &3, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain – Laxmi Publications Ltd, New Delhi.
2. Advance Surveying, Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
3. Surveying, C. Venkata ramaiah, University press, India Limited. Surveying and levelling, R. Subramanian, Oxford University press.

Reference Books:

1. Textbook of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co. Ltd. New Delhi
2. Textbook of Surveying, Arora (Vol No. 1&2), Standard Book House, Delhi.

Web References:

1. https://nptel.ac.in/courses/105107122
2. https://unacademy.com/course/complete-course-on-surveying/DXQWGD23

II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET04	**Fluid Mechanics**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering Mechanics, Mathematics

Course Objectives :

1. To understand the properties of fluids and fluid statics
2. To derive the equation of conservation of mass and its application
3. To solve kinematic problems such as finding particle paths and streamlines
4. To use important concepts of continuity equation, Bernoulli's equation and turbulence, and apply the same to problems
5. To analyse laminar and turbulent flows
6. To understand the various flow measuring devices.

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

1. Determine the fluid pressure and use various devices for measuring fluid pressure.
2. Calculate hydrostatic force and use of law of conservation mass to fluid flow.
3. Apply Bernoulli's equation to fluid flow problems and boundary layer theory to determine lift and drag forces on a submerged body.
4. Apply appropriate equations and principles to analyse pipe flow problems.
5. Use of different fluid flow measuring devices.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO5	2	3	3	-	-	-	-	-	-	-	-	-	3	3	-

UNIT - 1 Lecture Hours: 12

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

UNIT - 2 Lecture Hours: 12

Hydrostatics: Hydrostatic forces on submerged plane, Horizontal, Vertical and inclined surfaces – center of pressure. Fluid Kinematics: Description of fluid flow, Stream line, path line and streak line 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, flow net analysis.

UNIT - 3 Lecture Hours: 12

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

UNIT - 4 Lecture Hours: 12

Viscous Flow: Reynold's experiment – Characteristics of Laminar & Turbulent flows, Flow between parallel plates, Flow through long tubes. Closed Conduit Flow: Laws of Fluid friction, Darcy-Weisbach equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line, variation of friction factor with Reynold's number – Moody's Chart

UNIT - 5 Lecture Hours: 12

Measurement of Flow: Pitot tube, venturimeter and Orifice meter – classification of orifices, small orifice and large orifice, flow over rectangular, triangular, trapezoidal and Stepped notches – Broad crested weirs. Introduction of boundary layer theory.

Textbooks :

1. Fluid Mechanics, P. N. Modi and S. M. Seth, Standard book house, New Delhi, 2004.
2. Fluid mechanics and hydraulic machines, R. K. Bansal - Laxmi Publications (P) ltd., New Delhi, 2006.

Reference Books:

1. Hydraulics and Fluid Mechanics, R.S Kurmi , S.chand & co ,New Delhi,2008.
2. Fluid Mechanics and hydraulic Machinery, R.K. Rajput, published chand.s, India, 2011.

Web References:

1. https://nptel.ac.in/courses/112104118
2. https://unacademy.com/lesson/introduction-to-fluid-mechanics/RSROWP5M

II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL01	**Surveying Field Work - I**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Surveying

Course Objectives :

1. To impart the practical knowledge in the field- measuring distances, directions, angles
2. To determining R.L.'s areas and volumes
3. To set out Curves and stake out points
4. To traverse the area and draw maps.

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

1. Perform chain surveying to fix the offsets and closed circuit survey
2. Demonstrate the use of compass in measuring the distance between two inaccessible points and in closed traversing.
3. Determine the area of boundary by various methods of plane table surveying
4. Calculate the reduced level by fly levelling.
5. "Estimate the longitudinal section and cross section using fly levelling

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	3	2	-	2	2	3	-
CO2	3	3	3	2	-	-	-	-	2	3	-	3	3	3	-
CO3	2	3	3	3	-	-	-	-	3	3	-	2	3	2	-
CO4	3	2	2	2	-	-	-	-	2	2	-	3	2	2	-
CO5	2	2	2	2	-	-	-	-	2	2	-	2	2	2	-

List of Experiments

1. Survey by chain survey of road profile with offsets in case of road widening.
2. Survey in an area by chain survey (Closed circuit)
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. Two Point Problem by the plane table survey
8. Fly levelling : Height of the instrument method (differential levelling)
9. Fly levelling: rise and fall method.
10. Fly levelling: closed circuit/ open circuit.
11. Fly levelling: Longitudinal Section and Cross sections of a given road profile.

Textbooks :

1. Engineering geology by Dr.N.Chennakesavulu
2. Engineering Geolgy by Parbin Singh.

Reference Books:

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

Web References:

1. https://nptel.ac.in/courses/105105106
2. https://mg-nitk.vlabs.ac.in/

II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL02	**Strength of Materials Lab**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Strength of Materials

Course Objectives :

1. To determine experimental data include universal testing machines and torsion equipment.
2. To determine experimental data for spring testing machine, compression-testing machine, impact tester, hardness tester.
3. To determine stress analysis and design of beams subjected to bending and shearing loads using several methods.
4. To determine Flexural strength of a beam.
5. To determine experimental stress with fatigue and compression tests.

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

1. Assess the tensile strength of steel specimen and Determine the shear strength of the material
2. Determine the hardness and impact properties of materials
3. Verify the theories related to the beams
4. Determine the shear strength of the material

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	2	3	-	-	2	3	-
CO2	2	3	3	3	-	-	-	-	3	2	-	-	2	2	-
CO3	3	2	2	2	-	-	-	-	2	2	-	-	2	2	-
CO4	2	3	3	3	-	-	-	-	3	2	-	-	3	2	-

List of Experiments

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

II B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL03	**Engineering Geology Lab**	**1**	**0**	**2**	**2**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Nil

Course Objectives:

1. To study the basics of engineering geology and introductory part of the earth science activities.
2. Two understand the utility and application of geological principals in various phases of civil engineering
3. To describe the sources, and cauterization of common building materials.
4. To learn the basic aspect occurs due to structural features like folds and faults.
5. To explain various natural hazards and their implication on structures and effects on society

Course Outcomes: At the end of the course, student will be able to	
1.	Describe and identify various Minerals
2.	Distinguish and identify the rocks
3.	Recognize various types of folds, faults and joints
4.	Interpret and draw the sections from geological maps
5.	Identify horizontal beds, vertical beds, inclined beds, folds, faults, unconformities.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	2	-	-	-	-	2	2	-		2	3	-
CO2	3	-	-	2	-	-	-	-	2	2	-		3	2	-
CO3	2	2	-	3	-	-	-	-	3	3	-		3	3	-
CO4	3	3		2					2	3					
CO5	2	2	-	3	-	-	-	-	3	2	-		2	2	-

Part - A

Introduction to Engineering Geology

1. **Study of Mineralogy**: Minerals definition, identification studies and advantages Physical properties of minerals.
2. **Study of Petrology** : Rock definition, classification of rocks Dykes and sills, common structures and textures of Rocks Megascopic study of rocks
3. **Study of Structural Geology** : Out crop, Strike and dip Folds, Faults and Joints - types, importance and occurrence

Part - B

List of Experiments

1. Physical properties of minerals: Megascopic identification of
   a) Rock forming minerals – Quartz group, Feldspar group, Garnet group, Mica group & Talc, Chlorite, Olivine, Kyanite, Asbestos, Tourmelene, Calcite, Gypsum, etc.
   b) Ore forming minerals – Magnetite, Hematite, Pyrite, Pyralusite, Graphite, Chromite, etc.

2. Megascopic description and identification of rocks.
   a) Igneous rocks – Types of Granite, Pegmatite, Gabbro, Dolerite, Syenite, Granite Poryphery, Basalt, etc.
   b) Sedimentary rocks – Sand stone, Ferrugineous sand stone, Lime stone, Shale, Laterite, Conglamorate, etc.
   c) Metamorphic rocks – Biotite – Granite Gneiss, Slate, Muscovite & Biotite schist, Marble, Khondalite, etc.
3. Study and Observation of folds, faults and joints.
4. Structural Geology-Problem on strike, Dip.
5. Interpretation and drawing of sections for geological maps showing tilted beds, faults, unconformities etc.

Textbooks :

1. Engineering geology by Dr.N.Chennakesavulu
2. Engineering Geolgy by Parbin Singh.

Reference Books:

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

Web References:

1. https://nptel.ac.in/courses/105105106
2. https://mg-nitk.vlabs.ac.in/

Regulation: R18

Course Code	Course Name	L	T	P	C
P18MCT03	**Professional Practice , Laws And Ethics**	**2**	**0**	**0**	**0**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Basic knowledge about sciences up to intermediate or equivalent level.

Course Objectives :

1. To give basic insights and inputs to the student to inculcate Human values to grow as a responsible human beings with proper personality
2. Professional Ethics in stills the student to maintain ethical conduct and discharge their professional duties.

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

1. It gives a comprehensive understanding of a variety issues that are encountered by every professional in discharging professional duties.
2. It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively
3. Professional Ethical values and contemporary issues
4. Excelling in competitive and challenging environment to contribute to industrial growth.
5. Understanding basic purpose of profession, professional ethics and various moral and social issues.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	3	2	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	2	3	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	3	2	-	-	-	3	-	3
CO4	-	-	-	-	-	2	-	2	3	-	-	-	2	-	3
CO5	-	-	-	-	-	3	-	3	2	-	-	-	3	-	2

UNIT - 1 Lecture Hours: 06

Human Values: Morals, Values and Ethics –Integrity –Trustworthiness -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.

UNIT - 2 Lecture Hours: 12

Principles of Harmony: Truthfulness –Customs and Traditions -Value Education –Human Dignity –Human Rights –Fundamental Duties -Aspirations and Harmony (I, We & Nature) –Gender Bias - Emotional Intelligence – Salovey –Mayer Model –Emotional Competencies –Conscientiousness

UNIT - 3 Lecture Hours: 10

Engineering Ethics and Social Experimentation: History of Ethics -Need of Engineering Ethics - Senses of Engineering Ethics-Profession and Professionalism — Self Interest -Moral Autonomy – Utilitarianism –Virtue Theory -Uses of Ethical Theories -Deontology-Types of Inquiry –Kohlberg's Theory -Gilligan's Argument –Heinz's Dilemma -Comparison with Standard Experiments — Learning from the Past – Engineers as Managers –Consultants and Leaders –Balanced Outlook on

Law -Role of Codes –Codes and Experimental Nature of Engineering.

UNIT - 4 Lecture Hours: 12

Engineers Responsibilities towards Safety and Risk: Concept of Safety -Safety and Risk –Types of Risks –Voluntary v/s Involuntary Risk –Consequences -Risk Assessment –Accountability –Liability - Reversible Effects -Threshold Levels of Risk -Delayed v/s Immediate Risk -Safety and the Engineer – Designing for Safety –Risk-Benefit Analysis-Accidents

UNIT - 5 Lecture Hours: 12

Engineers Duties and Rights: Indian Society: Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

Textbooks :

1. Professional Ethics by R. Subramaniam –Oxford Publications, New Delhi
2. Ethics in Engineering by Mike W. Martin and Roland Schinzinger -Tata McGraw-Hill –2003

Reference Books:

1. Professional Ethics and Human Values by A. Alavudeen, R.Kalil Rahman and M. Jayakumaran – University Science Press
2. Professional Ethics and Human Values by Prof.D.R.Kiran-Tata McGraw-Hill -20139.Human Values And Professional Ethics by Jayshree Suresh and B. S. Raghavan, S.Chand Publications

Web References:

1. https://nptel.ac.in/courses/109104068
2. https://onlinecourses.nptel.ac.in/noc19_hs35/preview

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET05	**Structural Analysis - I**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Engineering Mechanics and Strength of Materials.

Course Objectives :

1. To give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading Conditions.
2. To impart concepts of Bending Moment and Shear force for beams with different Boundary and loading conditions
3. The procedure for development of slope deflection equations and to solve application to continuous beams with and without settlement of supports
4. The concepts of moving loads and influence lines are imparted for assessment of Maximum SF and BM at a given section when loads of varying pans rolling loads of Pratt and Warren trusses.

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

1. Draw SFD, BMD and Deflection of propped cantilivers
2. Analyse statically determinate structures with various loads
3. Estimate the bending moment and shear forces for continuous beams.
4. Analyse the continuous beams using slope deflection method and explain strain energy theorems.
5. Identify the behaviour of structures due to the moving loads and Draw the influence line diagrams for various types of moving loads on beams/bridges.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	-	-	-	-	-	3	3	-
CO2	2	3	-	3	-	-	-	-	-	-	-	-	3	2	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	-	3	-	-	-	-	-	-	-	-	2	3	-
CO5	2	3	-	2	-	-	-	-	-	-	-	-	3	2	-

UNIT - 1 Lecture Hours: 10

Propped Cantilevers: Analysis of propped cantilevers-shear force and Bending moment diagrams-Deflection of propped cantilevers.

UNIT - 2 Lecture Hours: 10

Fixed Beams – Introduction to statically indeterminate beams with U. D. load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads - shear force and Bending moment diagrams-Deflection of fixed beams including effect of sinking of support, effect of rotation of a support.

UNIT - 3 Lecture Hours: 12

Continuous Beams: Introduction- Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed- Continuous beams with

overhang, continuous beams with different moment of inertia for different spans-Effects of sinking of supports-shear force and Bending moment diagrams.

UNIT - 4 Lecture Hours: 14

Slope-Deflection Method: Introduction, derivation of slope deflection equation, application to continuous beams with and without settlement of supports. **Energy Theorems:** Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams.

UNIT - 5 Lecture Hours: 14

Moving Loads And Influence Lines: Introduction maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load, U. D load longer than the span, U. D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length. **INFLUENCE LINES:** Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a sections, single point load, U.D. load longer than the span, U.D. load shorter than the span.

Textbooks :

1. Basic Structural Analysis, C. S. Reddy Tata Mc.Graw-Hill, New Delhi
2. Analysis of Structures by T.S. Thandavamoorthy, Oxford University Press, New Delhi
3. Analysis of Structures- Vol. II, V.N.Vazirani and M. M. Ratwani, Khanna Publishers, New Delhi and I.

Reference Books:

1. Theory of Structures, B. C Punmia, A. K Jain & Arun K. Jain, Lakshmi Publications
2. Theory of Structures, R.S. Khurmi, S. Chand Publishers.

Web References:

1. https://archive.nptel.ac.in/courses/105/105/105105166/
2. https://unacademy.com/course/complete-course-of-structural-analysis-for-gate-ese-98/JCUTKKS8

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET06	**Concrete Technology**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Building Materials and Construction

Course Objectives :

1. To learn the concepts of Concrete production and its behavior in various environments.
2. To learn the test procedures for the determination of properties of concrete.
3. To understand durability properties of concrete in various environments.

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

1. Extract various properties of Portland cement, Admixture and importance of aggregates in concrete
2. Summarize fresh concrete manufacturing process and tests involved to check workability
3. Familiarize the basic chemistry of hardened concrete and tests for strength.
4. Explain Elasticity, Shrinkage and Creep in concrete
5. Recognize various factors affecting and Design the concrete mix by BIS method.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3	-	-	3	-	-	-	-	-	-	3	3	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	3	2	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO5	3	3	3	-	-	3	-	-	-	3	-	-	2	3	-

UNIT - 1 Lecture Hours: 10

Ingredients Of Concrete Cements & Admixtures: Portland cement – Chemical composition – Hydration, Setting of cement, Fineness of cement, Structure of hydrate cement Test for physical properties – Different grades of cements – Admixtures – Mineral and chemical admixtures – accelerators, retarders, air entrainers, plasticizers, super plasticizers, fly ash and silica fume. **Aggregates:** Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregates – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand– Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus –Grading of fine & coarse Aggregates – Gap graded and well graded aggregate as per relevant IS code – Maximum aggregate size.

UNIT - 2 Lecture Hours: 09

Fresh Concrete: Steps in Manufacture of Concrete–proportion, mixing, placing, compaction, finishing, curing and its types. Properties of fresh concrete - Workability – Factors affecting workability – Measurement of workability by different tests, Setting times of concrete, Effect of time and temperature On workability Segregation & bleeding – Mixing and vibration of concrete, Ready mixed concrete, Shotcrete.

UNIT - 3 Lecture Hours: 09

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

UNIT - 4 Lecture Hours: 08

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.

UNIT - 5 Lecture Hours: 09

Mix Design: Factors in the choice of mix proportions – Durability of concrete - Quality Control of concrete – Statistical methods – Acceptance criteria - Concepts Proportioning of concrete mixes by various methods – BIS method of mix design. Introduction to special concretes.

Textbooks :

1. Concrete Technology, M. S. Shetty. – S. Chand &Company, 2018.
2. Properties of Concrete, A. M. Neville – PEARSON – 4thedition, 2013

Reference Books:

1. Concrete Technology, A. R. Santha Kumar, Oxford University Press, New Delhi, 2013.
2. Concrete Technology, M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi, 2015.

Web References:

1. https://archive.nptel.ac.in/courses/105/102/105102012/
2. https://unacademy.com/course/concrete-technology-gatecivil/DGXI5UTT

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET07	**Water Resources Engineering - I**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Nil

Course Objectives :

1. Introduce hydrologic cycle and its relevance to Civil engineering
2. Appreciate concepts and theory of physical processes and interactions
3. Provide an overview and understanding of Unit Hydrograph theory and its analysis
4. Appreciate the concepts of groundwater movement and well hydraulics
5. Introduce the concepts of planning and design of irrigation systems and Discuss the relationships between soil, water and plant and their significance in planning an irrigation system

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

1. Describe hydrological cycle and identify key elements of precipitation
2. Apply hydrological concepts to understand the abstractions in precipitation and to analyse infiltration capacity.
3. Apply the technique for developing hydrographs for estimating the peak run off from different catchments
4. Assess aquifer parameters and yield of a well
5. Explain the Importance of irrigation and estimation of water requirements for a crop

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	3	-	-	2	-	-	-	-	-	3	3	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	2	-	2	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO5	3	3	-	-	-	-	3	-	-	-	-	-	3	3	-

UNIT - 1 Lecture Hours: 09

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. Types and forms, measurement, rain gauge network, presentation of rainfall 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.

UNIT - 2 Lecture Hours: 08

Abstractions from Precipitation: Initial abstractions. Evaporation: factors affecting, measurement, reduction. **Evapotranspiration:** factors affecting, measurement, control .Infiltration: factors affecting, Infiltration capacity curve, measurement, Infiltration indices.

UNIT - 3 Lecture Hours: 10

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 rainfall 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.

UNIT - 4 Lecture Hours: 08

Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, 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.

UNIT - 5 Lecture Hours: 10

Irrigation And Water Requirement Of Crops: Necessity and Importance of Irrigation, advantages and ill-effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation, standards of quality for Irrigation water. **Soil-water-plant relationship,** vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Crop seasons in India, Duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies, determination of irrigation requirements of crops.

Textbooks :

1. Engineering Hydrology" by Jayaram Reddy, Laxmi Publications Pvt. Ltd., 2ndEdition, New Delhi reprint, 2008.
2. Irrigation& Waterpower Engineering by B.C.Punmia, B.B.L. Pande, Ashok K.R. Jain, Arun K.R.Jain, Laxmi Publications (P) Ltd , 16thEdition, New Delhi, 2009.

Reference Books:

1. Hydrology and Water Resources Engineering" by R.K.Sharma & T.K. Sharma,, Dhanapati Rai Publications ,5thEdition, , 2000.
2. Irrigation Engineering and Hydraulic Structures by S.K Garg, Khanna publishers, 24thEdition, 2012.

Web References:

1. https://archive.nptel.ac.in/courses/105/102/105102012/
2. https://unacademy.com/course/concrete-technology-gatecivil/DGXI5UTT

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET08	**HYDRAULICS & HYDRAULIC MACHINES**	**3**	**1**	**0**	**4**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Fluid mechanics and Engineering Mechanics

Course Objectives :

1. To study about uniform and non-uniform flows in open channel and also tolearn about the characteristics of hydraulic jump.
2. To introduce dimensional analysis for fluid flow problems.
3. To understand the working principles of various types ofhydraulic machines.
4. To understand the working principles of various pumps.

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

1. Solve uniform and non- uniform open channel flow problems.
2. Apply the principals of dimensional analysis and similitude in hydraulic model testing
3. Discuss basic forces on turbo machinery
4. Evaluate the performance characteristics of hydraulic turbines
5. Generalize the working principles of various pumps.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	-	-	-	-	-	-	-	-	3	3	-
CO2	3	2	3	3	-	-	-	-	-	-	-	-	2	3	-
CO3	2	2	2	-	-	-	-	-	-	-	-	-	2	2	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	2	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-	2	2	-

UNIT - 1 Lecture Hours: 09

Introduction: Engineering hydrology and its applications, Hydrologic cycle, hydrological data-sources of data. Types and forms, measurement, rain gauge network, presentation of rainfall 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.

UNIT - 2 Lecture Hours: 08

Abstractions from Precipitation: Initial abstractions. Evaporation: factors affecting, measurement, reduction. **Evapotranspiration:** factors affecting, measurement, control .Infiltration: factors affecting, Infiltration capacity curve, measurement, Infiltration indices.

UNIT - 3 Lecture Hours: 10

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 rainfall

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.

UNIT - 4 Lecture Hours: 08

Groundwater: Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, 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.

UNIT - 5 Lecture Hours: 10

Irrigation And Water Requirement Of Crops: Necessity and Importance of Irrigation, advantages and ill-effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian agricultural soils, methods of improving soil fertility, preparation of land for Irrigation, standards of quality for Irrigation water. **Soil-water-plant relationship,** vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, Crop seasons in India, Duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies, determination of irrigation requirements of crops.

Textbooks :

1. Engineering Hydrology" by Jayaram Reddy, Laxmi Publications Pvt. Ltd., 2ndEdition, New Delhi reprint, 2008.
2. Irrigation& Waterpower Engineering by B.C.Punmia, B.B.L. Pande, Ashok K.R. Jain, Arun K.R.Jain, Laxmi Publications (P) Ltd , 16thEdition, New Delhi, 2009.

Reference Books:

1. Hydrology and Water Resources Engineering" by R.K.Sharma & T.K. Sharma,, Dhanapati Rai Publications ,5thEdition, , 2000.
2. Irrigation Engineering and Hydraulic Structures by S.K Garg, Khanna publishers, 24thEdition, 2012.

Web References:

1. https://archive.nptel.ac.in/courses/105/102/105102012/
2. https://unacademy.com/course/concrete-technology-gatecivil/DGXI5UTT

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET09	**Strength of Materials - II**	**3**	**1**	**0**	**4**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Strength of Materials - I

Course Objectives :

1. To give concepts of Principal stresses and strains developed in cross section of the beams on the cross section and stresses on any inclined plane. To impart concepts of failures in the material considering different theories
2. To give concepts of torsion and governing torsion equation, and there by calculate the power transmitted by shafts and springs and design the cross section when subjected to loading using different theories of failures.
3. To classify columns and calculation of load carrying capacity and to assess stresses due to axial and lateral loads for different edge conditions and to calculate combined effect of direct and bending stresses on different engineering structures.
4. Introduce the concept of unsymmetrical bending in beams Location of neutral axis Deflection of beams under unsymmetrical bending.
5. Impart concepts for determination of Forces in members of plane pin- jointed perfect trusses by different methods.

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

1. Describe the basic concepts of Principal stresses developed in a member when it is subjected to stresses along different axes.
2. asses stresses in different engineering applications like shafts, springs, columns and struts subjected to different loading conditions
3. Explain forces in different types of trusses used in construction
4. Determine Direct and bending stresses in various sections
5. Analyse Pin jointed frames by method of joints and sections.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	2	-	-	-	-	-	-	-	-	3	3	-
CO2	2	3	-	3	-	-	-	-	-	-	-	-	3	2	-
CO3	3	2	-	2	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	-	3	-	-	-	-	-	-	-	-	2	3	-
CO5	2	3	-	2	-	-	-	-	-	-	-	-	3	2	-

UNIT - 1 Lecture Hours: 14

Principal Stresses And Strains And Theories Of Failures: 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. Theories Of Failures: Introduction – Various Theories of failures like Maximum Principal stress theory – Maximum Principal strain theory – Maximum shear stress theory – Maximum strain energy theory – Maximum shear strain energy theory.

UNIT - 2 Lecture Hours: 14

Torsion Of Circular Shafts And Springs: Theory of pure torsion – Derivation of Torsion equations: $T/J = q/r = N\phi/L$ – Assumptions made in the theory of pure torsion – Tensional moment of resistance – Polar section modulus – Power transmitted by shafts – Combined bending and torsion and end thrust. **Springs:** Introduction – Types of springs – deflection of close helical springs under axial pull and axial couple – Carriage or leaf springs.

UNIT - 3 Lecture Hours: 12

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 – Rankine – Gordon formula – Long columns subjected to eccentric loading – Prof. Perry's formula.

UNIT - 4 Lecture Hours: 10

Direct And Bending Stresses: Stresses under the combined action of direct loading and B.M. Core of a section – determination of stresses in the case of chimneys, retaining walls and dams – conditions for stability – stresses due to direct loading and B.M. about both axis.

UNIT - 5 Lecture Hours: 10

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

Textbooks :

1. Introduction to text book of Strength of Materials , R.K.Bansal, 4thEdition,Laxmi Publications Pvt. Ltd., New Delhi, 2008.
2. Strength of Materials, S. Ramamrutham and R.Narayanan , 11th Edition,Dhanpat Rai publications, 2009.

Reference Books:

1. Strength of Materials, Bhavi Katti, 7th Edition, 2010.
2. Strength of Materials, Timoshenko& Young, 4th Edition, Tata Mc Graw hill, 2003.

Web References:

1. https://nptel.ac.in/courses/112107146
2. https://unacademy.com/course/complete-course-of-structural-analysis-for-gate-ese-98/JCUTKKS8

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL03	**Surveying Field Work - II**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Surveying

Course Objectives :

1. To determine the relative position of any objects or points of the earth.
2. To determine the distance and angle between different objects.
3. To prepare a map or plan to represent an area on a horizontal plan.
4. To develop methods through the knowledge of modern science and the technology and use them in the field.
5. To solve measurement problems in an optimal way.

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

1. Determine angles, distance and height of farthest object by theodolite
2. Familiarize with tachometric survey
3. Setting of curve and contour plotting
4. Appraise operation of total station by adopting sample exercises

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	-	-	-	-	3	2	-	2	3	2	-
CO2	3	2	2	2	-	-	-	-	2	3	-	2	2	3	-
CO3	2	3	3	2	-	-	-	-	3	2	-	2	3	2	-
CO4	3	2	2	2	2	-	-	-	2	3	-	3	2	3	-

List of Experiments

1. Theodolite Survey: Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Theodolite Survey: Finding the distance between two inaccessible points.
3. Theodolite Survey: Finding the height of far object.
4. Tachometric Survey: Heights and distance problems using tachometric principles.
5. One Exercise on Curve setting.
6. One Exercise on contours.
7. Total Station: Introduction to total station and practicing setting up, levelling up and elimination of parallax error.
8. Total Station: Determination of area using total station.
9. Total Station: Traversing
10. Total Station: Contouring
11. Total Station: Determination of Remote height.
12 Total Station: distance between two inaccessible points.

Web References:

1. https://onlinecourses.nptel.ac.in/noc20_ce16/preview
2. https://sl-iitr.vlabs.ac.in/

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL04	**Fluid Mechanics and Hydraulic Machinery Lab**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Hydraulic Machinery

Course Objectives :

1. To identify the behaviour of analytical models introduced in lecture to the actual behaviour of real fluid flows.
2. To explain the standard measurement techniques of fluid mechanics and their applications.
3. To illustrate the students with the components and working principles of the Hydraulic machines- different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. To analyse the laboratory measurements and to document the results in an appropriate format.

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

1. Examine the coefficient of discharge for venturimeter, orifice, small orifice and external mouthpiece.
2. Evaluate loss of head to sudden contraction and friction
3. Verify Bernoulli's equation
4. Determine the efficiency of turbines and pumps.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	2	3	-	-	2	2	-
CO2	3	2	2	-	-	-	-	-	3	2	-	-	2	2	-
CO3	3	2	-	-	-	-	-	-	2	3	-	-	2	2	-
CO4	3	3	-	-	-	-	-	-	3	2	-	-	2	2	-

List of Experiments

1. Determination of coefficient of discharge for Venturimeter.
2. Determination of coefficient of discharge for Orifice meter.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouthpiece by variable head method.
5. Determination of Coefficient of loss of head in a sudden contraction and
6. Determination of friction factor of head loss due to friction in circular pipes
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes
9. Efficiency test on Pelton wheel turbine
10. Efficiency test on Francis turbine.
11. Efficiency test on centrifugal pump.
12 Efficiency test on reciprocating pump.

Web References:

1. https://archive.nptel.ac.in/courses/112/106/112106311/
2. https://fmc-nitk.vlabs.ac.in/

II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL05	**Concrete Technology Lab**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Concrete Technology

Course Objectives :

1. Providing the students with sufficient information about the principles of production of concrete material, its constituents, and behaviours.
2. Qualifying the students in controlling the quality of fresh and hardened concrete in both lab and field.
3. Teaching the students for taking into account the sustainability aspects of producing concrete

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

1. Evaluate physical and strength properties of cement
2. Analyse the properties of coarse and fine aggregates.
3. Assess the workability of concrete by compaction factor and slump cone
4. Determine compressive and split tensile strength of hardened concrete

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	3	2	-	2	3	2	-
CO2	2	3	2	2	-	-	-	-	2	2	-	2	2	2	-
CO3	2	2	3	3	-	-	-	-	2	2	-	2	3	3	-
CO4	3	2	2	2	-	-	-	-	3	2	-	2	2	3	-

List of Experiments

1. Determination of normal Consistency and fineness of cement.
2. Determination of initial setting time and final setting time of cement.
3. Determination of specific gravity and soundness of cement.
4. Determination of compressive strength of cement.
5. Determination of grading and fineness modulus of Coarse aggregate by sieve analysis.
6. Determination of specific gravity of coarse aggregate
7. Determination of grading and fineness modulus of fine aggregate (sand) by sieve analysis.
8. Determination of bulking of sand.
9. Determination of workability of concrete by compaction factor method.
10. Determination of workability of concrete by slump test
11. Determination of compressive strength of cement concrete and its young's modulus.
12. Determination of split tensile strength of concrete.

Web References:

1. https://nptel.ac.in/courses/105102012
2. https://cs-iitd.vlabs.ac.in/

Regulation: R18

Course Code	Course Name	L	T	P	C
P18MCT05	**Indian Constitution**	**2**	**0**	**0**	**0**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Basic knowledge about sciences up to intermediate or equivalent level.

Course Objectives:

1. To know about Indian constitution.
2. To know about central and state government functionalities in India.
3. To know about Indian society.

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

1. Understand the functions of the Indian government
2. Understand and abide the rules of the Indian constitution
3. Understand and appreciate different culture among the people.
4. Understand the meaning and importance of Constitution
5. Explain about making of Indian Constitution - contribution of Constituent assembly on it.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	-	2	-	-	-	-	1	-	-
CO2	-	-	-	-	-	2	-	2	-	-	-	-	1	-	-
CO3	-	-	-	-	-	2	-	2	-	-	-	-	-	-	-
CO4	-	-	-	-	-	2	-	2	-	-	-	-	-	-	-
CO5	-	-	-	-	-	2	-	2	-	-	-	-	1	-	-

UNIT - 1 Lecture Hours: 06

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens.

UNIT - 2 Lecture Hours: 12

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India –Judicial Review.

UNIT - 3 Lecture Hours: 10

Structure And Function Of State Government State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature –Judicial System in States – High Courts and other Subordinate Courts.

UNIT - 4 Lecture Hours: 12

Constitution Functions Indian Federal System – Center – State Relations – President's Rule – Constitutional Amendments – Constitutional Functionaries – Assessment of working of the Parliamentary System in India.

UNIT - 5 Lecture Hours: 12

Indian Society: Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

Textbooks :

1. Introduction to the Constitution of India, Durga Das Basu,Prentice HallofIndia, New Delhi, 1997.
2. Indian Political System, R.C.Agarwal, S.Chand and Company, New Delhi, 1997.

Reference Books:

1. Sharma, Brij Kishore, " Introduction to the Constitution of India:, Prentice Hallof India, New Delhi,2000.
2. U.R.Gahai, "Indian Political System ", New Academic PublishingHouse, Jalaendhar,1999.

Web References:

1. https://onlinecourses.nptel.ac.in/noc20_lw03/preview
2. https://legislative.gov.in/constitution-of-india/

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET10	**Building Planning and Drawing**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Building Materials

Course Objectives :

1. Initiating the student with the knowledge of basic building materials and their properties.
2. Imparting the knowledge of course pattern in masonry construction and flat roofs and techniques of forming foundation, columns, beams, and walls, sloped and flat roofs.
3. The student is to be exposed to the various patterns of floors, walls, different types of paints and varnishes.
4. Imparting the students with the techniques of formwork and scaffolding.
5. The students should be exposed to classification of aggregates, moisture content of the aggregate.

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

1. Describe objectives and principles of building byelaws and codes
2. Familiarize with requirements of components for residential and public buildings
3. Interpret the technical terminologies related to planning and various conventional signs and symbols used
4. Categorize various types of doors, windows, ventilators and roofs.
5. Draw various components of residential building from the line diagram.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	-	3	-	-	-	-	-	-	2	-	-
CO2	2	2	2	2	-	2	-	-	-	2	-	-	3	3	-
CO3	2	3	3	2	-	3	-	-	-	3	-	-	2	2	-
CO4	3	3	2	3	-	3	-	-	-	3	-	-	3	3	-
CO5	2	2	3	3	3	2	-	-	-	2	-	-	2	2	-

UNIT - 1 Lecture Hours: 09

Building Byelaws and Regulations Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements- Indian national building code -2016 recommendations ; Andhra Pradesh state building rules**.**

UNIT - 2 Lecture Hours: 12

Tiles &Wood: Characteristics of good tile - manufacturing methods, types of tiles. Uses of materials like Aluminium, Gypsum, Glass and Bituminous materials. **Wood**: Structure – Properties- Seasoning of timber- Classification of various types of woods used in buildings- Defects in timber. Alternative materials for wood – Galvanized Iron, Fiber Reinforced Plastics, Steel, Aluminium.

UNIT - 3 Lecture Hours: 10

Sign Conventions And Bonds Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond - odd and even courses for one, one and half, walls in thickness at the junction of a corner.

UNIT - 4 Lecture Hours: 12

Doors, Windows, Ventilators And Roofs Panelled and glazed door, glazed windows, paneled windows, swing ventilators, fixed ventilators. King Post truss, Queen Post truss Sloped and flat roof and buildings.

UNIT - 5 Lecture Hours: 16

Planning And Designing of Buildings Draw the Plan, Elevation and Sections of a Residential and Public buildings from the given line diagram.

Textbooks :

1. Planning, designing and Scheduling, Gurucharan Singh and Jagadish Singh
2. Building planning and drawing by M.Chakravarthi

Reference Books:

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

Web References:

1. https://onlinecourses.nptel.ac.in/noc20_me79/preview
2. https://gharpedia.com/blog/principles-of-building-planning/

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET11	**Design an Drawing of Reinforced Concrete Structures**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Engineering Mechanics, Strength of Materials & Structural Analysis.

Course Objectives :

1. To study introduction of limit state design, which include concepts of limit state design, loads, strain curves for cold worked deformed bars and mild steel bars, Assumptions in limit state design and design of singly reinforced beams.
2. To study about design for flexure, shear, torsion and bond, which include limit state analysis, Design examples in simply supported and continuous beam, detailing.
3. To study about slabs, which include classification of slabs, design of one - way slabs, two-way slabs, and continuous slabs using IS coefficients (conventional).
4. To study Compression members, which include Effective length of a column, design of short and long columns, under axial loads, uniaxial bending and biaxial bending.
5. To study about footings, which include types of footings, distribution of base pressure, general design considerations for footings, design of isolated rectangular and square footing.

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

1. Explain concepts of Limit State Method and Design of beams including Detailing
2. Design of Flexure, Shear, Torsion and Bond of beams including detailing by limit state method.
3. Design different types of slabs by limit state method
4. Design compression members by limit state method.
5. Design different types of footings by limit state method

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CO3	2	2	3	3	-	-	-	-	-	-	-	-	2	-	-
CO4	2	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CO5	3		3	3	-	-	-	-	-	-	-	-	3	2	-

UNIT - 1 Lecture Hours: 10

Introduction : Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads - Design philosophies - Concepts of limit state design - Basic statistical principles - Types of sections - 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 - limit state analysis and design of singly reinforced Beams (Rectangular and flanged beams.

UNIT - 2 Lecture Hours: 14

Design for Flexure, Shear, Torsion and Bond: Limit state analysis and design of doubly reinforced sections (Rectangular and T-beams).- effecstive depth- Moment of Resistance – Minimum depth for

a given capacity – Limiting Percentage of Steel – Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

UNIT - 3 Lecture Hours: 10

Design of 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 Code.

UNIT - 4 Lecture Hours: 12

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.

UNIT - 5 Lecture Hours: 10

Footings: Different types of footings – Distribution of base pressure – General Design considerations for footings – Design of isolated footings – rectangular and square footings

Textbooks :

1. Design of Reinforced concrete Structures, N.Subrahmanyian
2. Reinforced concrete design by N. Krishna Raju and R.N. Pranesh, New age International Publishers, New Delhi

Reference Books:

1. Reinforced Concrete Structures by Park and Pauley, John Wiley and Sons.
2. Design of concrete structures – Arthus H.Nilson, David Darwin, and Chorles W. Dolar,Tata Mc.GrawHill,3rd Edition, 2005.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ce65/preview
2. https://unacademy.com/course/design-of-reinforced-concrete-structures/IRIHWE1J

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET12	**Transportation Engineering - I**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Engineering physics, Surveying and Concrete Technology.

Course Objectives :

1. To learn different concepts in the field of Transportation Engineering.
2. To acquire design principles of Highway Geometrics and Pavements
3. To acquire designing knowledge of intersections and traffic management plan preparation
4. To obtain knowledge on designing of flexible and rigid pavements
5. To learn various highway construction and maintenance procedures

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

1. Plan highway network for a given area
2. Determine Highway alignment and design highway geometrics
3. Design Intersections and prepare traffic management plans
4. Design flexible and rigid pavements
5. Construct and maintain highways and identify sustainability of highway material

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	3	-	3	-	-	-	-	-	-	2	3	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	2	-	3	-	-	-	-	-	-	-	-	3	2	-
CO4	2	3	3	3	-	3	-	-	-	-	-	-	2	3	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-	3	2	-

UNIT - 1 Lecture Hours: 10

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

UNIT - 2 Lecture Hours: 13

Design for Flexure, Shear, Torsion and Bond: Limit state analysis and design of doubly reinforced sections (Rectangular and T-beams).- effective depth- Moment of Resistance – Minimum depth for a given capacity – Limiting Percentage of Steel – Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions. Design examples in simply supported and continuous beams, detailing.

UNIT - 3 Lecture Hours: 13

Design of 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 Code.

UNIT - 4 Lecture Hours: 13

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.

UNIT - 5 Lecture Hours: 11

Footings: Different types of footings – Distribution of base pressure – General Design considerations for footings – Design of isolated footings – rectangular and square footings

Textbooks :

1. Highway Engineering, Khanna S. K., Justo C. E. G and Veeraragavan A, Nem Chand Bros., Roorkee.
2. Traffic Engineering and Transportation Planning, Kadiyali L. R, Khanna Publishers, New Delhi

Reference Books:

1. Principles of Highway Engineering, Kadiyali L. R, Khanna Publishers, New Delhi
2. Transportation Engineering and Planning, Papacostas C.S. and P.D. Prevedouros, Prentice Hall of India Pvt.Ltd; New Delhi.

Web References:

1. https://nptel.ac.in/courses/105101087
2. https://unacademy.com/course/course-on-highway-engineering/99BQ4W99

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET13	**Structural Analysis - II**	**3**	**1**	**0**	**4**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Engineering Mechanics, Strength of Materials & Structural Analysis-I.

Course Objectives :

1. To give preliminary concepts of assessment of bending moment shear force in three hinged arches and two hinged arches with different loading conditions
2. Infer the nature of cables and suspension bridges
3. The procedure for development of Approximate methods and to solve application to portal method and cantilever method with different loading conditions
4. To impart concepts of Bending Moment and Shear force for beams with different Boundary and loading conditions
5. The procedure for development of multi storey frames by various methods like moment distribution method and kani's method

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

1. Analyze the three hinged arches and two hinged arches with different types of shapes
2. Analyze the cables and suspension bridges.
3. Estimate the bending moment and shear forces in frames for different fixity conditions.
4. Analyze the lateral loads with portal and cantilever method.
5. Analyze the multi-storey frames using various methods.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-		3	2	-
CO2	2	2	2	2	-	-	-	-	-	-	-		2	2	-
CO3	3	3	3	3	-	-	-	-	-	-	-		3	2	-
CO4	3	2	2	2	-	-	-	-	-	-	-		3	3	-
CO5	2	3	3	3	-	-	-	-	-	-	-		2	3	-

UNIT - 1 Lecture Hours: 14

Three Hinged Arches: Elastic theory of arches – Eddy"s theorem –Types of arches -Three hinged parabolic arches- Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Hinges with supports at different levels - Analysis of three hinged circular arches. Two Hinged Arches: Types of two hinged arches, analysis of parabolic arches and circular arches- Determination of horizontal thrust, bending moment, normal thrust and radial shear – Rib shortening and temperature stresses, Introduction of Tied arches and Fixed arches (No Analytical problem).

UNIT - 2 Lecture Hours: 12

Cable Structures and Suspension Bridges: Introduction, characteristics of cable, analysis of cables subjected to concentrated and uniformly distributed loads, anchor cable, temperature stresses, analysis of simple suspension bridge, three hinged and two hinged stiffening girder suspension bridges.

UNIT - 3 Lecture Hours: 10

Lateral Load Analysis Using Approximate Methods: Application to building frames. (i) Portal Method (ii) Cantilever Method.

UNIT - 4 Lecture Hours: 12

Moment Distribution Method: Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – Portal frames – including sway substitute frame analysis by two-cycle moment distribution method.

UNIT - 5 Lecture Hours: 12

KANI'S METHOD: Principles of the method, Application to continuous beams and portal frames (single bay, single storey with vertical legs only) without and with side-sway

Textbooks :

1. Structural Analysis, T. S. Thandavamoorthy, Oxford university press, India.
2. Analysis of structures, Vazrani & Ratwani – Khanna Publications

Reference Books:

1. Theory of structures, Ramamuratam, Dhanpatrai Publications.
2. Comprehensive Structural Analysis-Vol. I & 2, R. Vaidyanathan & P. Perumal- Laxmi Publications Pvt. Ltd., New Delhi

Web References:

1. https://nptel.ac.in/courses/105106050
2. https://unacademy.com/course/course-on-structural-analysis-for-gate

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET13	**Water Resources Engineering - II**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Fluid mechanics and Water Resources Engineering-I

Course Objectives :

1. Design of erodible and non-erodible canals & Basics about floods and flood routing
2. Design methods of canals structures
3. Know the principles of design of hydraulic structures on permeable foundations.
4. Know the concepts for analysis and design principles ofstorage and diversion head works.
5. Learn design principles of canal structures

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

1. Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design
2. Demonstrate the design principles of canal structures and cross drainage works.
3. Plan and design of diversion head works
4. Identify various types of reservoir design aspects and Analyze the stability of gravity dams
5. Determine the stability of earth dams and design spillways

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO2	2	2	2	2	-	-	-	-	-	-	-	-	3	2	-
CO3	2	3	2	3	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	2	2	-
CO5	3	2	3	-	-	-	-	-	-	-	-	-	3	3	-

UNIT - 1 Lecture Hours: 12

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, design of erodible canals – Kennedy's silt theory and Lacey's regime theory, balancing depth of cutting. **Floods:** Causes and effects, Rational formula, Flood routing- Muskingum method.

UNIT - 2 Lecture Hours: 12

Canal Structures: Falls: Types and location, design principles of Sarda type fall. **Cross Drainage Works**: Types, design principles of aqueduct, siphon aqueduct and super passage. **Outlets:** types, proportionality, sensitivity and flexibility

UNIT - 3 Lecture Hours: 10

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, exit gradient.

UNIT - 4 Lecture Hours: 12

Reservoir Planning: Site selection, yield and storage capacity of reservoir. Dams: Types of dams, selection

of site for a dam **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, grouting.

UNIT - 5 Lecture Hours: 12

Earth Dams: Types, causes of failure, criteria for safe design, seepage, measures for control of seepage-filters, stability analysis-introduction. **Spillways:** Types, design principles of Ogee spillways, types of spillways crest gates-introduction of water power engineering.

Textbooks :

1. Irrigation and Water Power Engineering"by Punmia B C,P.B.B Lal, A.K. Jain and A.K. Jain (2009), Laxmi Publications Pvt. Ltd.,New Delhi.
2. Irrigation and Water Resources Engineering"by Asawa G L (2013), New Age International Publishers.

Reference Books:

1. Water Resources Engineering" by Mays L.W (2013), Wiley IndiaPvt. Ltd, New Delhi
2. Irrigation Engineering" by Sharma R.K. and Sharma, T.K (2012),S.Chand & Co Publishers.

Web References:

1. https://nptel.ac.in/courses/126105010
2. https://unacademy.com/lesson/introduction-to-irrigation-engineering/Q7K93IMK

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL07	**Computer Aided Civil Engineering Drawing Lab**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Building Planning & Drawing, Engineering Drawing

Course Objectives :

1. To learn software like AutoCAD, Invertor/ Pro E/ Uni-graphics and to produce basic concepts to make 2D drafting.
2. To apply basic concept to drawing, edit, dimension, hatching etc. to develop 2D & 3D Modelling.
3. To make 3D modelling, Assembling, modification & manipulation along with detailing.

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

1. Use the AutoCAD commands for drawing 2D & 3D building drawings required for different civil engineering applications.
2. Plan and draw Civil Engineering Buildings as per aspect and orientation
3. Presenting drawings as per user requirements and preparation of technical report
4. Prepare the sketch of front elevation and sectional elevation from a given plan.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	2	3	-	-	-	-	3	-	-	3	3	-
CO2	2	2	3	3	2	-	-	-	-	3	-	2	2	2	-
CO3	2	2	2	2	3	-	-	-	-	3	-	2	3	2	-
CO4	2	3	3	2	2	-	-	-	-	3	-	2	2	3	-
CO5	2	2	2	3	2	-	-	-	-	3	-	2	3	3	-

List of Experiments

1 Introduction to basic commands used in CAD.
2. Draw the important building components like section of a load bearing wall foundation to parapet.
3. Draw the Plan, Elevation, and Section of residential building.
4. Draw the layout of building.
5. Draw the Layouts of electrical lines in buildings.
6. Prepare the truss and label the various parts.
7. Creation of 3D view of residential building
8. Creation of 3D view of office building
9. Creation of 3D view of bank building
10. Creation of 3D view of library building
11. Creation of 3D view of function hall building

Web References:

1. https://nptel.ac.in/courses/112102101
2. https://www.autodesk.com/campaigns/civil-engineer

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18MCT08	**Design Thinking for Innovation**				

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : NILL

Course Objectives :

1. To bring awareness on innovative design and new product development.
2. To explain the basics of design thinking.
3. To familiarize the role of reverse engineering in product development.
4. To train how to identify the needs of society and convert into demand.
5. To introduce product planning and product development process.

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

1. Explain the steps in the design process.
2. Apply systematic approach in design.
3. Develop strategies for new product development
4. Use new materials to improve the product
5. Understand reverse engineering methods in product development

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	2	-	-	-	-	-	-	-	--	-	-	-	-	-
CO3	2	2	2	2	-	-	-	-	1	1	-	-	2	3	-
CO4	2	2	2	2	-	-	-	-	1	1	-	-	2	3	-
CO5	2	2	2	2	2	2	-	-	1	1	-	-	2	3	-

UNIT - 1 Lecture Hours: 14

What is design thinking, overview of design thinking, systematic approach to product development, design challenges. Systematic Inventive Thinking: Systematic inventive thinking: The TRIZ methodology, Decision and Evaluation: Focused thinking framework, Six thinking hats , Ethical considerations

UNIT - 2 Lecture Hours: 12

Design for Innovation: Introduction to design for interaction, nine lessons for innovation, differencein creativity and innovation, Building blocks for innovation

UNIT - 3 Lecture Hours: 10

Science to Engineering: Job of engineers, engineering units and measurement, elements of engineering analysis, forces and motion, energy, kinematics and motion, conversion of units, Area and volume conversions, quantities measurements. Physics to Engineering: Application of Newton laws, Pascal‟s law, Bouncy, Bernoulli‟s theorem, Ohm‟s law

UNIT - 4 Lecture Hours: 12

Historical Development: Design thinking in civil engineering, problem identification and solving techniques in various fields of civil engineering, design thinking process - a case study. Study of Product Developments.

UNIT - 5 Lecture Hours: 12

Reverse engineering in product development: Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, fibre reinforced concrete, study of introducing low cost buildings, speed construction techniques, environmental considerations in design, and safety considerations in design.

Textbooks :

1. E. Lumsdaine and M. Lumsdaine, Creative Problem Solving, McGraw Hill,
2. J. Goldenberg and D.Mazursky, Creativity in product innovation. Cambridge University Press,2002

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, "Engineering Design: A Systematic Approach", 3rd edition, Springer, 2007
2. Creative Problem Solving for Managers - Tony Proctor - Routledge Taylor & Francis Group

Web References:

1. https://nptel.ac.in/courses/110106124
2. https://archive.nptel.ac.in/courses/110/106/110106124/

III B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET15	Design & Drawing of Steel Structures	**3**	**1**	**0**	**4**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites : Engineering Mechanics, Strength of Materials, Structural Analysis& Design and Drawing of Reinforced Concrete Structures.

Course Objectives :

1. Familiarize Students with different types of Connections and relevant IS codes
2. Equip student with concepts of design of flexural members
3. Know Design Concepts of tension and compression members
4. Familiarize students with different types of column bases and their Design
5. Familiarize students with Plate girder and Gantry Girder and their Design

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

1. Work with relevant IS codes and design of connections.
2. Carryout analysis and design of flexural members and detailing
3. Design tension &compression members of different types with connection detailing.
4. Design of column foundations with detailing.
5. Design Plate Girder and Gantry Girder with connection detailing.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	2	-	2	-	-	-	-	-	-	3	-	-
CO2	2	2	2	2	-	2	-	-	-	2	-	-	2	2	-
CO3	2	2	2	3	-	3	-	-	-	2	-	-	2	2	-
CO4	3	2	3	3	-	2	-	-	-	3	-	-	2	3	-
CO5	2	3	2	2	-	2	-	-	-	2	-	-	2	2	-

UNIT - 1 Lecture Hours: 12

Connections: Introduction - Definition - Types of Connections - Codal Provisions **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.

UNIT - 2 Lecture Hours: 12

Beams: Allowable stresses, design requirements as per IS Code-Design of simple and compound beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

UNIT - 3 Lecture Hours: 10

Tension Members and compression members: General Design of members subjected to direct tension and bending –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. Design Principles of Eccentrically loaded columns, Splicing of columns.

UNIT - 4 Lecture Hours: 12

Design of Column Foundations: Design of slab base and gusseted base. Column bases subjected moment.

UNIT - 5 Lecture Hours: 12

Design of Plate Girder: Design consideration – I S Code recommendations Design of plate girder-Welded – Curtailment of flange plates, stiffeners – splicing and connections. **Design of Gantry Girder:** impact factors - longitudinal forces, Design of Gantry girders.

Textbooks :

1. Steel Structures Design and Practice, N. Subramanian, Oxford UniversityPress.
2. Design of steel structures, S. K. Duggal, Tata Mc Graw Hill, NewDelhi
3. Design of Steel Structures S. S. Bhavikatti, I. K International Publishing House Pvt. Ltd.

Reference Books:

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; UniversityPress

Web References:

1. https://nptel.ac.in/courses/105105162
2. https://unacademy.com/lesson/decision-support-system-dss/X4ZNEMK9

III B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET16	Geotechnical Engineering-I	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering geology

Course Objectives :

1. To understand the basic principles of Soil Mechanics and their applications to solve problems related to Geotechnical Engineering.
2. To enable the student to find out the Classification of the soil and Permeability characteristics.
3. To impart the concept of seepage of water through soils and determine theseepage discharge.
4. To enable the students to differentiate between compaction and consolidation of soils and to determine the magnitude and the rate of consolidation settlement.
5. To enable the student to understand the concept of shear strength of soils, assessment of the shear parameters of sands and clays and the areas of theirapplications

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

1. The student must know the definition of the various parameters related to soil mechanics and know the methods of determination of the various index properties of the soils.
2. The student should be able to classify the soils, know the importance of permeability, and determine in the laboratory.
3. The student should be able to know the Effective pressures in soils and also its stress distribution by different theories.
4. The student should be able to know the importance of the engineering properties of the soil such as compressibility and shear strength and determine them in the laboratory.
5. The student should be able to apply the above concepts in day-to-day civil engineeringpractice

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	-		-	-	-	-	-	-	3	3	-
CO2	3	3	3	3	-		-	-	-	-	-	-	3	2	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2	3	-
CO4	3	3	3	3	-	-	-	-	-	-	-	-	3	2	-
CO5	3	2	3	3	-	-	-	-	-	-	-	-	2	-	-

UNIT – 1 Lecture Hours: 10

Introduction: Soil formation – soil structure and clay mineralogy – Adsorbed water – Phase diagrams- Simple definitions - some important relationships **Index Properties**: Grain size analysis – Sieve and Hydrometer methods - Relative density – consistency limits and indices.

UNIT - 2 Lecture Hours: 12

Soil Classification: Introduction - Particle size classification as per IS-code - Unified soil classification system - Indian standard soil classification system **Permeability:** Capillary rise-Darcy's law and its Validity - Determination of coefficient of permeability - constant and variable head methods - Factors affecting permeability - Permeability of stratified soil deposits

UNIT - 3 Lecture Hours: 12

Seepage Through Soils: Principle of effective stress - physical meaning of effective stress - Total, neutral and effective stresses and quicksand condition. **Flow nets:** Characteristics and Uses. **Stress Distribution In Soils:** Stresses induced by applied loads – Boussinesq's and Westergaard's theories for point loads and areas of different shapes– Newmark's influence chart – 2:1 stress distribution method

UNIT - 4 Lecture Hours: 14

Compressibility of Soil: Introduction; Compressibility of soil; **Consolidation:** e-p and e-log p curves – Concept of consolidation - Terzaghi"s theory of one-dimensional Consolidation – Time rate of consolidation and degree of consolidation – Determinationof coefficient of consolidation (cv) - Over consolidated and normally consolidated clays **Compaction:** Introduction - Laboratory tests - Factors affecting compaction -Structure and engineering behavior of compacted cohesive soils - Compaction in the field - Compaction specifications and field control

UNIT - 5 Lecture Hours: 16

Shear Strength of Soils: Basic mechanism of shear strength - Mohr – Coulomb Failure theories – Stress-Strain behavior of Sands - Critical Void Ratio – Stress-Strain behavior of clays – Shear Strength determination- various drainage conditions

Textbooks :

1. Basic and Applied Soil Mechanics, Gopal Ranjan and A. S. R. Rao, New Age InternationalPublishers.
2. Soil Mechanics and Foundation Engineering, V. N. S. Murthy, CBS publishers

Reference Books:

1. Soil Mechanics and Foundation Engineering by Dr.K.R.Arora, Standard Publishers distributors.
2. An introduction to Geotechnical Engineering, Holtz and Kovacs; Prentice Hall. Fundamentalsof
3. Geotechnical Engineering, B M Das, Cengage Learning, New
4. Soil Mechanics and Foundation Engineering by Dr. B C Punmia, Dr. Ashok. K. Jain, Dr. Arun. K. Jain, Laxmi Publications (P) Ltd.

Web References:

1. https://archive.nptel.ac.in/courses/105/101/105101201/
2. https://unacademy.com/course/complete-course-on-geotechnical-engineering/94HOFO3E

III B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET17	**Transportation Engineering – II**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Surveying, Transportation Engineering – 1

Course Objectives :

1. To know various components and their functions in a railway track.
2. To acquire design principles of geometrics in a railway track.
3. To know various techniques for the effective movement of trains.
4. To acquire design principles of airport geometrics and pavements.
5. To know the planning, construction and maintenance of Docks and Harbours.

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

1. Familiarize turnouts and controllers of railway system
2. Design airport geometrics and airfield pavements.
3. Plan, construct and maintain Docks and Harbours
4. Familiarize turnouts and controllers of railway system
5. Design airport geometrics and airfield pavements.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	-	-	-	-	-	-	-	-	3	-	-
CO2	2	2	3	2	-	-	-	-	-	-	-	-	2	3	-
CO3	2	2	3	2	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	2	3	-	-	-	-	-	-	-	-	3	2	-
CO5	2	3	3	2	-	-	-	-	-	-	-	-	2	-	-

UNIT - 1 Lecture Hours: 10

Components of Railway Engineering: Introduction – permanent way components – cross section of permanent way – functions and requirements of rails, sleepers and ballast – types of gauges – creep of rails – theories related to creep– coning of wheels – adzing of sleepers – rail fastenings.

UNIT - 2 Lecture Hours: 12

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 – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves

UNIT - 3 Lecture Hours: 12

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 – Signaling systems – Mechanical

signaling system – Electrical signaling system – Interlocking

UNIT - 4 Lecture Hours: 14

Airport Planning & Design: Airport Master plan – Airport site selection - Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Visual aids and Air traffic control. **Runway Design:** .Various Design factors – Design methods for flexible pavements – CBR method –Design methods for rigid pavements – Westergaard method – Introduction to Airport Drainage

UNIT - 5 Lecture Hours: 16

Planning, Layout, Construction & Maintenance Of Docks & Harbors: Classification of ports – Requirement of a good port – classification of Harbors – Docks - dry docks, wharves and jetties – Transition sheds and ware houses –Break waters – Dredging– Maintenance of Ports and Harbors – Navigational aids.

Textbooks :

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

Reference Books:

1. Railway Engineering, Saxena & Arora – Dhanpat Rai, New Delhi.
2. Transportation Engineering, Railways, Airports, Docks & Harbours, Srinivasa Kumar R, University Press, Hyderabad
3. Airport Engineering Planning & Design, Subhash C. Saxena, 2016, CBS Publishers,NewDelhi.
4. IRC 24-2000: Indian road congress for the design of Railway bridges

Web References:

1. https://archive.nptel.ac.in/courses/105/106/105106050/
2. https://link.springer.com/book/10.1007/978-3-030-44394-8

=II B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL09	**TRANSPORTATION ENGINEERING LAB**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Transportation Engineering – 1

Course Objectives :

1. To organise traffic surveys and collect wide variety of traffic data, subjecting them to analysis and interpretation.
2. To conduct various standard tests on soil, aggregate and bitumen.

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

1. Examine the aggregate crushing strength, impact value and the moisture content
2. Determine the dellotious material percentage and frictional value by abrasion
3. Find out Penetration and ductility of bitumen
4. Estimate the binding properties of bitumen in pavement construction
5. evaluate flow properties of bitumen by marshal stability test

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	3	-	-	-	-	2	2	-	3	3	2	-
CO2	3	3	3	2	-	-	-	-	3	3	-	2	2	2	-
CO3	2	3	2	3	-	-	-	-	2	2	-	2	3	3	-
CO4	3	3	3	2	-	-	-	-	3	3	-	3	2	3	-
CO5	2	2	2	3	-	-	-	-	2	2	-	2	3	2	-

List of Experiments

1. Aggregate Crushing value
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test
5. Abrasion Test.
6. Shape tests
7. Penetration Test.
8. Ductility Test.
9. Softening Point Test.
10. Flash and fire point tests.
11. Stripping Test
12. Viscosity Test
13. Marshall Stability test.

Web References:

1. https://ts-nitk.vlabs.ac.in/
2. https://www.youtube.com/watch?v=lE7LFOuGKyI&list=PL4_tNnCBDtMwbjUgBmY2I2woie7RAQByZ

III B.Tech II Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL08	**GEOTECHNICAL ENGINEERING LAB**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering geology

Course Objectives :

1. Classify the soil based on index properties of soil
2. Find the field bulk and dry density of cohesion-less and cohesive soils
3. Find the coefficient of permeability of coarse grained and fine grained soils & compressibility characteristics of soil

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

1. Examine specific gravity and Grain size analysis
2. Determine field density, atterberg limits and free swell index of soil
3. Estimate permeability and shear strength of soil
4. Evaluate soil compaction, consolidation, compressibility and bearing capacity of soil

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	3	2	-	-	2	2	-
CO2	3	3	3	3	-	-	-	-	2	2	-	-	2	2	-
CO3	3	2	2	2	-	-	-	-	2	3	-	-	3	2	-
CO4	3	2	3	2	-	-	-	-	3	2	-	-	2	3	-

List of Experiments

1. Determination of specific gravity
2. Gradation analysis by Sieve analysis
3. Gradation analysis by Hydrometer analysis.
4. Field density-Core cutter and Sand replacement methods
5. Determination of Atterberg limits
6. Differential free swell (DFS)
7. Permeability by Constant head permeability method
8. Permeability by Variable head permeability method
9. Direct shear test
10. Vane shear test
11. IS - Light compaction test
12. IS - Heavy compaction test
13. Consolidation test (to be demonstrated).
14. Tri-axial Compression test (UU Test)
15. Unconfined Compression test
16. CBR Test

Web References:

1. https://nptel.ac.in/courses/105101160
2. https://smfe-iiith.vlabs.ac.in/

IV B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET18	**Geotechnical Engineering-II**	**3**	**1**	**0**	**4**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering Geology, Geotechnical Engineering

Course Objectives :

1. To explain the importance of soil investigations including Destructive and Non-destructive Methods
2. To explain how earth pressure theory is important in retaining structure design
3. To explain the concept of stability of slopes and how to determine factor of safety ofslopes.
4. To explain how do select a suitable shallow foundation system for various siteconditions and also analysis of different foundation system
5. To explain in what circumstances pile is needed and how do analysis the pile and pilegroup under various soil condition.

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

1. Carry out Soil investigation for any Civil Engineering Construction
2. Analyze Earth Retaining Structures for any Kind of Soil Medium
3. Students will be able to calculate the factors of safety of different types of slopes undervarious soil conditions, analyse the stability of slopes
4. The student must be able to compute the magnitude of foundation settlement to decidethe size of the foundation.
5. The student must be able to use the field test data and arrive at the bearing capacity.The student must be able to design Piles based on the principles of bearing capacity.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	-	2	-	-	3	2	-
CO2	3	2	2	2	-	-	-	-	-	3	-	-	2	3	-
CO3	2	3	2	3	-	-	-	-	-	2	-	-	3	2	-
CO4	3	2	3	-	-	3	-	-	-	-	-	-	2	2	-
CO5	2	3	2	2	-	2	-	-	-	-	-	-	2	-	-

UNIT - 1 Lecture Hours: 10

Soil Exploration: Need –and preparation of soil investigation Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Pressure meter – planning ofProgramme report.

UNIT - 2 Lecture Hours: 12

Stability of Slopes: Infinite and finite earth slopes in sand and clay – types of failures – factorof safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices– Taylor's Stability Number.

UNIT - 3 Lecture Hours: 12

Earth Retaining Structures: Rankine & Coulomb's theory of earth pressure – Culmann's graphical method - earth pressures in layered soils. **Bearing Capacity:** Bearing capacity – criteria for determination of bearing capacity – factorsinfluencing bearing capacity

UNIT - 4 Lecture Hours: 14

Shallow Foundations: Types of foundations and factors to be considered in their location - Bearing capacity – analytical methods to determine bearing capacity – Terzaghi's theory - IS Methods - Safe bearing pressure based on N- value – allowable bearing pressure; safe bearingcapacity and settlement from plate load test – Types of foundation settlements and their determination - allowable settlements of structures

UNIT - 5 Lecture Hours: 16

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

Textbooks :

1. Principles of Foundation Engineering by Braja M. Das, Eight Edition 2017, CengageIndia Private Limited
2. Foundation Analysis and Design by Joseph Bowles, Fifth Edition 2001, McGraw-Hill Education

Reference Books:

1. Soil Mechanics and Foundation Engineering by Dr.K.R.Arora 2020, StandardPublishers distributors
2 Soil Mechanics and Foundation Engineering by Dr. B C Punmia, 16th Edition, 2017,Laxmi Publications (P) Ltd.

Web References:

1. https://archive.nptel.ac.in/courses/105/101/105101201/
2. https://unacademy.com/course/comprehensive-course-on-geotechnical-engineering---part-ii/QWS91SEA

IV B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET19	Environmental Engineering	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering Chemistry, Fluid mechanics, Water Resource Engineering

Course Objectives :

1. Outline planning and the design of water supply systems for a community/town/city
2. Provide knowledge of water quality requirement for domestic usage
3. Impart understanding of importance of protection of water source quality
4. Enlightens the efforts involved in converting raw water into clean potable water.
5. Impart knowledge on design of water distribution network. Selection of valves andfixture in water distribution systems

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

1. Plan and design the water and distribution networks and sewerage systems
2. Identify the water source and select proper intake structure
3. Characterisation of water.
4. Selection of suitable treatment flow for raw water treatments
5. Select the appropriate appurtenances in the water supply

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	-	-	3	-	-	-	-	-	3	3	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	3	-	-	-	3	2	-	-	-	-	-	3	3	-
CO4	2	2	3	2	-	2	2	-	-	2	-	-	2	2	1
CO5	2	2	-	2	-	2	2	-	-	3	-	-	2	2	-

UNIT - 1 Lecture Hours: 10

Introduction: Importance and Necessity of Protected Water Supply systems, Water borne diseases, Estimation of water demand for a town or city, Per capita Demand and factors influencing it - Types of water demands and its variations factors affecting water demand, Design Period, Factors affecting the Design period, Population Forecasting.

UNIT - 2 Lecture Hours: 12

Sources of Water: Lakes, Rivers, Impounding Reservoirs, comparison of sources with reference to quality, quantity and other considerations- Capacity of storage reservoirs, Mass curve analysis. Groundwater sources of water: Types of water bearing formations, springs, Wells and Infiltration galleries, Yields from infiltration galleries. Factors governing the selection of the intake structure, Types of Intakes. Conveyance of Water: Gravity and Pressureconduits.

UNIT - 3 Lecture Hours: 12

Quality and Analysis of Water: Characteristics of water–Physical, Chemical and Biological-Analysis of Water – Physical, Chemical and Biological characteristics. Comparison of sourceswith reference to quality- I.S. Drinking water quality standards and WHO guidelines for drinking water

UNIT - 4 Lecture Hours: 14

Treatment of Water: Flowchart of water treatment plant, Treatment methods: Theory and Design of Sedimentation, Coagulation, Sedimentation with Coagulation, Filtration. Theory ofdisinfection-Chlorination and other Disinfection methods, Softening of Water, Removal of colour and odours - Iron and manganese removal – Adsorption-fluoridation and deflouridation– aeration–Reverse Osmosis-Iron exchange–Ultra filtration.

UNIT - 5 Lecture Hours: 16

Distribution of Water: Requirements- Methods of Distribution system, Layouts of Distribution networks, Pressures in the distribution layouts, Analysis of Distribution networks:Hardy Cross and equivalent pipe methods -Components of Distribution system: valves such assluice valves, air valves, scour valves and check valves, hydrants, and water meters Laying and testing of pipe lines-selection of pipe materials, pipe joints.

Textbooks :

1. Environmental Engineering – Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus – Mc-Graw-Hill Book Company, New Delhi, 2017
2. Elements of Environmental Engineering – K. N. Duggal, S. Chand & Company Ltd.,New Delhi, 2012.

Reference Books:

1. Water Supply Engineering – P. N. Modi. Standard Book House. 2018
2 Water Supply Engineering – B. C. Punmia. Laxmi Publications.2016

Web References:

1. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40/
2 https://gosmartbricks.com/green-building-technology-concept-need-and-types/

IV B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET20	Estimating, Specifications & Contracts	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Building Planning and Drawing

Course Objectives :

1. To know the quantity calculations of different components of the buildings.
2. The rate analysis of different quantities of the buildings components.
3. Understand the estimation work for buildings components and roads.
4. Learn types of contracts and valuation.
5. Learn detailed estimation of the buildings.

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

1. The student should be able to determine the quantities of different components ofbuildings.
2. The student should be in a position to find the cost of various building components.
3. The student should be capable of finalizing the value of structures.
4. The student should be capable of prepare a contract document.
5. The students are able to prepare detail estimation of buildings

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	3	-	3
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	-	2
CO3	2	2	2	-	-	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	-	-	-	-	-	-	-	-	-	3	-	3
CO5	3	3	2	-	-	-	-	-	-	-	-	-	3	-	2

UNIT - 1 Lecture Hours: 10

Approximate methods of estimation: General items of work in Building – Standard Units Principles of working out Quantities for detailed and abstract estimates –Approximate method of Estimating Specifications for – earth work, concrete, reinforced cement concrete, brick work, plastering and painting.

UNIT - 2 Lecture Hours: 12

Rate analysis: rate Analysis – earthwork, concrete, reinforced cement concrete, brick work, plastering and painting.

UNIT - 3 Lecture Hours: 12

Earthwork estimation Earthwork estimation for roads– Bar Bending schedule for slabs, beams, footing and staircase.

UNIT - 4 Lecture Hours: 14

Contracts system Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation–Types of valuations and purpose of valuation methods of valuation

UNIT - 5 Lecture Hours: 16

Detailed estimation of buildings using Detailed Estimation of Buildings using individual wall method– Detailed Estimation ofcentre line method.

Textbooks :

1. Estimating and Costing, B.N. Dutta, 28th Edition, UBS publishers.2020
2. Civil Engineering Contracts and Estimates, B. S. Patil, third Edition, Universities Press(India) Pvt. Ltd., Hyd.2006
3. Construction Planning and Technology, Rajiv Gupta, second Edition, CBS Publishers& Distributors Pvt. Ltd. New Delhi.2014

Reference Books:

1. Standard Schedule of rates and standard data book, Public works department.
2 IS 1200 (Parts I to XXV-1974/ Method of Measurement of Building & Civil EnggWorks – B.I.S.
3. Estimation, Costing and Specifications, M. Chakrabarti; Laxmi publications. 2010.
4. National Building Code, Bureau of Indian Standards,2006

Web References:

1. https://pdfcoffee.com/download/estimation-amp-costing-5-pdf-free.html
2. https://unacademy.com/course/estimation-costing-valuation-12/HMHRZZRR

IV B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CET21	**Remote Sensing And GIS**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering physics and Surveying

Course Objectives :

1. To introduce the basic principles of Remote Sensing and GIS techniques.
2. To learn concepts of visual and digital image analyses
3. To introduce GIS system and data entry and preparation
4. To understand the principles of spatial analysis
5. To understand the applications of RS and GIS to civil engineering

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

1. Be familiar with basics of remote sensing and sensor platforms.
2. Interpret the aerial photographs and satellite imageries
3. Be familiar with GIS system & data models
4. Create and input spatial data for GIS application
5. Apply RS & GIS concepts in General and Hydrology applications

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	2	-	-	-	-	-	-	2	-	2	-
CO2	2	2	2	3	2	-	-	-	-	2	-	2	-	2	-
CO3	2	3	3	3	3	-	-	-	-	-	-	3	-	2	-
CO4	3	2	2	2	2	-	-	-	-	-	-	2	-	2	-
CO5	2		2	-	3	2	2	-	-	2	-	2	-	2	-

UNIT - 1 Lecture Hours: 10

Introduction to remote sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere, energy interaction with the earth surfaces, characteristics of remote sensing systems **Sensors and platforms:** Introduction, types of sensors, airborne remote sensing, space borne remote sensing, image data characteristics, digital image data formats-band interleaved by pixel, band interleaved by line, band sequential, IRS, LANDSAT, SPOT

UNIT - 2 Lecture Hours: 12

Image analysis: Introduction, elements of visual interpretations, digital image processing- image preprocessing, image enhancement, image classification, supervised classification, unsupervised classification

UNIT - 3 Lecture Hours: 12

Geographic Information System: Introduction, key components, application areas of GIS, map projections. **Data entry and preparation**: Spatial data input, raster data models, vector data models

UNIT - 4 Lecture Hours: 14

Spatial data analysis: Introduction, overlay function-vector overlay operations, raster overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table, network analysis-optimal path finding, network allocation, network tracing and buffer analysis

UNIT - 5 Lecture Hours: 16

RS and GIS applications: Land cover and land use, agriculture, forestry, geology, geomorphology, urban applications, Flood zoning and mapping, ground water prospects and potential recharge zones, watershed management

Textbooks :

1. Remote sensing and GIS by Bhatta, 2nd Edition 2011 Oxford University Press
2. Remote Sensing and Image Interpretation by Lillesand, T.M, R.W. Kiefer andJ.W.Chipman, Seventh Edition 2015, Wiley India Pvt. Ltd., New Delhi.

Reference Books:	
1.	Fundamentals of Remote Sensing, George Joseph, third Edition 2013, UniversitiesPress
2	Concepts and Techniques of Geographical Information System by Chor Pang Lo andA K W Yeung, third Edition 2016 Prentice Hall (India).

Web References:

1. https://archive.nptel.ac.in/courses/105/103/105103193/
2. https://unacademy.com/course/an-amazing-course-on-remote-sensing-gis-gps-advance-survey/87E0EPS2

IV B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL011	**Structural Analysis & Design Programming Lab**	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: STAAD PRO

Course Objectives :

1. learn the use of software Staad.pro
2. learn the design of RC structures using software Staad.pro
3. learn seismic design of RC structures using software Staad.pro

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

1. Understand the software usages and produce structural drawing for structural members.
2. Design and analyze various types of beams.
3. Design and detailing of 2D and 3D frame
4. Familiarize with analysis and design of steel tubular truss.
5. To study design requirements for single and multi-storey building

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	2	-	-	-	-	-	-	-	3	2	-
CO2	3	2	2	3	2	-	-	-	-	-	-	-	2	2	-
CO3	2	3	3	2	3	-	-	-	-	-	-	-	3	2	-
CO4	3	2	2	3	2	-	-	-	-	-	-	-	2	3	-
CO5	2	3	3	2	3	-	-	-	-	-	-	-	3	2	-

List of Experiments

1. Introduction to staad pro
2. Analysis and design of simply supported beam
3. Analysis and design of continuous beam
4. Analysis design of fixed and cantilever beam
5. 2-D Frame Analysis and Design
6. 3-D Frame Analysis and Design
7. Steel Tabular Truss Analysis and Design
8. Analysis of single-storey building
9. design of single-storey building
10. Analysis of multi-storey building
11. design of multi-storey building

IV B.Tech I Semester **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEL010	Environmental Engineering lab	**0**	**0**	**3**	**1.5**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering Chemistry, Fluid mechanics, Water ResourceEngineering

Course Objectives :

1. Perform the experiments to determine water and waste water quality
2. Understand the water & waste water sampling, their quality standards
3. Estimate quality of water, waste water, Industrial water

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

1. Understand about the equipment used to conduct the test procedures
2. Perform the experiments in the lab
3. Compare the water, air quality standards with prescribed standards set by the local governments

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	2	-	2	3	-	-	-	-	2	3	-	-
CO2	2	2	3	3	-	3	2	-	-	-	-	3	2	2	-
CO3	2	3	3	2	-	2	3	-	-	-	-	2	3	3	-
CO4	3	3	2	3	-	-	2	-	-	-	-	3	2	2	-

List of Experiments

1. Determination of pH of Water.
2. Determination of Electrical Conductivity (Salinity) of Water.
3. Determination and estimation of Total Hardness–Calcium & Magnesium.
4. Determination of Alkalinity
5. Determination of Acidity
6. Determination of Chlorides in water
7. Determination and Estimation of total solids, organic solids and inorganic solidsand settle able solids.
8. Determination of Iron.
9. Determination of Dissolved Oxygen with D.O. Meter or Wrinklers Method and B.O.D.
10. Physical parameters – Temperature, Colour, Odour, Turbidity, Taste.
11. Determination of Optimum coagulant dose.
12. Determination of Chlorine demand.
13. Determination of C.O.D.
14. Determination of N, P, K values in solid waste

Web References:

1. https://www.digimat.in/nptel/courses/video/105107176/L01.html
2. https://ee1-nitk.vlabs.ac.in/

List of Professional Electives **Regulation R18**

(PE begin from III – II semester)

Professional Elective - I		
S.No	**Course Code**	**Course Name**
1	P18CEE01	Repair and Rehabilitation of Structures
2	P18CEE02	Advanced Structural Engineering
3	P18CEE03	Advanced Surveying
4	P18CEE04	Urban Transportation Planning
5	P18CEE05	Ground Water Engineering
Professional Elective - II		
S.No	**Course Code**	**Course Name**
1	P18CEE06	Pre- Stressed Concrete
2	P18CEE07	Air Pollution Control
3	P18CEE08	Construction Technology & Management
4	P18CEE09	Physio-Chemical Processes for Water Waste Treatment
5	P18CEE10	Irrigation Design and Drawing
Professional Elective - III		
S.No	**Course Code**	**Course Name**
1	P18CEE11	Conservation Building Technology
2	P18CEE12	Advanced Environmental Engineering
3	P18CEE13	Pavement Analysis and Design
4	P18CEE14	Solid Hazardous Waste Management
5	P18CEE15	Environmental Geo-Technology

Professional Elective - I **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE01	**Repair and Rehabilitation of Structures**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: concrete technology, Structural Analysis, Design of Reinforced Concrete structure,

Course Objectives :

1. To familiarize the students with various types of deteriorations and preventive measures.
2. Imparting the knowledge of Non-Destructive Testing methods for concrete.
3. To create awareness in Failure of buildings.
4. Initiating the student with the knowledge of Materials for repair and rehabilitation
5. To produce Civil Engineering students to have strong foundation in Repair Techniques and Investigation of structures

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

1. Apply different types Deterioration of concrete in structures andtheir importance in building construction.
2. Do Non-Destructive Testing methods for concrete.
3. Identify types of failures of buildings.
4. Summarize the materials for repair and rehabilitation.
5. know Repair Techniques and Investigation of structures

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	2	-	-	-	-	2	2	-	-
CO2	2	3	2	2	3	-	-	-	-	-	-	3	3	-	-
CO3	3	2	3	3	-	-	-	-	-	-	-	2	3	3	-
CO4	2	3	2	2	-	-	3	-	-	-	-	2	2	-	-
CO5	3	3	3	2	2	-	-	-	-	-	2	3	3	2	-

UNIT - 1 Lecture Hours: 12

Deterioration of concrete in structures: Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, temperature and their causes, Mechanism, Effect, preventive measures. - Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures

UNIT - 2 Lecture Hours: 12

Non-Destructive Testing- Non destructive test methods for concrete Including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting-Corrosion: Methods for corrosion measurement and assessment including Half-cell potential and resistivity

UNIT - 3 Lecture Hours: 12

Failure of buildings: Definition of building failure-types of failures- Causes Of Failures- Faulty Design, Accidental over Loading, Poor quality of material And Poor Construction practices- Fire damage - Methodology for Investigation of failures-diagnostic testing methods and equipments- repair of cracks in concrete

UNIT - 4 Lecture Hours: 12

Materials for repair and rehabilitation - Natural admixtures-Fibers- wraps- Glass and Carbon fiber wraps- Steel Plates-Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods

UNIT - 5 Lecture Hours: 12

Repair Techniques: Grouting, Jacketing,, externally bonded plates, nailing, Underpinning and under water repair; Materials, Equipment, Precautions and Processes. Retrofitting techniques for beams and columns. **Investigation of structures**: Distress, observation and preliminary test methods. Case studies:related to rehabilitation of bridge piers, dams, canals, heritage structures

Textbooks :

1. Maintenance & Repair of Civil Structures" by B.L. Gupta & Amit Gupta
2. Rehabilitation of Concrete Structures" by B. Vidivelli, Standard Publishers
3. Concrete Bridge Practice Construction, Maintenance & Rehabilitation" by V. K. Raina.

Reference Books:

1. Concrete Structures- protection Repair and Rehabilitation" by R.Doodge Woodson, BHPublishers
2. Bungey, "Non-Destructive Evaluation of concrete Structures" Surrey University Press.
3. W.H.Ranso, "Concrete Repairs and Maintenance Illustrated" RS Means Company

Web References:

1. https://archive.nptel.ac.in/courses/105/106/105106050/
2. https://link.springer.com/book/10.1007/978-3-030-44394-8

Professional Elective - I **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE02	**Advanced Structural Engineering**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Engineering Mechanics, Structural analysis and Design and drawing of concrete and steel structures

Course Objectives :

1. Understand different types of staircases design.
2. Familiarize Students with Raft Foundations and Retaining walls
3. Understand Concepts of flat slabs
4. Familiarize the components of roof trusses
5. Understand different types of transmission towers and chimneys

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

1. Design the stair cases
2. Design raft foundations and different types of RCC retaining walls
3. Carryout analysis and design of flat slabs
4. Design the roof trusses and unsupported beam designs
5. Solve the problems design of Silos and Chimneys

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	2	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CO3	3	2	2	3	-	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CO5	2	3	2	2	-	-	-	-	-	-	-	-	3	3	-

UNIT - 1 Lecture Hours: 06

Stair Cases: Types of stair cases - Analysis and Design of L- shaped and U-shaped stair cases.

UNIT - 2 Lecture Hours: 06

Analysis and Design of RCC Retaining walls: Cantilever and Counter fort

UNIT - 3 Lecture Hours: 07

Analysis and Design of Flat Slabs- Direct Design and Equivalent Frame Methods- Check forPunching shear

UNIT - 4 Lecture Hours: 07

Roof Trusses: Different types of trusses – Design loads – Load combinations as per IS Code recommendations, structural details –Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses

UNIT - 5 Lecture Hours: 06

Analysis and Design of Chimney, Concepts of loading

Textbooks :

1. Reinforced Concrete Structures‟ Vol-2, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain,Laxmi, publications Pvt. Ltd., New Delhi
2. Reinforced Concrete Structures, N. Subrahmanian, Oxford Publishers
3. Design Drawing of Concrete and Steel Structures, N. Krishna Raju University Press 2005.
4. Steel Structures Design and Practice, N. Subramanian, Oxford University Press.

Reference Books:

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 codes.

Web References:

1. https://archive.nptel.ac.in/courses/105/107/105107123/
2. https://unacademy.com/goal/civil-engineering/CCIIL/free-platform/transportation-engineering/GJLZJ

Professional Elective - I **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE03	**Advanced Surveying**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Surveying

Course Objectives :

1. To acquire knowledge on fundamentals of astronomical terms in surveying
2. To learn the usage of elements of Photogrammetry
3. To know about the applications of Remote Sensing and GPS in surveying
4. To obtain knowledge about GIS
5. To learn the needs of Map projections

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

1. Familiarize fundamentals of astronomical terms and its benefits
2. Identify usage of Photogrammetric elements
3. Evaluate Remote Sensing and GPS techniques
4. Identify various advantages of GIS techniques
5. plot the maps by using map projections

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	-	-	-	-	1	2	-
CO2	2	2	2	-	2	-	-	-	-	-	-	-	1	2	-
CO3	3	3	-	-	2	-	-	-	-	-	-	-	2	2	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	2	-
CO5	3	2	2	-	3	-	-	-	-	2	-	-	1	3	-

UNIT - 1 Lecture Hours: 06

Astronomy: Definitions of astronomical terms, star at elongation, star at prime vertical star at horizon, starat culmination, celestial coordinate systems, Napier's rule of circular parts, various time systems: sidereal, apparent, solar and mean solar time, equation of time-its cause.

UNIT - 2 Lecture Hours: 06

Elements of Photogrammetry Introduction: types of photographs, types of aerial photographs, aerial camera and height displacements in vertical photographs, stereoscopic vision and stereoscopies, height determination from parallax measurement, flight planning

UNIT - 3 Lecture Hours: 07

Remote Sensing Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing GPS Surveying: Basic Concepts - Different segments - space, control and user segments - satellite configuration - signal structure - Orbit determination and representation - Anti Spoofing andSelective Availability - Task of control segment - Hand Held and Geodetic receivers -data processing - Traversing and triangulation

UNIT - 4 Lecture Hours: 07

Geographical Information System Definition of GIS, Key Components of GIS, Functions of GIS, Spatial data, Geospatial analysis, Integration of Remote sensing and GIS and Applications in Civil Engineering

UNIT - 5 Lecture Hours: 06

Map Projections Introduction; Scale Factor; Geometry of the sphere and cone; Areas; Surface areas of solids;Types of Map Projections; Map projection to a plane; Gnomonic Projection; Stereographic Projection; Orthographic Projection; Conical Projection; Albers Equal -area Projection; Polyconic Projection; Conformal Projection; Lambert Projection; Mercator Projection; Transverse Mercator Projection; Universal Transverse Mercator Projection; The choice of projection.

Textbooks :

1. Surveying, Vol No.1, 2 &3, B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain –Laxmi Publications Ltd, New Delhi.
2. Advance Surveying, Satish Gopi, R. Sathi Kumar and N. Madhu, Pearson Publications.
3. Textbook of Surveying, C. Venkataramaiah, University press, India Limited.
4. Surveying and levelling, R. Subramanian, Oxford University press.

Reference Books:

1. Textbook of Surveying, S.K. Duggal (Vol No. 1&2), Tata McGraw Hill Publishing Co.Ltd. New Delhi.
2 Textbook of Surveying, Arora (Vol No. 1&2), Standard Book House, Delhi.
3. Higher Surveying, A.M. Chandra, New Age International Pvt ltd.
4. Fundamentals of surveying, S.K. Roy – PHI learning (P) ltd.
5. Plane Surveying, Alak de, S. Chand & Company, New Delhi.

Web References:

1. https://archive.nptel.ac.in/courses/105/104/105104100/
2. https://unacademy.com/course/advance-surveying-gps-and-gis-gate-civil/I3F2PZKT

Professional Elective - I **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE04	**URBAN TRANSPORTATION PLANNING**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Transportation Engineering-I

Course Objectives :

1. To obtain knowledge on problems in Urban transportation system and travel demand.
2. To learn the collection of data in urban areas and its inventories
3. To acquire knowledge on trip generation and distribution
4. To analyze the mode choice
5. To learn assignment of traffic and identification of corridor

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

1. Identify problems in Urban transportation system and travel demand.
2. Familiarize data collection in urban areas
3. Determine trip generation and its distribution in urban transportation
4. Evaluate mode choice and Probabilistic Models
5. Identify traffic assignment and corridor in urban traffic areas

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-	2	2	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-	2	2	-
CO5	2	2	2	-	-	-	-	-	-	-	-	-	3	2	-

UNIT - 1 Lecture Hours: 06

Urban Transportation Problems & Travel Demand: Urban Issues, Travel Characteristics, Evolution of Planning Process, Supply and Demand – Systems approach; Overall Planning process, Long term Vs Short term planning, Demand Function, Independent Variables, Travel Attributes, Assumptions in Demand Estimation, Sequential, and Simultaneous Approaches, Aggregate and Disaggregate Techniques.

UNIT - 2 Lecture Hours: 06

Data Collection And Inventories: Collection of data, Types and Sources of Data organisation of surveys and Analysis, Study Area, Zoning, Road Side and Home Interview Surveys, Commercial Vehicle Surveys, Sampling Techniques, Expansion Factors, Accuracy Checks, Use of Secondary Sources, Economic data – Income – Population – Employment – Vehicle Owner Ship.

UNIT - 3 Lecture Hours: 07

Trip Generation & Distribution: UTPS Approach, Trip Generation Analysis: Zonal Models, Household Models, Trip Attraction models, Commercial Trip Rates; Trip Distribution: Growth Factor Methods, Gravity Models, Opportunity Models, Time Function Iteration Models.

UNIT - 4 Lecture Hours: 07

Mode Choice Analysis: Mode Choice Behaviour, Competing Modes, Mode Split Curves, Discrete Choice Analysis, Choice sets, Maximum Utility, Probabilistic Models: Binary Logit, Multinomial Logit Model – IIA property

UNIT - 5 Lecture Hours: 06

Traffic Assignment and Corridor Identification: Diversion Curves; Basic Elements of Transport Networks, Coding, Route Properties, Path Building Criteria, Skimming Tree, All- or-Nothing Assignment, Capacity Restraint Techniques, Reallocation of Assigned Volumes, Equilibrium Assignment, Selection of corridor, Corridor Identification

Textbooks :

1. Introduction to Urban System Planning, Hutchinson, B.G., McGrawHill.
2. Transportation Engineering - An Introduction, Khisty C.J., PrenticeHall

Reference Books:

1. Urban Transportation: Planning, Operation and Management by S. Ponnuswamy and Dr.David Johnson Victor
2 Urban Transportation Research and Development by National academy of engineering

Web References:

1. https://archive.nptel.ac.in/courses/105/107/105107067/
2. https://archive.nptel.ac.in/courses/105/105/105105208/

Professional Elective - I **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE05	**Ground water Engineering**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Water Resources Engineering

Course Objectives :

1. Appreciate groundwater as an important natural resource.
2. Understand flow towards wells in confined and unconfined aquifers.
3. Understand the principles involved in design and construction of wells.
4. Create awareness on improving the groundwater potential using various recharge techniques.
5. Know the importance of saline water intrusion in coastal aquifers and its control measures.

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

1. Estimate aquifer parameters and yield of wells also determine the process of artificial recharge for increasing groundwater potential.
2. Analyse radial flow towards wells in confined and unconfined aquifers and also take effective measures for controlling saline water intrusion.
3. Design wells and understand the construction practices.
4. Interpret geophysical exploration data for scientific source finding of aquifers.
5. Apply appropriate measures for groundwater management.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	-	-	-	-	-	-	2	2	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	2	2	2	-	-	-	-	-	-	2	-	-	2	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-

UNIT - 1 Lecture Hours: 12

Introduction Groundwater in the hydrologic cycle, groundwater occurrence, forms of subsurface water, Aquifer parameters and their determination, general groundwater flow equation**. Artificial Recharge: Concept** of artificial recharge of groundwater, recharge methods-basin, stream-channel, ditch andfurrow, flooding and recharge well methods, recharge mounds and induced recharge.

UNIT - 2 Lecture Hours: 12

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. **Saline Water Intrusion** Occurrence of saline water intrusion, Ghyben- Herzberg relation, Shape of interface, control of salinewater intrusion.

UNIT - 3 Lecture Hours: 10

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. **Well Design** Water well design-well diameter, well depth, well screen-screen length, slot size, screen diameter and screen selection, design of collector wells, infiltration gallery

UNIT - 4 Lecture Hours: 12

Geophysics Surface methods of exploration of groundwater – Electrical resistivity and Seismic refraction methods, Sub-surface methods – Geophysical logging and resistivity logging. Aerial Photo geometry applications

UNIT - 5 Lecture Hours: 12

Groundwater Modeling 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

Textbooks :

1. Groundwater, Raghunath H M, New Age International Publishers, 2005.
2. Groundwater Hydrology, Todd D. K., Wiley India Pvt Ltd., 2014.
3. Groundwater Hydrology, Todd D K and L W Mays, CBS Publications, 2005.

Reference Books:

1. Groundwater Assessment and Management, Karanth K R, Tata McGraw Hill Publishing Co., 1987.
2. Groundwater Hydrology, Bouwer H, McGraw Hill Book Company, 1978.
3. Groundwater Systems Planning and Management, Willis R and W.W.G. Yeh, Prentice Hall Inc., 1986.
4. Groundwater Resources Evaluation, Walton W C, McGraw Hill Book Company, 1978

Web References:

1. https://archive.nptel.ac.in/courses/105/103/105103026/
2. https://unacademy.com/course/ground-water-hydrology-and-well-hydraulics-civil engineering/3UAVPGV4

Professional Elective - II **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE06	**PRESTRESSED CONCRETE**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Reinforced Concrete Design

Course Objectives :

1. Familiarize Students with concepts of prestressing
2. Equip student with different systems and devices used in prestressing
3. Understand the different losses of prestress including short- and long-term losses
4. Familiarize students with the analysis and design of prestressed concrete membersunder flexure, shear and torsion
5. Familiarize students with Codal provisions for prestressed concrete

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

1. Understand the different methods of prestressing.
2. Understand various tensioning devices of prestressing
3. Estimate effective prestress including the short- and long-term losses
4. Analyse and design prestressed concrete beams under flexure and shear
5. Understand the relevant IS Codal provisions for prestressed concrete

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	2	3	2	2	-	-	-	-	-	-	-	-	2	2	-
CO4	2	3	2	2	-	-	-	-	-	-	-	-	3	3	-
CO5	3	2	-	-	-	2	-	-	-	-	-	-	2	3	-

UNIT - 1 Lecture Hours: 08

Introduction- Basic concepts of prestressing-Advantages and applications of prestressing-General principles of prestressing, High strength concrete-Permissible stresses and characteristics, High strength steel-Permissible methods and Pre tensioning and Post tensioning systems, Basic assumptions in analysis of prestressed concrete.stresses and characteristics. **Methods and systems of prestressing**-Pre tensioning and Post tensioning

UNIT - 2 Lecture Hours: 06

Losses in prestressing - 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.

UNIT - 3 Lecture Hours: 07

Analysis of sections for flexure-prestressed beams with different tendon profiles-resultant stresses, concept of load balancing-stresses in tendons. Design for Flexural resistance- Types of

flexural failure – Code procedures.

UNIT - 4 Lecture Hours: 07

Shear: Design for Shear and Torsion- Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion

UNIT - 5 Lecture Hours: 06

Transfer of Prestress in pre tensioned members- Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stressdistribution in end block- Anchorage Zone reinforcement.

Textbooks :

1. Prestressed Concrete by N. Krishna Raju, sixth Edition 2018, Tata McGraw hill
2. Prestressed Concrete by S. Ramamrutham, fifth Edition 2013, Dhanpat Rai Publishing Company Private Limited-New Delhi
3. Prestressed Concrete by K.U.Muthu,

Reference Books:

1. Prestressed Concrete Analysis And Design Fundamentals by Naaman A.E. 2013, McGraw Hill India
2. Prestressed Concrete, by P. Dayaratnam, Third Edition 2018, Oxford & IBH PublishingCo Pvt.Ltd

Web References:

1. https://archive.nptel.ac.in/courses/105/106/105106118/
2. https://unacademy.com/goal/civil-engineering/CCIIL/free-platform/reinforced-concrete-structure/prestressed-concrete/JRBLN

Professional Elective - II **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE07	**AIR POLLUTION CONTROL**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Environmental Studies

Course Objectives :

1. To know the analysis of air pollutants
2. To know the applications for removal of various oxide
3. To know the properties of the atmosphere and air quality
4. To acquire the design principles of particulate and gaseous control
5. To learn the control methods of use and reuse of environmentally friendly fuels

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

1. Decide the ambient air quality based on the analysis of air pollutants
2. Describe the application for removal of various oxide emitted from various sources
3. Judge the plume behaviour in a prevailing environmental condition
4. Design particulate and gaseous control measures for an industry
5. Describe the methods of use and reuse of environmentally friendly fuels

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	3	-	-	-	-	-	3	-	-
CO2	3	-	2	-	-	-	2	-	-	-	-	-	2	-	-
CO3	2	-	2	-	-	-	2	-	-	-	-	-	2	-	-
CO4	2	2	3	-	-	-	2	-	-	-	-	-	2	2	-
CO5	2	2	2	-	-	-	2	-	-	-	-	-	2	-	-

UNIT - 1 Lecture Hours: 08

Air Pollution: Sampling and analysis of air pollutants, conversion of ppm into µg/m^3. Definition of terms related to air pollution and control - secondary pollutants - Indoorair pollution – Ozone holes and Climate Change and its impact - Carbon Trade.

UNIT - 2 Lecture Hours: 06

Thermodynamics and Kinetics of Air-pollution: Applications in the removal of gases likeSO, NO, CO and HC - Air-fuel ratio- Computation and Control of products of combustion, Automobile pollution. Odour pollution control, Flares.

UNIT - 3 Lecture Hours: 07

Meteorology and Air Pollution: Properties of atmosphere: Heat, Pressure, Wind forces, Moisture and relative Humidity, Lapse Rates - Influence of Terrain and Meteorological phenomena on plume behaviour and Air Quality - Wind rose diagrams and Isopleths PlumeRise Models

UNIT - 4 Lecture Hours: 07

Air Pollution Control: Control of particulates – Control at Sources, Process Changes, Equipment modifications, Design and operation of control Equipment's – Settling Chambers, Cyclone separators –Fabric filters–Scrubbers, Electrostatic precipitators

UNIT - 5 Lecture Hours: 06

Air Pollution Control Methods: Control of NO and SO emissions – Environmentally friendly fuels - In-plant Control Measures, process changes, methods of removal and recycling. Environmental criteria for setting industries and green belts.

Textbooks :

1. Air Pollution and Control by K.V.S.G. Murali Krishna 2015, Laxmi Publications,New Delhi.
2. Air Pollution by M. N. Rao and H. V. N. Rao, Tata McGraw Hill Company.2001

Reference Books:

1. An Introduction to Air pollution by R. K. Trivedy and P.K. Goel, B.S. Publications.2005
2 Air Pollution by Wark and Warner - Harper & Row, New York.

Web References:

1. https://onlinecourses.nptel.ac.in/noc23_ce14/preview
2. https://unacademy.com/class/air-pollution-control/7Q3GF90J

Professional Elective - II **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE08	**CONSTRUCTION TECHNOLOGY AND MANAGEMENT**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Building Materials, Concrete Technology

Course Objectives :

1. To introduce to the student, the concept of project management including networkdrawing and monitoring.
2. To introduce the student to various techniques in project scheduling.
3. To introduce student to various elements of project management tools
4. To introduce the various equipment related to construction like earth moving equipment, trucks and handling equipment, aggregate production and construction equipment and machinery.
5. To introduce the importance of safety in construction projects

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

1. understand the importance of construction planning
2. understand the various project planning tools.
3. understand the functioning of various earth work equipment
4. know the methods of production of aggregate products and concreting
5. apply the gained knowledge to project management and construction techniques

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	-	2	-	-	-	-	1	-	2	3	-
CO2	2	2	-	2	-	3	-	-	-	-	2	-	3	3	-
CO3	3	-	-	3	-	3	-	-	-	-	1	-	3	2	-
CO4	3	3	3	3	-	2	-	-	-	-	2	-	2	3	-
CO5	2	3	3	2	-	3	-	-	-	3	2	-	3	2	-

UNIT - 1 Lecture Hours: 08

Construction project management and its relevance: qualities of a project manager – project planning – coordination –scheduling - monitoring – bar charts – milestone charts – critical path method

UNIT - 2 Lecture Hours: 06

Project evaluation and review technique: cost analysis - updating – crashing for optimum cost – crashing for optimum resources – allocation of resources, introduction to software for construction management project management using PRIMAVERA (or) equivalent.

UNIT - 3 Lecture Hours: 07

Construction equipment economical considerations: earthwork equipment – Trucks and handling equipment – rear dump trucks – capacities of trucks and handling equipment –

calculation of truck production – compaction equipment – types of compaction rollers

UNIT - 4 Lecture Hours: 07

Hoisting and earthwork equipment: hoists – cranes – tractors - bulldozers – graders – scrapers– draglines - clamshell buckets

Concreting equipment: concrete mixers –mixing and placing of concrete – consolidating and finishing-crushers – jaw crushers – gyratory crushers – impact crushers – selection of crushingequipment - screening of aggregate

UNIT - 5 Lecture Hours: 06

Construction methods: earthwork – piling – placing of concrete – form work – fabrication and erection – quality control and safety engineering. Introduction to BIM for Civil Engineers(Building Information Modelling).

Textbooks :

1. Construction Planning, Equipment and Methods' by Peurifoy and Schexnayder,Shapira by seventh Edition 2010, Tata Mcgrawhill
2. Construction Project Management Theory and Practice' by Kumar Neeraj Jha, secondedition 2015, Pearson Education India.
3. 'Construction Technology' by Subir K. Sarkar and Subhajit Saraswati 2008, OxfordUniversity press.
4. Project Planning and Control with PERT and CPM, by B. C. Punamia and K KKhandelwal, fifth edition 2016, Laxmi Publications Pvt Ltd. Hyderabad

Reference Books:

1. 'Construction Project Management - An Integrated Approach' by Peter Fewings,Taylor and Francis, Third edition 2019, Routledge
2. 'Construction Management Emerging Trends and Technologies' by Trefor Williams,Cengage learning, First Edition 2009, Delmarcengage learning publications
3. Hand Book of Construction Management by P. K. Joy, First Edition 2000, Trinity Press

Web References:

1. https://onlinecourses.nptel.ac.in/noc21_ce21/preview
2. https://unacademy.com/lesson/construction-technology-for-civil-engineers/HLYDUNSG

Professional Elective - II **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE09	**PHYSICO-CHEMICAL PROCESSES FOR WATER WASTE TREATMENT**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Environmental Science, Engineering chemistry

Course Objectives :

1. To educate the students on the basic treatment reactors of the water and waste water.
2. To educate the students on the treatment process of the water and waste water.
3. To explain about the water and waste water purification systems.
4. To explain about the reverse osmosis and the chemical process of the treatment of waterand waste water.
5. To impart the knowledge on the advanced treatment methods of the water and wastewater.

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

1. Understand the treatment equipment of the water and wastewater.
2. Understand the various methods of treatment of water and wastewater.
3. Understand the concept of purification systems for the waterand wastewater.
4. Know the chemical process of the treatment of water and wastewater.
5. Know the knowledge regarding advanced methods for the treatment of water and wastewater.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	2	-	-	3	-	-	-	-	-	3	-	-
CO2	2	2	-	2	-	-	3	-	-	-	-	-	2	-	-
CO3	3	2	-	3	-	-	2	-	-	-	-	-	2	-	-
CO4	2	3	-	3	-	-	2	-	-	-	-	-	2	-	-
CO5	2	3	-	3	-	-	2	-	-	-	-	-	3	2	-

UNIT - 1 Lecture Hours: 08

Process Dynamics, Reactions and Reactors: Reactors used for the Treatment of Waste water,Mass transport processes, The Mass-Balance Principle, Reactions kinetics and reaction rates, Configurations of ideal and non-ideal reactors, Principle of ideal reactor design, completely mixed batch reactors, completely mixed flow reactors

UNIT - 2 Lecture Hours: 06

Coagulation and Flocculation: Coagulation Process, Stability of colloids, Repulsive and Attractive Potentials, destabilization of Colloids, Transport of colloidal particles, Destabilization in Water and Wastewater Treatment by Al(III) and Fe(III).Selection of a coagulant. Sedimentation Processes: Zone Settling, Compression, Sedimentation tank design factors for water and wastewater,

UNIT - 3 Lecture Hours: 07

Water and Waste water Purification Systems: Biological and chemical processes for waterand wastewater purification, Secondary and Tertiary treatment systems with their design factors. **Filtration:** Filtration process, types of filters, slow sand and rapid sand Filtration and their performances. Factors for the consideration of Design of Gravity filters, deep Granular Filters:Filter media, Fluidization and bed expansion in back washing

UNIT - 4 Lecture Hours: 07

Reverse Osmosis: Osmosis and Osmotic Pressure, Water and Solute Diffusion, Propertiesof Cellulose Acetate Membranes, Pre-treatment and Flux Maintenance. **Chemical Oxidation:** Limitation of Oxidative Processes and Oxidizing agents in Water and Wastewater Treatment, Principle and Theories of Chemical Oxidation, Concept and definition,Thermodynamic and kinetic consideration, Role of pH in Chemical Oxidation.

UNIT - 5 Lecture Hours: 06

Advanced Treatment: Adsorption processes: types of adsorption, factors influencing, adsorption equilibrium and development of adsorption isotherms, activated carbon adsorptionkinetics. **Miscellaneous methods:** Ion-Exchange: Exchange processes, Exchange Materials, Exchangereaction, Equilibrium, Exchange Isotherm.

Textbooks :

1. Physical-chemical treatment of water and waste water by Arcadio p. sincere, firstedition 2002, CRC press
2. Physico chemical processes for water quality control by Weber, W.J 1983 John Wileyand sons, Newyork.
3. Environmental Engineering by Peavy, H.S, Rowe, D.R. and Tchobanoglous.G 1985Mc Graw Hills, NewYork

Reference Books:

1. Wastewater Engineering, Treatment and Reuse by Metcalf and Eddy 2003, Tata McGraw-Hill Publication, New Delhi.
2 Foundation Water & Waste Water Engineering by Fair and Gayer.C.A.Sastry 1996Narosa Publishing House, Bombay.

Web References:

1. https://onlinecourses.nptel.ac.in/noc22_ch25/preview
2. https://shop.elsevier.com/books/physicochemical-methods-for-water-and-wastewater-treatment/mack/978-0-08-024013-8

Professional Elective - II **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE10	**Irrigation Design And Drawing**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Water Resource Engineering I and Water Resource Engineering II, Engineering Drawing

Course Objectives :

1. To understand design principle of irrigation structures to regulate surplus water from a tank
2. To understand design principle of irrigation structures to regulate a sluice which is water channel controlled at its head by a gate
3. To understand design principle of irrigation structures for flow control and to stabilize waterways and prevent the formation of gullies by using different shapes like trapezoidal.
4. To understand design principle of irrigation structures to control and regulate the waterentering the off-take channel.
5. To understand design principle of irrigation structures to drain liquid from the reservoirby liquid flow that passes over a higher level than the liquid surface in the reservoir

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

1. know how surplus water will regulate by designing of Surplusirrigation Structures.
2. know how water channel will control by designing Tank Sluicewith tower head.
3. how flow will control and stabilize waterway bydesigning Canal Drop – Notch Type.
4. know how flow will control by diverting canal from parentcanal by designing canal regulator.
5. liquid will drain from reservoir by liquid flow thatpasses over higher level by designing Syphon Aqueduct Type III

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	2	-	-	2	2	-
CO2	3	2	2	2	-	-	-	-	-	2	-	-	2	2	-
CO3	2	2	-	3	-	-	-	-	-	2	-	-	3	2	-
CO4	2	2	-	3	-	-	-	-	-	2	-	-	3	2	-
CO5	3	3	3	2	-	-	-	-	-	2	-	-	2	2	-

UNIT – 1 Lecture Hours: 09

Design of Surplus Weir

UNIT – 2 Lecture Hours: 10

Design of Tank Sluice with a Tower head

UNIT – 3 Lecture Hours: 09

Design of Canal Drop – Notch Type

UNIT – 4 Lecture Hours: 10

Design of Canal Regulator

UNIT – 5 Lecture Hours: 10

Design of Syphon Aqueduct Type - III

Textbooks :

1. Water Resources Engineering – Principles and Practice by C. Satyanarayana Murthy,Second Edition, 2000, New age International Publishers.
2. Water Resources Engineering - Handbook of Essential Methods and Designby AnandPrakash, 2004, American Society of Civil Engineers

Reference Books:

1. Irrigation Engineering and Hydraulic Structures, S. K. Garg, Nineteenth Edition,August 2005, Khanna Publications.
2. Irrigation and Water Power Engineering by B. C Punmia, Seventeenth Edition 2021,Lakshmi Publications Pvt. Ltd., New Delhi.

Web References:

1. https://nptel.ac.in/content/storage2/courses/105105110/pdf/m3l01.pdf
2. https://nptel.ac.in/courses/105/105/105105110/

Professional Elective - III **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE11	**Conservation Building Technology**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Environmental sciences, building materials

Course Objectives :

1. To impart knowledge of the principles behind the green building technologies and understand the green building rating systems.
2. Initiating the student about the criteria used for site selection and water efficiency methods.
3. To understand the principles energy efficiency of resources management in buildings.
4. Initiating the student with the knowledge of building materials and technologies.
5. To understand the methodologies used to maintain indoor environmental quality and waste managements

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

1. Define a green building, along with its features, benefits and rating systems.
2. Describe the criteria used for site selection and water efficiency methods.
3. Explain the energy efficiency terms and methods used in green building practices.
4. Select the materials for sustainable built environment & adopt waste management methods.
5. Describe the methods used to maintain indoor environmental quality and waste management.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	3	-	-	-	-	-	3	-	-
CO2	2	2	-	-	-	-	2	-	-	-	-	-	2	-	-
CO3	3	2	-	2	-	-	3	-	-	-	-	-	3	-	-
CO4	2	3	-	-	-	-	2	-	-	-	-	-	2	-	-
CO5	2	2	-	-	-	-	2	-	-	-	-	-	2	-	-

UNIT - 1 Lecture Hours: 10

Introduction of green building technology: Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green Technology – definition, Importance, advantages and disadvantages, factors affecting green technologies, Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT - 2 Lecture Hours: 10

Site selection and planning: Criteria for site selection, preservation of landscape, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc. **Water conservation and efficiency:** Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, waste water treatment, recycle and reuse systems.

UNIT - 3 Lecture Hours: 08

Energy Efficiency: Environmental impact of building constructions, Methods to reduce operational energy: Energy efficient building envelopes, energy efficient appliances for HVAC systems in buildings, zero ozone

depleting potential (ODP) materials, wind and solar energy harvesting , concept of net zero buildings

UNIT - 4 Lecture Hours: 08

Environmentally friendly building materials and technologies: Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, Ferro-cement and Ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc,

UNIT - 5 Lecture Hours: 10

Indoor Environmental Quality for Occupant Comfort and Wellbeing: Day lighting, air ventilation, exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc. **Waste Management:** Handling of construction waste materials, on-site and off-site organic waste management

Textbooks :

1. Alternative building material and technologies by K.S.Jagadish, B.V.Venkatamana Reddy and K.S.Nanjunda Rao 2009, New Age International Pvt Ltd Publisher.
2. Non-Conventional Energy Resources by G.D.Rai 2012, Khanna Publishers.

Reference Books:

1. Sustainable Building Design Manual by TERI Volume I and II 2004 New Delhi.
2 IGBC Green Homes Rating System by Abridged reference guide, Version 2.0. 2013, Indian Green Building Council Publishers

Web References:

1. https://nptel.ac.in/noc/courses/noc19/SEM2/noc19-ce40/
2 https://gosmartbricks.com/green-building-technology-concept-need-and-types/

Professional Elective - III **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE12	**Advance Environmental Engineering**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Environmental Engineering, water resources engineering

Course Objectives :

1. Outline planning and the design of wastewater collection, conveyance and treatment systems for a community/town/city
2. Provide knowledge of characterisation of wastewater generated in a community
3. Impart understanding of treatment of sewage and the need for its treatment.
4. Summarize the appurtenance in sewerage systems and their necessity
5. Effluent disposal method and realise the importance of regulations in the disposal of effluents in rivers.

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

1. Plan and design the sewerage systems
2. Select the appropriate appurtenances in the sewerage systems
3. Analyse sewage and suggest and design suitable treatment system for sewage treatment
4. Identify the critical point of pollution in a river for a specific amount of pollutant disposal into the river
5. Suggest a suitable disposal method with respect to effluent standards.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	-	2	-	-	-	-	-	3	-	-
CO2	2	2	-	-	-	-	2	-	-	-	-	-	2	-	-
CO3	2	2	2	2	-	-	3	-	-	-	-	-	2	-	-
CO4	2	2	2	2	-	-	2	-	-	-	-	-	3	-	-
CO5	2	-	2	-	-	-	2	-	-	-	-	-	2	-	-

UNIT - 1 Lecture Hours: 10

Introduction to Sanitation – Systems of sanitation – relative merits & demerits – collection and conveyance of waste water – sewerage – classification of sewerage systems- Estimation of sewage flow and storm water drainage – fluctuations – types of sewers - Hydraulics of sewers and storm drains– design of sewers – appurtenances in sewerage – cleaning and ventilation of sewers.

UNIT - 2 Lecture Hours: 10

Sewage characteristics – Sampling and analysis of wastewater - Physical, Chemical and Biological Examination-Measurement of BOD and COD - BOD equations. Treatment of sewage: Primary treatment-Screens-grit chambers-grease traps– floatation– sedimentation – design of preliminary and primary treatment units

UNIT - 3 Lecture Hours: 08

Secondary treatment: Aerobic and anaerobic treatment process comparison. Suspended growth process: Activated Sludge Process, principles, designs, and operational problems, modifications of Activated

Sludge Processes, Oxidation ponds, Aerated Lagoons. Attached Growth Process: Trickling Filters– mechanism of impurities removal- classification–design- operation and maintenance problems. RBCs, Fluidized bed reactors.

UNIT - 4 Lecture Hours: 08

Miscellaneous Treatment Methods: Nitrification and Denitrification – Removal of Phosphates – UASB–Membrane reactors-Integrated fixed film reactors. Anaerobic Processes: Septic Tanks and Imhoff tanks- working Principles and Design–Reuse and disposal of septic tank effluent, FAB Reactors.

UNIT - 5 Lecture Hours: 10

Bio-solids (Sludge) management: Characteristics-SVI, handling and treatment of sludge- thickening – anaerobic digestion of sludge, Sludge Drying Beds. Centrifuge Disposal of sewage: Methods of disposal – disposal into water bodies-Oxygen Sag Curve-Disposal into sea, disposal on land- sewage sickness.

Textbooks :

1.	Wastewater Engineering Treatment and Reuse, Metcalf & Eddy, Tata McGraw-Hill edition.2012
2.	Rural Municipal & Industrial Water Management, K.V.S.G. Murali Krishna. Reem Publications Pvt. Ltd.2008.

Reference Books:

1. Wastewater Treatment for Pollution Control and Reuse, Soli. J Arceivala, Sham R Asolekar, Mc-GrawHill, NewDelhi; 3rd Edition.2017
2. Sewage treatment and disposal, P. N. Modi & Seth, Rajsons Publications Pvt.Ltd.2015

Web References:

1. https://nptel.ac.in/courses/105/104/105104102/
2. https://www.vssut.ac.in/lecture_notes/lecture1424353637.pdf

Professional Elective - III **Regulation: R18**

Course Code	Course Name	L	T	P	C
P18CEE13	**Pavement Analysis And Design**	**3**	**0**	**0**	**3**

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Transportation Engineering I&II, Geotechnical engineering II

Course Objectives :

1. To know various factors affecting pavement design
2. To know various concepts for the stresses in pavements.
3. To acquire design principles of flexible pavements.
4. To acquire design principles of rigid pavements
5. To acquire design principles of shoulders and drainages.

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

1. Understand factors affecting pavement design
2. Understand stresses in pavements.
3. Design flexible pavements using various methods
4. Design rigid pavements using various methods
5. Design shoulders and drainage.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-

UNIT - 1 Lecture Hours: 10

Factors affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads

UNIT - 2 Lecture Hours: 10

Stresses in Pavements: Stress in Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts; Stresses in Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars, Introduction to DAMA, KENLAYER & KENSLABS Programs

UNIT - 3 Lecture Hours: 08

Design of Flexible Pavements: Flexible Pavement Design Concepts, Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO, Road Note No 29 & IRC Methods, Design of

Runways & Taxiways, Design of Low Volume Rural Roads

Course Code	Course Name	L	T	P	C

UNIT - 4 Lecture Hours: 08

Design of Rigid Pavements: Calibrated Mechanistic Design Process, PCA, AASHTO & IRC Specifications, Introduction to Prestressed and Continuously Reinforced Cement Concrete Pavement Design, Rigid Pavement Design for Low Volume Rural Roads

UNIT - 5 Lecture Hours: 10

Design of Shoulders and Drainage: Shoulder Design Considerations, Traffic Prediction, Parking, Regular & Encroaching Traffic, Thickness Design Specifications for Flexible & Rigid Shoulders; Pavement Drainage Concepts, Drainage Related Failures, Inflow-Outflow Concepts, Condition of Continuity, Surface and Sub Surface Drainage Design Specifications

Textbooks :

1.	Pavement Analysis and Design by Yang H. Huang, Second Edition 2003, Pearson Education.
2.	Principles of Pavement Design by Yoder. J. &Witczat Mathew, Second Edition 1991, W. John Wiley & Sons Inc

Reference Books:

1. Design of Functional Pavements by Nai C. Yang 1972, McGraw Hill Publications
2. Pavement and Surfacing's for Highway & Airports by Micheal Sargious 1975, Wiley

Web References:

1. https://nptel.ac.in/courses/105/105/105105107/
2. https://easyengineering.net/pavement-analysis-and-design-book-pdf/

Professional Elective - III **Regulation: R18**

P18CEE14	Solid and Hazardous Waste Management	3	0	0	3

Internal Marks: 40 **External Marks:** 60

Course Prerequisite: Environmental studies

Course Objectives :

1. To understand the source of solid waste, their properties and its handing
2. To know the types of hazardous waste and their disposal
3. To aware the legal aspects of hazardous waste management
4. To know about Handling, Storage, Processing, Transportation,
5. To aware the materials in municipal solid waste. Biological, thermal, chemicalprocessing waste management.

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

1. Know the various type solid waste, their properties and their treatment
2. Know the types of hazardous waste, their disposal and their legal aspects
3. Understand the methods of solid and hazardous waste disposal
4. Aware the site remedial technology
5. Know about recycling of materials in municipal solid waste. Know about variousbiological, thermal, chemical processing.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	3	-	-	-	-	-	3	-	-
CO2	3	2	3	3	-	-	2	-	-	-	-	-	3	-	-
CO3	2	3	2	2	-	-	3	-	-	-	-	-	3	-	-
CO4	3	-	3	3	-	-	2	-	-	-	-	-	3	-	-
CO5	2	2	3	2	-	3	3	-	-	2	2	-	2	2	-

UNIT - 1 Lecture Hours: 10

SOLID WASTES: Sources, types, composition, physical, chemical, and biological propertiesof solid wastes, sources and types of hazardous and infectious wastes in municipal solid wastes.

UNIT - 2 Lecture Hours: 10

SOILD WASTE COLLECTION: Solid Waste Generation and Collection Solid Waste Generation and Collection: Handling, Storage, Processing, Transportation.

UNIT - 3 Lecture Hours: 08

DISPOSAL OF SOLID WASTE: Materials Separation and Processing, Thermal Conversion, Biological and Chemical Conversion, Recycling of Material in Municipal Solid Wastes, Land-Filling, Composting, Gas Generation, Closure of Land-Fills. Hazardous Wastes, Fundamentals, Fate, and Transport of Contaminants, Toxicology Origin, Quantity and QualityParameters.

UNIT - 4 Lecture Hours: 08

BIOMEDICAL / INFECTIOUS WASTE: Composition, Collection, Handling and Disposal. Legal aspects of Hazardous Waste Management: Collection, Conveyance, Treatment and Disposal.

Course Code	Course Name	L	T	P	C

UNIT - 5 Lecture Hours: 10

HAZARDOUS WASTE MANAGEMENT PRACTICES: Environmental Audits, Pollution Prevention. Treatment and Disposal Methods: Physicochemical Processes, Biological Methods, Stabilization & Solidification, Thermal Methods, Land Disposal, Site & Subsurface Characterization, Remedial Technologies.

Textbooks :

1. Techno Banoglous, Theisen and Vigil, Integrated Solid Waste Management, McGraw Hill. Publication, 1993.
2. Solid and Hazardous Waste Management PM Cherry, CBS Publishers and Distributors. New Delhi, 2016.

Reference Books:

1. Solid Waste Engineering by Vesilind, P.A., Worrell, W., Reinhart, D., Cenage learning, Second Edition 2004, New Delhi.
2. Hazardous Waste Management by Charles A. Wentz 1995, McGraw Hill Publication.

Web References:

1. https://nptel.ac.in/courses/105/106/105106056/
2. https://nptel.ac.in/courses/105/103/105103205/

Professional Elective - III **Regulation: R18**

P18CEE15	Environmental Geo-Technology	3	0	0	3

Internal Marks: 40 **External Marks:** 60

Course Prerequisites: Geo-technology Engineering & Environmental Engineering

Course Objectives :

1. Familiarize with geotechnical problems and environmental concerns with solid wastes.
2. Study about various sources of contamination of ground and characterization methods.
3. Familiarize with different transport process and their modelling.
4. To get familiarize with various remediation methods.
5. Familiarize with different landfills and collection systems.

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

1. Learn about geotechnical problems regarding solid wastes and characterization of solidwastes.
2. Identify potential problems in soil due to contaminants and characterize thecontaminated ground.
3. Different contaminant transport processes and their modelling.
4. Identify the most appropriate remediation technique.
5. Learn about waste containment liners and their collection system.

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	2	-	-	3	-	-	-	-	-	3	-	-
CO2	2	2	2	2	-	-	2	-	-	-	-	-	2	-	-
CO3	2	-	3	-	-	-	2	-	-	-	-	-	2	-	-
CO4	2	2	2	-	-	-	2	-	-	-	-	-	2	-	-
CO5	2	-	2	-	-	-	2	-	-	-	-	-	2	-	-

UNIT – 1 Lecture Hours: 10

Introduction - Environmental cycles - Soil and water - Environmental interaction relating to geotechnical problems - Effect of pollution on soil - water behaviour - Classification of waste, Characterization solid wastes, Environmental Concerns with waste.

UNIT – 2 Lecture Hours: 10

Sources and Site Characterization: Scope of Geo-environmental Engineering, Sources, types and composition of different wastes, Various Sources of Contaminations, Potential problems in soils due to contaminants, Need for contaminated site characterization; and Characterizationmethods.

UNIT – 3 Lecture Hours: 08

Contaminant Transport: Transport process, Ground water pollution downstream of landfills, Mass-transfer process, Modelling, Bioremediation, and Phytoremediation.

UNIT – 4 Lecture Hours: 08

Remediation Techniques: Objectives of site remediation, various active and passive methods, remediation NAPL sites, Emerging Remediation Technologies.

UNIT – 5 Lecture Hours: 10

Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, engineered landfills (including basal liner and cover liner systems), Gas collection system.

Textbooks :

1. Geo-environmental Engineering by Sharma, H. D. and Reddy, K. R, Second Edition2004, John Wiley & Sons
2. Introduction to Environmental Geo technology by Hsai Yang Fang and John Daniel,Second Edition 2004, CRC press, Taylor and Francis

Reference Books:

1. Geotechnical and Environmental Aspects of Waste Disposal Sites by R W Sarsby andA J Felton, First Edition 2006, CRC Press.
2. Introductory Geotechnical Engineering: An Environmental Perspective by Hsai-yangFang And John L Daniels, First Edition 2006, CRC Press

Web References:

1. https://nptel.ac.in/courses/105/103/105103025/
2. https://www.springer.com/gp/book/9789811370090