SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution & Accredited by NAAC with "A" Grade)
(An Autonomous Institution)
(As per UGC Regulations 2018)
Madagadipet, Puducherry - 605 107

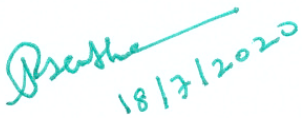
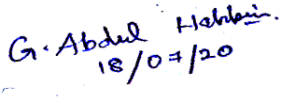
Department of Civil Engineering

18.07.2020

Minutes of Board of Studies

The first Board of Studies meeting of Department of Civil Engineering was held on 18th July 2020 at 10:30 A.M in the Simulation Lab, Mechanical Block, Sri Manakula Vinayagar Engineering College with Head of the Department in the Chair.

The following members were present for the BoS meeting

Sl.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. S.Sundararaman Professor and Head Department of Civil, SMVEC	Chairman	
External Members			
2	Dr R Senthil Professor& HOD Civil, Division of Structural Engineering, Department of Civil Engineering, College of Engg., Guindy, Anna University, Chennai	Pondicherry University Nominee	
3	Dr.R.Malathy Professor and Dean (Research) Dept. of Civil Engineering, Sona College of Technology, Salem	Academic Council Nominee	
4	Dr A Rose Enid Teresa Professor and Head Rajalakshmi Engineering College, Chennai	Academic Council Nominee	
5	Dr.B.Parthiban Assistant Manager – Structural Designer, Fujita Engineering India Pvt. Ltd., Chennai	Member	
6	Shri. G. Abdul Hakkim (Alumni) Design Engineer Emmarde Steel Private Limited, Puducherry	Member	

Internal Members			
1	Dr. S. Jayakumar	Member	
2	Ms.G . Yamuna	Member	
3	Mr. K. Srinivasan	Member	
4	Mr. S. Sivaprasath	Member	
Co-opted Members			
1	Prof. D.Jaichithra	Member	
2	Dr.T Sivaranjini	Member	
3	Dr.S.Deepa	Member	
4	Mr.M.Devanathan	Member	

Agenda of the Meeting

1) Discuss about the curriculum Structure of B.Tech – Civil Engineering
2) To discuss and approve the B.Tech. Degree Regulations 2020 (R-2020), Curriculum from I to VIII semesters and syllabi for I to IV Semesters for the B.Tech – Civil Engineering and the students admitted in the Academic Year 2020-21. (First Year).
3) To discuss and approve the B.Tech. Degree Regulation 2019, Curriculum from I to VIII semesters and syllabi for I to IV Semesters for the B.Tech – Civil Engineering and the students admitted in the Academic Year 2019-20 (Second Year)
4) To discuss and approve the B.Tech. Degree Curriculum and Syllabi from I to VIII semesters under Pondicherry University Regulations 2013 for the B.Tech – Civil Engineering and the students admitted in the Academic Year 2017-18 (Final Year) and in the Academic Year 2018-19 (Third Year)
5) To discuss about the uniqueness of the Curriculum (R-2020)
6) To discuss and approve Evaluation Systems
7) To discuss about the Innovative Teaching / Practices Methodology adopted to handle the emerging. / Advanced Technological concept courses
8) To discuss and approve the Ph.D programme in Civil Engineering for the students admitted in the Academic Year 2019-20
9) Any other item with the permission of chair

Minutes of the Meeting

Dr. S.Sundararaman, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

Item:1	The Curriculum Structure of B.Tech – Civil Engineering has been discussed
Item:2	Recommended to academic council with following corrections in the Curriculum and Syllabus of Regulation 2020: 1. In the First Semester, "Fundamentals of Civil and Mechanical Engineering" subject need to be removed and include preliminary study of any professional core subject (Building Materials or Building Technology). 2. The subject in fourth semester "Operational Research" need to changed to fifth semester and the subject "Numerical Methods" in fifth semester to be in fourth semester 3. Instead of mentioning the subject " E-Tabs Laboratory" in the fourth semester, it can be "Modeling and Analysis Laboratory"
Item:3	2019 Regulation, Curriculum & Syllabus has been approved and recommended for Academic Council
Item:4	2013 Regulation, Curriculum & Syllabus has been approved and recommended for Academic Council
Item:5	Uniqueness of the Curriculum (R-2020) has been discussed and found satisfactory
Item:6	Discussed on the Evaluation System in regulations 2020, 2019 and recommended to academic council
Item:7	Discussed about the Innovative Teaching / Practices Methodology adopted to handle the emerging / Advanced Technological concept courses and found satisfactory
Item:8	PhD Regulation has been approved and recommended to Academic Council

The meeting was concluded at 12:30 PM with vote of thanks by **Dr. S.Sundararaman**, Head of Department, Civil Engineering.

18/7/20

Dr.S.Sundararaman
HOD/Civil
Chairman –BoS (Civil)

Dr.V.S.K. Venkatachalapathy
Director cum Principal
Chairman – Academic council

Annexure I

ITEM 1

CURRICULUM STRUCTURE OF R2019

(B.TECH – CIVIL ENGINEERING)

S.No	Course Category	Breakdown of Credits
1	Humanities and Social Science (HS)	09
2	Basic Sciences(BS)	38
3	Engineering Sciences (ES)	36
4	Professional Core (PC)	61
5	Professional Electives (PE)	18
6	Open Electives (OE)	09
7	Project Work and Internship (PW)	12
8	Employability Enhancement Courses (EEC*)	-
9	Mandatory courses (MC*)	-
	Total	**183**

Components	No. of Subjects
Theory	43
Practical	24
Project	3
Mandatory Course	5
Employability Enhancement Course	14

CURRICULUM STRUCTURE OF R2020

(B.TECH – CIVIL ENGINEERING)

S.No	Course Category	Breakdown of Credits
1	Humanities and Social Science (HS)	07
2	Basic Sciences(BS)	19
3	Engineering Sciences (ES)	22
4	Professional Core (PC)	77
5	Professional Electives (PE)	18
6	Open Electives (OE)	9
7	Project Work (PW)	10
8	Internship (PW)	02
9	Employability Enhancement Courses (EEC*)	-
10	Mandatory courses (MC*)	-
Total		**164**

Components	No. of Subjects
Theory	42
Practical	26
Project	3
Mandatory Course	7
Employability Enhancement Course	15

Annexure II

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

ACADEMIC REGULATIONS 2019
(R-2019)

BACHELOR OF TECHNOLOGY PROGRAMMES

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SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

BACHELOR OF TECHNOLOGY PROGRAMMES
(Eight Semesters)

REGULATIONS 2020

CHOICE BASED CREDIT SYSTEMS (CBCS)

(Common to all B.Tech. Full time Programmes)

1. INTRODUCTION

1.1 All the thirteen Under Graduate Engineering programmes shall be governed by the rules and regulations provided in this version of Academic Regulations. The curriculum of each programme provides broad based knowledge, quality content of courses, academic flexibility, scope for multi-disciplinary learning activities, and opportunities for industry oriented projects. The curriculum designed shall be in line with the Outcome Based Education (OBE).

1.2 The stringer evaluation norms shall be followed to maintain quality of engineering education. The examination system shall be transparent and governed by the rules, regulations and time bounded activities.

1.3 The semester system shall be adopted for academic activities in the college. Normally, odd semester starts in second week of June and even semester starts in second week of December.

1.4 The provisions made in this document shall govern the policies and procedures, curriculum, course delivery, evaluation system and conduct of the examinations.

1.5 The medium of instruction throughout the programme shall be in English.

1.6 Sri Manakula Vinayagar Engineering College (SMVEC) envisions to nurture knowledge, skills, attitude and values of the aspiring youth to enable them to become global citizens. To achieve this process, the institution has evolved a flexible integrated academic curriculum. This OBE is acquired by the learners of a programme under 'Learner Centric' Model. With an intense consideration of OBE process, the Educational system of SMVEC has been framed to provide the needful scope for the learners through the CBCS that will pave the platform to strengthen their knowledge, skills, attitude and values.

Objectives of CBCS

- To shift focus from the teacher-centric to student-centric education
- To allow students to choose inter-disciplinary, intra-disciplinary and skill oriented courses from the choices to provide more flexibility in learning systems
- To make education broad-based on par with global standards

- ❖ To help students to earn credits by choosing unique combination of courses
- ❖ To offer flexibility for students to get international exposure by providing International Certificate Courses.
- ❖ To provide necessary flexibility to students to gain the vital life skills
- ❖ To equip students to keep abreast of industrial requirements and societal needs

1.7 The rules and regulations shall be subjected to amendment made by the Academic Council (AC) from time to time based on the recommendations of the Board of Studies (BoS).

2. PRELIMINARY DEFINITIONS AND NOMENCLATURE

College	:	Sri Manakula Vinayagar Engineering College
University	:	Pondicherry University
Programme	:	B.Tech Degree Programme
Discipline/ Department	:	Branch or specialization of B.Tech Degree Programme like Civil Engineering, Mechanical Engineering, etc.
Course	:	Theory /Practical course that is normally studied in a semester like Mathematics, Computer Programming, etc.
Core Course	:	Compulsory course in the curriculum
Elective Course	:	An optional course in the curriculum
Head of the Institution	:	The Director / Principal
Controller of Examinations (CoE)	:	The authority of the Institution who is responsible for all activities of the End Semester Examinations of the institution
Lateral Entry	:	Admission of students directly into the second year of B.Tech. Degree programme after completion of Diploma Course in Engineering
L – T – P – PW – C	:	**L** - **L**ecture, **T**- **T**utorial, **P**- **P**ractical, **PW**–**P**roject **W**ork and **C - C**redits respectively
Curriculum	:	The various components / courses studied in each programme that provide appropriate outcomes(knowledge, skills and attitude/ behaviour) in the chosen branch of study.
Semester Grade Point Average (SGPA)	:	Weightage of average grade points of subjects in a semester.
Cumulative Grade Point Average (CGPA)	:	Weightage of average grade points of all subjects in all semesters completed by a student
Odd semester	:	Semester is typically from June to November
Even semester	:	Semester is typically from December to April
Period	:	50 minutes duration of a theory / practical class

Day	:	8 periods of theory / practical classes in a calendar day
Enrolment	:	Enlistment of a student in the rolls of a class in an academic year
Arrear	:	A course in which a student has failed (*has not fulfilled the examination passing criteria)*
CAT	:	Continuous Assessment Test
CAM	:	Continuous Assessment Test Marks
ESE	:	End Semester Examination
ESM	:	End Semester Examination Marks
EEC	:	Employability Enhancement Course
Regular Examination	:	An examination conducted in a semester for a course which is prescribed in the curriculum of that semester
Arrear Examination	:	Semester examination conducted exclusively for the students who have failed in previous attempts
First Attempt	:	Appearance in the semester examination of a course in a semester in which the student has registered for the course. If a student has registered for a course in a semester and 'Absent' for the semester examination conducted in that semester, it is also treated as the *First Attempt*
Academic Council (AC)	:	Apex academic body to scrutinize and approve the proposals with or without modification of the Boards of Studies with regard to courses of study, academic regulations, curricula, syllabi and modifications thereof, instructional and evaluation arrangements, methods, procedures relevant thereto etc.,
Board of Studies (BoS)	:	Apex academic body to prepare syllabi for various courses keeping in view the objectives of the college, interest of the stakeholders and national requirement into consideration
Academic Standing Committee (ASC)	:	ASC shall perform the functions under emergent situations subject to ratification by the Academic Council (AC)
Academic Appeals Board (AAB)	:	If a student finds some anomaly in the award of marks in the Continuous Assessment Test and in End Semester examination, he/she can make an appeal to the *Academic Appeals Board* for review of marks awarded
Departmental Advisory Committee (DAC)	:	Committee formulate a process to review post implementation effects of curriculum and suggest various measures to ensure academic standard and its excellency of the course offered by the department
Department Consultative Committee (DCC)	:	Review, revise and prepare curriculum structure following institutional policy, suggest improvements in syllabus of a course(s) prepared by course teacher(s) and forward the curriculum to BoS for further recommendation

Programme Academic Coordinator (PAC)	:	Coordination of all academic activities of the department viz Curriculum revision, framing of syllabus, time table, BOS meeting as member secretary, re-registration of course(s), display and submission of attendance status
AICTE	:	All India Council for Technical Education
UGC	:	University Grants Commission
NBA	:	National Board of Accreditation
NAAC	:	National Assessment and Accreditation Council

3. BRANCHES OF STUDY

Sri Manakula Vinayagar Engineering College offers the following B.Tech. programmes:

1. B.Tech - Electrical and Electronics Engineering
2. B.Tech - Electronics and Communication Engineering
3. B.Tech - Computer Science and Engineering
4. B.Tech - Information Technology
5. B.Tech - Instrumentation and Control Engineering
6. B.Tech - Mechanical Engineering
7. B.Tech - Civil Engineering
8. B.Tech - Biomedical Engineering
9. B.Tech - Mechatronics Engineering
10. B.Tech – Computer Science and Business Systems
11. B.Tech – Computer and Communication Engineering
12. B.Tech – Artificial Intelligence and Data Science
13. B.Tech – Fashion Technology

4. ADMISSION ELIGIBILITY

The norms for admission, eligibility criteria such as marks, physical fitness and mode of admission will be as prescribed by the University from time to time.

4.1 First Year B.Tech and Lateral Entry

4.1.1 *B.Tech -First Year*

Candidates for admission to the first semester of the eight semester B.Tech. Degree programme should be required to have passed:

The Higher Secondary Examination of the (10+2) curriculum (Academic Stream) prescribed by the Government of Tamil Nadu or any other examination equivalent there to with minimum of 45% marks (a mere pass for OBC and SC/ST candidates) in aggregate of subjects – Mathematics, Physics and any one of the following optional subjects: Chemistry / Biotechnology/ Computer Science / Biology (Botany & Zoology) or an Examination of any University or Authority recognized by the Executive Council of the Pondicherry University as equivalent thereto.

4.1.2 B.Tech - Lateral Entry

For Lateral entry in to third semester of the eight semester B.Tech programme:

The minimum qualification for admission is a pass in three year diploma or four year sandwich diploma course in Engineering / Technology with a minimum of 60 % marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in the subjects covered from 3rd to final semester or a pass in any

B.Sc. course with Mathematics as one of the subjects of study with a minimum of 60 % marks (50% marks for OBC and a mere pass for SC/ST candidates) in aggregate in main and ancillary subjects excluding language subjects.

4.2 Age Limit

The candidate should not have completed 21 years of age as on 1st July of the Academic year under consideration. In the case of SC/ST candidates, the age limit is relaxable for three years for both the cases. No age limit for Lateral entry to the second year of the degree programme.

5 ACADEMIC STRUCTURE

5.1 Duration of the Program

A student after securing admission shall pursue B.Tech programme for a minimum period of 4 academic years (8 semesters), if not he / she has to complete the degree within the maximum period of 7 years (14 semesters) starting from the commencement of the first semester. For a student admitted in lateral-entry mode, the minimum and maximum period of study shall be 3 academic years (6 semesters) and 6 years (12 semesters) respectively starting from the commencement of the third semester.

5.2 Medium of Instruction

The medium of instruction for the entire undergraduate programme shall be only in English.

6 CURRICULUM STRUCTURE

According to the National Board of Accreditation (NBA) and as per Apex Body of respective department, India, for each Under Graduate (UG) programme, the curriculum has to be evolved after finalizing the Programme Educational Objectives (PEOs) and the corresponding Programme Outcomes (POs). The POs have been directly listed by NBA for UG programmes. Programme Specific Outcomes (PSOs) are to be evolved based on the knowledge and skills developed over the duration of programme. The curriculum that evolves should broadly ensure the achievement of the POs and PSOs, and thus the PEOs of the programme.

6.1 Category of Courses and its Credit Distribution

Course work is measured in units called credit hours or simply credits. The number of hours of a course per week is the number of credits for that course. One credit per lecture hour per week is assigned for each theory course. Laboratory courses are assigned for an hour with 0.5 credits per week. The credit detail of a course and semester is shown in Table 1.

Table 1 Details of number of courses with Credits

Nature of Course	Number of hours				Credits
	L	T	P	PW	
Theory	3	0	0	-	3
	4	0	0	-	4
Theory with Tutorial	3	1	0	-	4
Practical	0	0	2	-	1
	0	0	3	-	1
Project work	0	0	0	20	10

Total Number of Credits	Regular	Between 175 and 180
	Lateral entry	Between 131 and 135
Number of credits per Semester	17 to 26	
Number of courses per semester (for semesters 1)	05 theory + 03 laboratory + EEC + MC	
Number of courses per semester (for semesters 2)	06 theory + 03 laboratory + EEC + MC	
Number of courses per semester (for semesters 3 and 5)	06 theory + 04 laboratory + EEC + MC	
Number of courses per semester (for semesters 6)	06 theory + 03 laboratory+ EEC + MC	
Number of courses per semester (for semester 7)	04 theory + 04 laboratory +[Mini -Project work / Project Work (Phase-I)] + Internship +MC **Note:** Mini -Project work / Project Work (Phase-I) to be in 7th semester with maximum of 02 credits	
Number of courses for semester 8	03 theory + 01 laboratory + Project work (Phase-II) + MC	

EEC – Employability Enhancement Course and **MC** – Mandatory Course

6.2 Course Numbering Scheme

Each course is denoted by a unique code consisting of three alphabets, the first two alphabets represent the discipline of study followed by course type and sequence of numbering for each semester.

6.3 Electives

Every student shall opt electives from the list of electives relating to his/her degree programme in consultation with the Class Advisor, Programme Coordinator and the HoD.

6.4 Project Work

Every student shall be required to undertake a suitable project in industry / research organization / department in consultation with the Head of the Department and the guide and submit the project report thereon at the end of the semesters in which the student registered, on dates announced by the College/Department. A student shall register for the Mini-Project / Project Work (Phase – I) and Project Work (Phase – II) respectively in 7^{th} and 8^{th} semester.

6.5 Online Courses

It is mandatory for every student to register and earn credits for online courses like MOOC/ SWAYAM/NPTEL approved by Department committee consisting of HoD, Programme Coordinator, Class advisor and Subject Expert. Students have to complete relevant online courses successfully to a maximum of 2 credits. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment (CA) pattern) based on the marks secured in online examinations. However, the mandatory courses will not have any weightage in CGPA calculation.

6.6 Mandatory Course

All students shall enroll in any one of the personality and character development activities (NSS / RRC / Sports & Games) during the first year. National Service Scheme (NSS) have social service activities in and around the College. Sports and Games activities include preparation for inter-collegiate sports events. Further training activities will be during weekends, the camps will be normally during vacation period.

6.7 Skill Development Course / Employable Enhancement Course

Students shall opt for industry oriented courses / International skill based certification courses of 40 -50 hours duration, which will be offered by experts from industry / other institution / Centre of Excellence. Students should complete such one-credit courses during the semesters 1 to 6. However, the course credit will not have any weightage in CGPA calculation.

6.8 Industrial Training / Internship

- Students may undergo training or internship during summer / winter vacation at Industry/ Research organization / University (after due approval from the Mentor, Class advisor and Departmental Consultative Committee (DCC)). In such case, the internship/training should be undergone continuously (without break) in one organization. Normally no extension of time period is allowed. However, DCC may provide relaxation based on the exceptional case.
- The student is allowed to undergo internship in reputed industries/organizations, after due process.

7 COURSE ENROLMENT AND REGISTRATION

7.1 Course Registration

The registration for the forthcoming semester courses should be done in online mode, will commence preferably 10 working days prior to the last working day of the current semester.

7.1.1 After registering for all the courses, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Assessment Marks (CAM) and appear for the End Semester Examinations (ESE).

7.1.2 No Elective course shall be offered by any department unless minimum of 30 students to be registered for a course. However, if the students admitted in the associated branch and semester is less than 30, the above said condition will not be applicable.

7.2 Arrear Course Registration

In the first attempt of writing the End Semester Examination of a course if a student fails, the student can decide for any one of the following two options.

7.2.1 Retain Continuous Assessment Marks (CAM) option
In this case, the student retains the existing CAM and proceeds to write the supplementary exams / End Semester Examinations as and when they are conducted.

7.2.2 Re-earn Continuous Assessment Marks (CAM) option
In this case, the student has to re-register by paying the prescribed fee for the

course when it is offered next in the subsequent academic year. The existing CAM will get nullified. The student has to re-earn the CAM by taking-up all the internal tests, assignments and group presentation as per the norms of regulations.

8 EXAMINATION

8.1 Requirements for Appearing End Semester Examination

A student is expected to maintain 100% attendance in all courses because attendance also carries internal marks (Clause 10.3). A student will be qualified to appear for end semester examinations in a particular course of a semester only if he/she satisfies the below mentioned requirements.

8.1.1 The student is permitted to appear End Semester Examinations if only he/she maintains minimum of 75% of attendance. If he/she secured attendance greater than or equal to 60 % and less than 75% in any course in the current semester due to the following reasons only:

i. Medical reasons (hospitalization / accident and or illness)

ii. Due to participation in sports events or any competitions or NCC and / or NSS activities with prior written permission from the Head of the Institution through the Head of the Department

8.1.2 The student shall be considered for exemption from the prescribed attendance requirement for the reasons stated above and if exempted, the student shall be permitted to appear for the end semester examinations of that course. In all such cases, the students should have submitted the required documents on joining after the absence, to the Head of the Department through the Class Advisor.

8.1.3 A student shall normally be permitted to appear for End Semester Examination (ESE) of the course if he / she has satisfied the attendance requirements. If he/she secured attendance greater than or equal to 60 % and less than 75% then he/she has to pay the necessary condonation prescribed by the college authority.

8.1.4 If any student is suspended for any reason during the semester, the days of suspension of a student on disciplinary grounds will be considered as days of absence for calculating the percentage of attendance for each individual course.

8.2 Movement to Next Higher Semesters

8.2.1 A student can move to the next semester provided only if he/she fulfills the minimum attendance requirement for appearing in the semester examination.

8.2.2 The student who has failed to fulfill the above conditions will not be permitted to move to the higher semester, and shall rejoin the programme only after a temporary break.

8.2.3 A student, after the temporary break, will be permitted to rejoin the programme in the corresponding semester along with the regular students at the time of normal commencement of that semester after fulfilling all the requirement as per the regulation.

8.2.4 A student who rejoins the programme after the temporary break shall be governed only by the rules, regulations, course of study and syllabus in force,

at the time of rejoining the course.

8.3 Provision for Withdrawal from Examination

8.3.1 Complete Withdrawal: A student, who is eligible (nil arrear students) to appear for the semester examinations, will be permitted to withdraw from appearing for the entire End Semester Examinations as one unit (*Complete Withdrawal*) for valid reasons and on the recommendation of the Head of the Department and with the approval of the Dean (Academics). Complete Withdrawal application shall be made before the commencement of the first examination pertaining to the semester. Such withdrawal shall be permitted ***only once*** during the entire programme.

8.3.2 A student who has completely withdrawn from appearing for end semester examinations in a particular semester should appear for the examinations of all the withdrawn subjects in the next semester itself.

8.3.3 Withdrawal shall be permitted only once during the entire programme of time. If all other conditions are satisfactory, then the candidate who withdraws is also eligible to be awarded DISTINCTION whereas he/she is not eligible to be awarded a rank.

8.4 Scribe for End Semester Examination

8.4.1 If any student is not in position to write end semester examination on account of temporary physical disability or injury due to accident and applies for a scribe (writer) with medical certificate obtained from a medical officer not below the rank of Assistant Director level, then a scribe shall be allowed / assigned by CoE to such student. Normally, such scribe shall neither be a student or a degree holder of any technical programme having similar competency. The student shall, however, apply in a prescribed proforma to CoE asking for permission letter to the student for using the scribe well in advance, not the day of examination to make necessary action (Scriber, Separate Examination Hall). CoE shall then take the undertaking from the scribe in a prescribed proforma. Such student shall produce the permission letter from CoE for using scribe to the invigilator. Scribe shall be allowed extra time as per norms of Controller of Examinations.

8.4.2 In case any student is admitted with differently abled category. Students who can write but at much slower speed as compared to normal student, he/she may be allowed as extra time of 30 minutes for 50 marks paper and 60 minutes for 100 marks paper to write the examination for all the courses, provided he/she seeks permission from CoE for extra writing time on account of his/her disability by producing medical certificate from medical officer not below the rank of Assistant Director to this effect.

8.5 Supplementary Examinations

In order to complete the program within 4 years, only the student with maximum of two arrears will be permitted to appear for supplementary examination. The supplementary examination will be conducted in fifth and eighth semester only. For supplementary examination, the continuous assessment marks of the last attempt will be considered.

8.6 Malpractice in Examinations

If any student is found guilty of malpractices in examinations then he/she shall be punished as per the recommendations of the Complaint Redressal Committee (CRC) constituted by CoE with the approval of Head of the Institution. The CRC shall inquire

and decide the punishment by following guidelines for imposing punishment on examinees /others involved in unfair means. However, depending on the situation, committee may quantify the severity of the punishment based on Controller of Examination (CoE) manual.

9 ASSESSMENT PROCEDURES FOR AWARDING MARKS

The total marks for each course generally (Theory, Practical, Project Work) will be 100, comprising of two components namely Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM). However, there could be one credit courses, add-on courses, online certification courses and Mandatory courses that have only continuous assessment of 100 marks without an End-Semester Examination.

The Department Consultative Committee (DCC) has to approve such courses for every semester. The scheme of assessment may also be decided by the faculty handling the course concerned with the approval from DCC and shall be made available to the students during the course registration. Each course shall be evaluated for a maximum of 100 marks as illustrated in Table - 2

Table 2 Assessment Components

Sl. No	Category of Course	Continuous Assessment Marks (CAM)	End Semester Examination Marks (ESM)
1	Theory Courses	25	75
2	Laboratory Courses	50	50
3	Project Work	40	60
4	Mandatory Courses	100	-
5	Skill Development Course	100	-

Students may take National/International reputed professional certification courses after due approval from Department Consultative Committee (DCC). After completion of the course, the DCC has to verify the relevant documents and certificates. The credits and grades shall be mapped by the DCC intern recommended to CoE through the HoD.

10 MARKS DISTRIBUTION

10.1 Marks Distribution of Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM)

The mark distribution is dependent on the credit weightages of various components of the courses such as Theory, Lab, and Project. For the continuous assessment tests, course faculty shall decide the mark distribution and question paper pattern. The question paper must follow Revised Bloom's Taxonomy action verbs and indicate expected knowledge level and Course Outcomes (CO). Table 3 and 4 show the scheme of assessment for Continuous Assessment Test and weightage for each assessment. Table 5 shows the scheme for End Semester Examinations.

Table 3 Scheme for Continuous Assessment Test

S. No	Course Type	Continues Assessment Components									Total Marks
		Test Marks	Average of Pre /post-test/viva for each experiment	Average of Marks for experiment report for each experiment	Model Exam / Report	Assignment	Review-1	Review-2	Review-3	Attendance	
1	Theory	15	-	-		5	-	-	-	5	25
2	Practical	-	10	15	15	-	-	-	-	10	50
3	Project Work	-	-	-	-	-	10	10	20	-	40

Table 4 Weightage of Assessment for Theory Course

S. No	Test	Portion for Test	Test Marks	Duration of Test	Weightage for Internal
1	CAT – 1	1 ½ Units	50	1 ½ hours	10*
2	CAT – 2	1 ½ Units	50	1 ½ hours	
3	CAT – 3	2 units	50	1 ½ hours	
3	CAT – 4	5 Units (Unit – 1 to 5)	100	3 hours	5
Continuous Assessment for Theory course					15

***** A minimum of three tests (CAT 1, 2 and 3) to be conducted for every theory subject and, of them two best are to be considered for computation of internal assessment marks.

Table 5 Scheme for End Semester Examinations

S. No	Course Type	Written Exam	Practical Exam	Practical exam viva	Report and viva - voce	Publication of papers / prototypes /patents etc	Total Marks
1	Theory	75 (100)	-	-	-		75
2	Practical	40 (90)		10(10)	-		50
3	Project Work	-	-	-	50	10	60

Mark weightage (outside brackets) and maximum marks for the exam conducted (in brackets). The maximum marks could vary depending on the credit component for lecture/lab/project

10.2 Question Paper Pattern– Theory

Question paper pattern for CAT and ESE will be based on the patterns shown in Table 6 (a) and (b) and shall be informed to students by the faculty handling the course.

Table 6 (a) Question Paper patterns for CAT

Test Type	2 Marks	5 Marks	10 Marks	Total Marks
CAT 1 to 3	5	2	3 (Out of 4 Questions)	50
CAT 4	End Semester Examination Question Pattern			75

Table 6 (b) Question Paper patterns for End Semester Examination

2 Marks	5 Marks	10 Marks	Total Marks
10	5 (one questions from each unit)	3 (3 out of 5 Questions)	75

10.3 Mark Distribution of Attendance

The theory and practical examinations shall comprise continuous assessment throughout the semester in all subjects as well as End Semester Examinations conducted by the Institute at the end of the semester (November / December or April / May).

(a). *Theory courses for which there is a written paper of 75 marks in the End Semester Examination.* The Continuous Assessment marks of 25 has to be distributed as shown in Table 4 and 5 marks for class attendance in the particular subject.

The distribution of marks for attendance is as follows:

5 Marks for 95% and above
4 marks for 90% and above but below 95%
3 marks for 85% and above but below 90%
2 marks for 80% and above but below 85%
1 mark for 75% and above but below 80%

(b). Practical courses for which there is an end semester practical examination of 50 marks:

Every practical subject carries Continuous assessment mark of 50, distributed as follows: (i) Average of Pre /post- test/viva for each experiment – 10 marks (ii) Average of Marks for experiment report for each experiment-15 marks (iii) Model Exam / Report– 15 marks and (iv) Attendance – 10 marks.

The marks earmarked for attendance are to be awarded as follows:

10 marks for 95% and above
8 marks for 90% and above but below 95%
6 marks for 85% and above but below 90%
4 marks for 80% and above but below 85%
2 marks for 75% and above but below 80

10.3.1 Criteria for Assessment of Project Work

For final year Project Work out of 100 marks, the maximum marks for Continuous Assessment is 40 marks and that for the End Semester Examination (project report evaluation, publication of papers, patent etc and viva-voce examination) is 60 marks.

- Project work may be assigned to a group of students not exceeding 4 per group, under the supervision of faculty guide(s).
- The Head of the Department shall constitute a review committee for each programme. There shall be a minimum of three faculty members in the review committee. There shall be three reviews (as per Table 7) in total, during the semester by a review committee.

Table 7 CAM & ESM break-up for Project work

Sl. No	Description			Weightage
1	**Continuous Assessment Marks**			
a	Review 1	Review Committee#	5	10
		Guide	5	
b	Review 2	Review Committee#	5	10
		Guide	5	
c	Review 3	Review Committee#	10	20
		Guide	10	
			Total CAM	40
2	**End Semester Marks**			
a	Evaluation of final report and Viva-voce	Internal Examiner	25	50
		External Examiner	25	
b	Outcome*	Publication of papers /prototypes /patents etc	10	10
			Total ESM	**60**
			Total Marks	**100**

* *Outcome, in terms of paper publication, patents, product development and industry projects shall be awarded by both internal and external examiners, based on the document proofs submitted by the student concerned*

 # Review committee consists of internal faculty members nominated by the Head of the Department. The guide of the student being examined shall not be part of the committee.

- Interim project report shall be submitted before the project reviews with the approval of the guide. The Project Report, prepared according to the approved guidelines and duly signed by the guide and the Head of the Department shall be submitted to the department as per the timeline announced by the department.
- The End Semester Examination project work shall consist of evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted separately for each student by a committee consisting of the external examiner and an internal examiner. The Controller of Examinations (CoE) shall appoint Internal and External Examiners for the End Semester Examination of the Project Work.
- The Continuous Assessment Marks (CAM) and End Semester Examinations marks (ESM) for Project Work and the Viva-Voce Examination will be distributed as indicated in Table 7.

10.3.1.1 The Process and guidelines for in-house project

- Project work may be assigned to a single student or to a group of students not exceeding 4 per group, under the supervision of faculty guide(s).
- Students execute their in-house project in Department Center of

Excellence with the proper approval from the HoD through the respective supervisor

- There shall be three assessments by a review committee with the marks prescribed as shown in Table 7. The student shall make presentation on the progress made before the committee.

10.3.1.2 The process and guidelines for industry/organization projects

- Students opting for industry / organization project should decide, identify and interact with relevant industry/organization in 7th semester itself. The departmental committee shall decide the schedule appropriately. Students shall take necessary help from their department for exact plan of action and to apply through proper channel as well as Training and Placement Officer (TPO) to establish contact with industries.
- Students shall submit the application attached with relevant details viz. correspondence with industry, area and nature of project, progress report to the department before the end of 7th semester.
- Director/ Dean Academics shall issue permission letter to the students on the recommendation of HoD. Students shall be allowed to work in the industry for maximum of 13 weeks during the project work in 8th semester.
- An internal guide from the department and mentor from the industry/organization where the project is to be undertaken shall be allocated to student. Both guides should discuss and finalize the scope of the project work and monitor the progress together.
- Internal guide should visit the industry at least 3 times in a semester to see the progress of his/her student and a brief report should be submitted to the HoD about the project.
- Student should maintain a diary regularly to record the progress and get the approval from both internal and external guides at least twice in a month either by physically reporting or through email communication. If the progress is not found satisfactory due to any reason, the corrective action should be taken by the Guide after consulting with Dean Academic through HoD for further extension of the project completion.
- Progress report and certification of the project work undertaken shall be submitted by the student to the respective guide. The mode of evaluation shall be same as adopted for students carrying out in-house project.

10.4 Grading for Mandatory Courses

Mandatory Courses are courses that are required to be completed to fulfil the degree requirements (e.g. Human values, Environmental science, etc.). These courses will not be taken in to consideration for the GPA / CGPA calculations. Each of these courses are assessed continuously and internally for a total mark of 100. The pass mark is 50%. Students, who fail to pass this course are required to repeat the course, when it is offered next time.

11 REMEDIAL MEASURES FOR ABSENCE FROM A CAT

No Retest will be conducted. A student who has not appeared for a CAT (theory courses/component of embedded courses) shall be permitted to be eligible for rescaling only under the following conditions subject to DCC and ACC approval. The student shall apply to the DCC and the ACC will approve the application for eligibility rescaling only for the following reasons:

- Absence due to prolonged illness of more than 7 working days or due to hospitalization (in-patient treatment)
- Absence due to death of immediate family members
- Absence due to participation in NCC/NSS/NSO camps alone
- Absence due to participation and representation of college in Government conducted sports events, National level design competitions and off-campus placements with prior approval

For genuine cases, recommended by DCC, Rescaling of ESM for the missed CAT will be done as follows:

Missed CAT mark = ESM × CAT Weightage

- Rescaling marks are subject to a maximum of 20 % of ESM
- Rescaling can be done for only one CAT only

12 PASS REQUIREMENTS

12.1 A student is declared to have successfully passed a theory based course if he/she has secured:

- A minimum of 40% in the marks maximum of 75 marks in the end semester examinations.
- A minimum of 50% marks on combining both Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM).

12.2 A student is declared to have successfully passed a practical / project based course if he/she has secured:

- A minimum of 50% marks in the end semester examinations.
- A minimum of 50% marks on combining both Continuous Assessment Marks (CAM) and End Semester Examination Marks (ESM).

12.3 The letter grade “W” will be indicated for the courses for which the student has been granted authorized withdrawal (Table - 8).

12.4 For mandatory courses (one-credit), the student must satisfy the minimum attendance requirement and passing criteria as specified for the course in the department.

13 METHODS FOR REDRESSAL OF GRIEVANCES IN EVALUATION

Students who are not satisfied with the grades awarded in the End Semester Examination of Theory Courses for regular and arrear examinations can seek redressal as follows

- After declaration of results, photocopy of valued answer scripts with the marks awarded to individual answers shall be made available to the students on submission of an application along with the prescribed fees to Controller of

Examinations.

- Students can get their answer scripts revalued by submitting an application along with the prescribed fees to the Controller of Examinations.
- The provision for getting the photocopy of valued answer scripts and revaluation is extended to all the students including those who have passed the examination.
- The Controller of Examinations shall get the answer script revalued by appointing an examiner other than the one who has valued the script earlier and revise the grade accordingly.
- The marks obtained after revaluation will be taken as final irrespective of the marks awarded earlier. That is, if the marks obtained after revaluation happens to be lower than the original marks then '*the lower mark*' will be considered for the award of revised grade.

14 LETTER GRADE AND GRADE SHEET

All assessments of a course will be evaluated exactly based on the marks. However, for the purpose of reporting the performance of a candidate, letter grades, each carrying certain number of points, will be awarded as per the range given in Table 6, based on the percentage of marks obtained by the candidate in each subject:

Table 8 Letter Grade and its range

S.No	Range of percentage of total marks	Letter Grade	Grade Points
1	90 to 100	S	10
2	80 to 89	A	9
3	70 to 79	B	8
4	60 to 69	C	7
5	55 to 59	D	6
6	50 to 54	E	5
7	0 to 49	F	0
8	Absent	FA	0
9	Withdrawal from examination	W	0
10	Pass in mandatory-non- credit course	P	0

F – denotes Failure of the course and FA – Failure due to Absent

14.1 Grade Sheet

After the results are declared, grade sheets will be issued to each student, which will contain the following details:

- The College Name and Affiliating University.
- The list of courses registered during the semester and the grades scored.
- The Semester Grade Point Average (SGPA) for the semester.
- The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.
- On completion of a semester, each student is assigned a Semester Grade Point Average which is computed as below for all courses registered by the student during that semester

$$\text{Semester Grade Point Average (SGPA)} = \frac{\sum(C_i \times GP_i)}{\sum C_i}$$

where C_i is the Credit for a course in that semester and GP_i is the Grade Point earned by the student for that course. The GPA is rounded off to two decimals.

- The overall performance of a student at any stage of the Degree programme is evaluated by the Cumulative Grade Point Average (CGPA) up to that point of time.

$$\text{Cumulative Grade Point Average (CGPA)} = \frac{\sum(C_i \times GP_i)}{\sum C_i}$$

where C_i is the Credit for each course of the completed semesters at that stage and GP_i is the Grade Point earned by the student for that course.

***Scheme for conversion of CGPA to Percentage (%) marks*:** There are some employers / institutions that require the students to provide the details of the percentage (%) of marks scored in the semester examination / degree programme. In this regard, a scheme to convert the Cumulative Grade Point Average (CGPA) to Percentage (%) of marks is shown below:

Percentage (%) marks = (CGPA – 0.5) x 100

15 ELIGIBILITY FOR THE AWARD OF DEGREE

A student shall be declared to be eligible for the award of the B.Tech. Degree provided for which the student has

- Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.
- Successfully completed the course requirements and has passed all the prescribed end semester examinations in all the eight semesters (six semesters for lateral entry) within a maximum period of 7 years (6 years for lateral-entry) calculated from the commencement of the first semester to which the candidate was admitted.

15.1 Classification of Degree

After successful completion of the programme, degree will be awarded as per the following classifications based on the final CGPA

1. First class with Distinction

Student who satisfies the following conditions shall be declared to have passed the end semester examination in *First class with Distinction*

a) Students who have successfully completed the programme within eight consecutive semesters (*six consecutive semesters for lateral entry students*) and obtained a final CGPA of 8.5 or above by passing in end semester examination in all the courses (Theory and Practical) from first to eighth semester in the *first attempt* will be declared to have passed in ***First Class with Distinction***.

b) Students who have secured a final CGPA of 8.5 or above but failed to clear the courses offered from first to eighth semester in the first attempt are not

eligible for ***First Class with Distinction*** classification. However, those students who have opted for authorized complete withdrawal (only one time) from examination will be eligible for ***First Class with Distinction*** classification but it will not be considered for college Ranking.

2. First class

A student who satisfies the following conditions shall be declared to have passed the examination in First class:

a) Should have passed the examination in all the courses of all eight semesters (6 semesters in the case of Lateral Entry) within Five years (Four years in the case of Lateral Entry). One-year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the duration of six years (five years in the case of lateral entry)

b) Students who have obtained a final CGPA of **6.5** or above, but below **8.5 CGPA** shall be declared to have passed in ***First Class***.

c) Students who have lost the eligibility for ***First Class with Distinction*** classification by failing to clear the courses offered from first to eighth semester in the first attempt but securing a final CGPA of 8.5 or above shall also be declared to have passed in ***First Class***.

3. Second class

a) All other students (not covered in clauses at S.No.1 and 2 under Clause15.1) who qualify for the award of the degree shall be declared to have passed the examination in Second Class.

4. Gold Medals and Ranks

For the Award of Gold Medal and ranks and for each branch of study, the CGPA secured from 1st to 8th semester alone should be considered and it is mandatory that the candidate should have passed all the subjects from 1st to 8th semester in the first attempt. Rank certificates would be issued to the first five candidates in each branch of study.

15.2 Result Passing Board

The Controller of Examinations shall constitute a *Result Passing Board* for each branch of study. The *Result Passing Board* shall meet soon after the valuation of semester examination answer scripts to analyze the relative performance of students and award appropriate grace marks, if necessary, for overall improvement in the result. On finalization of the results by *Result Passing Board*, the Controller of Examinations shall declare the results in consultation with the HoD.

16 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

A student shall be permitted to withdraw temporarily from the college for the reason beyond his/her control. The applicable rules are:

i. The withdrawal shall be considered for one or two complete semesters. The student shall rejoin next year in the same semester during which the student has withdrawn.

ii. The student shall apply to Dean Academics through HoD for such a withdrawal stating the reasons for such withdrawal, along with supporting documents consent of his/her parent/guardian and clearance/no due from the all the concerned

department.

iii. Dean Academics shall peruse the case and recommend for the approval from Academic Council (AC) /Academic Standing Committee (ASC).

iv. A student availing of temporary withdrawal from the college under the above provision shall be required to pay such fees and/or charges as may be fixed by the AC/ASC such time as his/her name appears on the students enrolment. However, it may be noted that the fees/charges once paid shall not be refundable.

v. The total period of completion of the course reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed 7 years in any case including of the period of discontinuance.

17 TERMINATION FROM THE PROGRAM

A student shall be terminated from the program in the following cases:

i. Involved in ragging and not obeying disciplinary rules structured by college

ii. Not completing the programme in prescribed period; Students shall have to complete B.Tech programme in the maximum period of 7 years (14 semesters) for regular entry and 6 years (12 semesters) for lateral entry from the date of admission. Such student will be declared as Failed to Complete Technical Education (FCTE). However, genuine cases with proper justification may be referred to AC for extending programme completion period.

18 DISCIPLINE AND CONDUCT

18.1 Any act of misconduct committed by a student inside or outside the campus shall be an act of violation of discipline of the college. Violations of the discipline shall include:

(a). Disruption of teaching, examination, administrative work, curricular or extra–curricular activity and any act likely to cause such disruption.

(b). Damaging or defacing the property inside or outside the college campus.

(c). Engaging in any attempt at wrongful confinement of teachers, employees and students of the college.

(d). Use of abusive and derogatory slogans or intimidators' language or incitement of hatred and violence.

(e). Ragging in any form ("Ragging means causing, inducing, compelling or forcing a student whether by way of a practical joke or otherwise to do any act with detracts from human dignity or violates his person or exposes him to ridicule or to forbear from doing lawful act, by intimidating, wrongfully re-straining ,wrongfully confining or injuring him or by using criminal force to him or by holding out to him any threat of such intimidation, wrongful restraint, wrongful confinement, injury or the use of criminal offense. Supreme Court of India has defined ragging as a criminal offence,)

(f). Eve teasing or disrespectful behavior to women or girl students.

(g). An assault upon or intimidation of, or insulting behavior towards a teacher, officer, employee or student or any other person.

(h). Getting enrolled in more than one programme /course of study simultaneously.

(i). Committing forgery, tampering the documents or records, identity cards, furnishing false certificate or false information.

(j). Organizing instant agitation/meetings without prior permission in the campus.

(k). Viewing/downloading obscene information/data, images and executable files, sending obscene mails/messages via Facebook/tweeter/other social sites using college servers.

(l). Sharing the login and pass word and other details of IT facilities provided to other outside students.

(m). Refusing to provide an identity card when demanded by any teacher / college authority.

(n). Consuming or possessing alcoholic drinks, dangerous drugs or other intoxicants in the college campus.

(o). Possessing or using any weapons and fire arms in the college campus.

(p). Unauthorized occupations of hostel, accommodating guests or other persons in hostels without permission.

(q). Malpractice in examination

(r). Indulging in anti-national activities contrary to the provisions of acts and laws enforced by Government.

(s). Any other act which may be considered by the Director or the Discipline Committee to be an act of violation of discipline.

18.2 Any act of indiscipline of a student reported to Director/Concerned authority shall be referred to Redressal and Disciplinary Committee of the college. The Committee shall enquire into the charges and recommended suitable punishment if the charges are substantiated. The penalties / punishment / actions may include.

(a). Written warning and information to the parents/guardian.

(b). Imposition of fine

(c). Suspension from the College/Hostel/Mess/Library/or availing of any other facility.

(d). Suspension or cancellation of scholarship/fellowship/ studentship or any financial assistance from any source.

(e). Recover of loss caused to college property.

(f). Debarring from participation in sports/NSS/student club activites.

(g). Disqualifying from holding any representative position in the Class/College/Hostel Mess/Sports/Clubs and in similar other bodies.

(h). Disqualifying for appearing in placement and receiving any awards.

(i). Expulsion from the Hostel/Mess/Library/Club/College for a specified period by forfeiting fees.

(j). Debarring from appearing for an end semester examination.

18.3 Student(s) involved in any act of indiscipline /malpractice in examination shall be issued notice to him/her, asked to be present before the Complaint Redressal Committee (CRC) on the day at specified time and venue with his/her parents/guardian. He/She shall give written reply /oral explanation to the charges

levied against him/her for consideration. If the implicated student(s) fails to appear before the committee, then decision shall be taken as absent, on the basis of available evidence/documents which shall be binding on the concerned student.

18.4 Every admitted student shall be issued photo identification (ID) card which must be retained by the student while he/she is registered at SMVEC.The student must have valid ID card with him /her while in the institute.

19 ACADEMIC CALENDAR

19.1 The academic activities of the college shall be governed by academic calendar prepared for each academic year and approved by the AC/ASC. It shall be notified at the beginning of each academic year. Academic calendar shall incorporate schedule of admission, course registration, course delivery, examination/evaluation, course feedback, course/graduate exit survey, co-curricular activities, compensation of holidaysin case of academic loss, meetings (AC, ASC, IQAC, BoS, Alumni), Academic audit and vacation.

19.2 The curriculum shall be typically delivered in two semesters in an academic year. Each semester shall be of 20 weeks (approximately 100 working days) duration, including evaluation, grade moderation and result declaration. Generally, 13-14 weeks (65-70 days) for course content delivery and 4-6 weeks (20 – 30 days) for examination /evaluation shall be assigned in each semester. The academic session in each semester shall provide at least 75 teaching days with 40 hours per week. The first and second semesters of an academic year normally begin from second week of June and second week of December respectively.

19.3 The academic calendar should be strictly adhered to all other activities including co-curricular and extra-curricular activities that should be scheduled so as not to interfere with the curricular activities as stipulated in the academic calendar.

20 VARIOUS COMMITTEES AND ITS FUNCTIONS

20.1 Academic Council (AC)

Composition of Academic Council:

1. The Director / Principal (Chairman)
2. All the Heads of Departments in the college
3. Four teaching staff of the college representing different designation are nominated on rotation basis according to the service of seniority.
4. Not less than four experts/academicians from outside the college representing such areas as Industry, Commerce, Law, Education, Medicine, Engineering, Sciences etc., to be nominated by the Governing Body.
5. Three nominees of the university not less than Professors.
6. A faculty member nominated by the Principal (Member Secretary).

Term: The term of the nominated members shall be three years.

Meetings: Academic Council shall meet at least twice a year.

Functions of the Academic Council:

The Academic Council shall have powers to:

(a). Scrutinize and approve the proposals with or without modification of the

Board of Studies with regard to courses of study, academic regulations, curricula, syllabi and modifications thereof, instructional and evaluation arrangements, methods, procedures relevant thereto etc., provided that where the Academic Council differs on any proposal, it shall have the right to return the matter for reconsideration to the Board of Studies concerned or reject it, after giving reasons to do so.

(b). Make regulations regarding the admission of students to different programmes of study in the college keeping in view the policy of the Government.

(c). Make regulations for sports, extra-curricular activities, and proper maintenance and functioning of the playgrounds and hostels.

(d). Recommend to introduce the new programme of study to the Governing Body proposals.

(e). Recommend to the Governing Body institution of scholarships, studentships, fellowships, prizes and medals, and to frame regulations for the award of the same.

(f). Advise the Governing Body on suggestions(s) pertaining to academic affairs framed by it.

(g). Perform such other functions as may be assigned by the Governing Body.

20.2 Board of Studies (BoS)

Composition of Board of Studies:

1. Head of the Department concerned (Chairman).
2. The entire faculty of each specialization.
3. Two subject experts from outside the Parent University to be nominated by the Academic Council.
4. One expert to be nominated by the Vice-Chancellor from a panel of six recommended by the college principal.
5. One representative from industry/corporate sector/allied area relating to placement.
6. One postgraduate meritorious alumnus to be nominated by the principal. The Chairman, Board of Studies, may with the approval of the principal of the college, co-opt:
    a. Experts from outside the college whenever special courses of studies are to be formulated.
    b. Other members of staff of the same faculty.

Term: The term of the nominated members shall be three years.

Meetings: The Board of Studies shall meet at least twice a year.

Functions of BoS

The Board of Studies of a Department in the college shall:

(a). Prepare syllabi for various courses keeping in view the objectives of the college, interest of the stakeholders and national requirement for consideration and approval of the Academic Council;

(b). suggest methodologies for innovative teaching and evaluation techniques;

(c). suggest panel of names to the Academic Council for appointment of examiners; and

(d). coordinate research, teaching, extension and other academic activities in the department/college.

20.3 Academic Standing Committee (ASC)

Composition is same as that of AC expert extent members. ASC shall perform the functions under emergent situations subject to ratification by the AC.

20.4 Academic Appeal Board (AAB)

The entire process of Continuous Assessment shall be made transparent, in which students can get the explanation of marks being awarded from the course instructor, if and when required. However, if a student finds some anomaly in the award of marks in the continuous assessment, he/she can make an appeal to the *Academic Appeals Board* for review of marks awarded. Before appealing for such review, a student shall first approach the concerned Course Instructor and then the concerned Head of the Department, with a request to do the needful. Only after exhausting the above options and in situations where satisfactory actions / remedial measures have not been taken, the student may appeal to the Academic Appeals Board.

The Academic Appeals Board is constituted with Dean (Academics) as convener and two senior level professor as members, and the concerned Head of the Department and Class Advisor as co-opted members. The board will receive the grievance/complaints in writing from the aggrieved student regarding anomaly in award of marks. The board will examine the complaints and recommend appropriate measures to the Director/Principal, for necessary action.

20.5 Departmental Advisory Committee (DAC)

DAC is an another basic constituent of the academic system of an autonomous college. The composition and functions of the DAC are given below

i. Chairman : Head of the concerned Department

ii. Internal Members : Two senior faculty members of the department

iii. Industry Representative : One representative from industry/corporate sector / allied are related to the placement

iv. One academician from other Institution

v. One meritorious alumnus

vi. One parent

vii. One student

viii. Member secretary :Programme Academic Coordinator

Term: The term of the nominated members shall be three years.

Meetings: The meeting may be scheduled as and when necessary, but at least twice a year.

Functions of DAC

The DAC of a department in the college shall

(a). Formulate a process to review post implementation effects of curriculum

(b). Suggest measures to ensure academic standard and excellence of the course offered by the department.

(c). Suggest the methodologies for innovative teaching and evaluation techniques; enhancement of industry institute interaction

(d). Identify and recommend the record of new programme

(e). Review target set for attainment of course outcomes and programme outcomes

(f). Guide and provide support to department for enhancing interaction with outside world.

(g). Plan strategically to enhance the academic quality of department.

(h). Address concerns of stakeholders expressed through feedback.

(i). Defining and redefining the Programme Educational Objectives (PEOs) and Programme Outcomes (POs) based on the recommendations by departmental academic committee.

(j). Study the achievement of PEOs and POs reported by department academic committee and suggest measures for improvement.

20.6 Board of Examinations (BoE)

Composition

i. Director (Chairman)

ii. Dean Academic.

iii. Controller of Examination(COE): Member Secretary

iv. One expert possessing ten years of industrial/ field experience nominated by the Chairman

v. Coordinators (Examinations, Assessment, Results and Tabulation)

Functions of BoE:

(a). The BoE shall

i. Ensure proper performance of the various duties in conducting examinations viz paper setting, time table preparation, assessment and declaration of results.

ii. Recommend examination reforms and shall implement after the approval of academic council.

iii. Prepare the detailed time table of examinations as per the schedule approved by academic council.

iv. Arrange for strict vigilance during the conduct of examination so as to avoid use of unfair means by the students, faculty and invigilators.

(b). Chairman, BoE shall constitute Complaint Redressal Committee (CRC) consisting of three members as and when required to deal with the complaints related to the conduct of examinations.

(c). The recommendations of the CRC shall be approved by Chairman for the

BoE to take appropriate disciplinary actions in the concerned matter. The disciplinary actions shall be endorsed by the BoE.

(d). The BoE shall perform duties and responsibilities that are assigned by Academic Council of the institute from time to time.

20.7 Department Consultative Committee(DCC)

Composition

i. Head of Department (Chairman)

ii. Five faculty members (at least one from each specialization) nominated by HOD

iii. Member Secretary: Programme Academic Coordinator (UG) / Programme Evaluation Coordinator (UG)

Functions of DCC

(a). Review, revise and prepare curriculum structure following institutional policy, suggest improvements in syllabus of a course/s prepared by course teacher/s and forward the curriculum to BoS for further recommendations.

(b). Check appropriateness of course objectives, course outcomes, and mapping of COs with POs and suggest necessary improvements/modifications.

(c). Monitor the academic progress throughout the semester, conduct of classes and take appropriate corrective measures to improve the quality of curriculum delivery.

(d). Review academic performance of students.

(e). Counsel the concerned course teachers for improvement based on student feedback, academic and question paper audit reports.

(f). See target/s for attainment of course outcomes and programme outcomes.

(g). Formulate strategy to collect feedback from stake holders, analyze the collected feedback and forward the analysis to DAC.

(h). Contribute to maintain academic standard as well as improving the quality of the courses offered by the department and enhance industry–institute interaction.

(i). Suggest open and professional electives considering societal needs.

(j). Recommend methodologies for innovative teaching and evaluation techniques to BOS.

(k). Coordinate research, teaching, extension and other academic activities in the department/college.

(l). Carry out preparatory work for defining /redefining the Programme Educational Objectives(PEOs) and Programme Outcomes(POs)periodically.

(m). Monitor evaluation of course attainments leading to achievement of programme outcomes and report the results of assessment to BoS.

20.8 Programme Academic Coordinator (PAC)

There shall be Departmental Academic Coordinator. The functions and duties are:

(a). Coordination of all academic activities of the department viz Curriculum revision, framing of syllabus, time table, BOS meeting as member secretary, re-registration of course/s, display and submission of attendance status.

(b). Coordination to conduct internal academic audit and departmental advisory committee meeting as a member secretary.

(c). Monitoring academic activities and conduct of classes.

(d). Extend necessary help to departmental academic and evaluation committee.

(e). Recording and forwarding all academic related documents to Dean Academics.

(f). Work in association with Dean Academics.

20.9 Departmental Evaluation Coordinator (DEC)

Functions and duties of DEC are:

(a). Conduct course and graduate exit survey, make arrangements for feedback from stakeholders (industry/employer/alumni/student) and feedback analysis.

(b). Monitoring assessment of course outcome.

(c). Computation /assessment /evaluation/achievement of PEOs and POs as per NBA/NAAC requirements.

(d). Compilation of information required for preparation of Annual Quality Assurance Report (AQAR) by the Internal Quality Assurance Cell (IQAC).

(e). Extend necessary help to departmental academic and evaluation committee.

20.10 Class Advisor

Head of the Department will allot one faculty member to be the class advisor for a particular batch of students throughout their period of study. The role of class advisors is as follows:

i. To motivate and closely monitor the performance of the students.

ii. To build a strong alumni base for the institution by maintaining a meaningful rapport with students and parents.

iii. To maintain all important documents of the students for reference/inspection by all committees.

iv. To work closely with the student counselors on matters related to students attached to the student counsellors and update the details of the students from time to time.

20.11 Student Counselor (Mentor)

By guiding and counseling students, faculty can create a greater sense of belongingness amongst the student community. To help the students in planning their courses and for general guidance on the academic programme, the Head of the Department will allot a certain number of students to a teacher of the department who shall function as student counselor throughout the period of study.

The student counselor will guide / monitor the courses chosen by the students, check attendance and progress of the students and counsel them periodically. The student counselors should ensure that each student is made aware of the various options for progress. Students are monitored and guided to become overall performers. Students can select and work for career choices of their interest. The student counselors shall update and maintain the student counselor record of each

student under his guidance attached to them. The student counselors shall also help the class advisors to update the students details attached to them.

The student counselor may also discuss with the class advisor, HoD and parents about the progress of the students.

20.12 Class Committee

Every class will have a class committee constituted by the HoD. The members of the class committee will be as follows: -

1. Chairperson (a senior faculty who is preferably not teaching any course for the class)
2. All faculty handling courses for the class
3. Students (a minimum of 6 consisting of 3 boys and 3 girls on pro-rata basis)

Functions

The functions of the class committee shall include the following: -

(a). Clarify the regulations of the programme and the details of rules therein.

(b). Inform the student representatives about the academic schedule including the dates of assessments and the syllabus coverage for each assessment.

(c). Inform the student representatives about the details of Regulations regarding marks assigned for each assessment. In the case of practical courses (laboratory/ drawing / project work / seminar etc.) the breakup marks for each experiment / exercise / module of work, should be clearly discussed in the class committee meeting and informed to the students

(d). Analyze the performance of the students of the class after each assessment test and initiate steps for improvement.

(e). Identify slow learners, if any, and request the faculty concerned to provide additional help / guidance / coaching to such students.

(f). Discuss and sort out problems experienced by students in the classroom and in the laboratories.

(g). The class committee shall be constituted within the first week of commencement of any semester.

(h). The chairperson of the class committee may invite the class advisor / student counselor and the Head of the Department to the meeting of the class committee.

(i). The Director /Principal may participate in any class committee meeting.

(j). The chairperson is required to prepare the minutes of every meeting, submit the same through the Head of the Department to the Principal within two days of the meeting and arrange to circulate the same among the students and faculty concerned. Points requiring action by the management shall be brought to the notice of the management by the Principal.

Meetings

The class committee meetings are to be conducted as scheduled below.

Meeting 1	Within one week from the date of commencement of the semester
Meeting 2	One week before the 1st assessment test
Meeting 3	One week before the 2nd assessment test

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During the first meeting of the class committee, the students are to be informed about the nature and marks of assessments as per the framework of the Regulations. During these meetings the student representatives shall meaningfully interact and express opinions and suggestions of the students of the class to improve the effectiveness of the teaching-learning process.

20.13 Course Committee for Common Courses

Each common theory / laboratory course offered to more than one class / branch shall have a Course Committee, comprising all the faculties who are teaching the common courses and one of them is nominated as a Course Coordinator.

Sl. No	Nature of common courses	Person Responsible for Forming Course Committee and Nominating Course Coordinator
1	For common course handled in a particular department	Respective HoD
2	For common courses handled in more than one department	Controller of Examinations (CoE) puts up the course committee details to the Principal to get approval for the same and intimate to the concerned faculty

The course committee will ensure that a common question paper is prepared for the tests / exams and uniform evaluation is carried out. The Course committee will meeting a minimum of 3 times in each semester. The schedule for the course committee to meet is as follows.

Meeting 1	One week before the beginning of the semester
Meeting 2	One week before the 1st assessment test
Meeting 3	One week before the 2nd assessment test

21 REVISION OF REGULATIONS AND CURRICULUM

The college may revise, amend or change the regulations of curriculum and syllabus from time to time as and when found necessary.

SRI MANAKULA VINAYAGAR
ENGINEERING COLLEGE
(An Autonomous Institution)

Puducherry

B.TECH.

CIVIL ENGINEERING

ACADEMIC REGULATIONS 2019
(R-2019)

CURRICULUM

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society.

Mission

MI: Quality Education

To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2: Research and Innovation

To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3: Employability and Entrepreneurship

To inculcate the employability and entrepreneurial skills through value and skill based training.

M4: Ethical Values

To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of society.

DEPARTMENT VISION AND MISSION

Vision

To envision a world where the civil engineering department will be a home to an intellectual community with quality education embedded with practical knowledge, strong social commitment and ethical values.

Mission

M1: Quality Education

To fulfill the requirements of construction industry, Civil Engineering profession and rural community through dissemination of technical services.

M2: Practical Knowledge

To impart quality and real-time education to the students with the knowledge & skills needed for Civil Engineering practice

M3: Work Efficiency

To encourage research, development and consultancy through sustained interaction with industry & research organization.

M4: Societal issues

To develop graduates to compete at the global level to deal with modern issues.

M5: Moral & Ethical

To insist ethical values and professionalism among the students.

PROGRAMME OUTCOMES (POs)

PO1:Engineering knowledge:

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2:Problem analysis:

Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3:Design/development of solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4:Conduct investigations of complex problems:

Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage:**

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6:The engineer and society:

Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7:Environment and sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.

PO8:Ethics:

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work:

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10:Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11:Project management and finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning:

Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Fundamental Knowledge

To gain a thorough fundamental knowledge, problem solving skills, engineering experimental abilities, and design capabilities for a civil engineering career.

PEO2: Knowledge and Skills

To establish the knowledge and skills necessary for identifying and assessing design alternatives and the related social, economic, environmental, and public safety impacts.

PEO 3: Societal Implications

To develop the ability to deal effectively with ethical and professional issues, taking into account the broader societal implications of civil engineering

PEO 4:Competent Professionals

To create competent professionals who are trained in the design and development of Civil Engineering systems to engulf research and development activities

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1: Practical Knowledge

Inculcating practical knowledge in planning, analysis, design and construction management without much exploiting natural resources.

PSO 2: Critical Thinking

Imparting effective communicational skills, leadership attributes towards the team work and developing critical thinking abilities to find solutions for civil engineering problems of multi-disciplinary nature.

PSO 3: Challenging Employment

Ability to take up any challenging employment, entrepreneurship, research and development for sustainable civil society as a civil engineering graduate.

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

Sl.No	Course Category	Breakdown of Credits
1	Humanities and Social Science (HS)	09
2	Basic Sciences(BS)	38
3	Engineering Sciences (ES)	36
4	Professional Core (PC)	61
5	Professional Electives (PE)	18
6	Open Electives (OE)	09
7	Project Work and Internship (PW)	12
8	Employability Enhancement Courses (EEC*)	-
9	Mandatory courses (MC*)	-
Total		**183**

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

Sl.No	AICTE Suggested Course Category	Credits per Semester								Total Credits
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Science (HS)	-	4	-	-	3	-	1	1	9
2	Basic Sciences(BS)	12	16	3	3	4	-	-	-	38
3	Engineering Sciences (ES)	18	10	4	4	-	-	-	-	36
4	Professional Core (PC)	-	-	14	8	12	15	9	3	61
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives (OE)	-	-	-	3	-	3	3	-	9
7	Project Work (PW)	-	-	-	-	-	-	2	8	10
8	Internship (PW)	-	-	-	-	-	-	2	-	2
9	Employability Enhancement Courses (EEC*)	-	-	-	-	-	-	-	-	-
10	Mandatory courses (MC*)	-	-	-	-	-	-	-	-	-
Total		**30**	**30**	**21**	**21**	**22**	**21**	**20**	**18**	**183**

**** EEC and MC are not included for CGPA calculation***

SEMESTER – I										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	T 101	Mathematics – I	BS	3	1	0	4	25	75	100
2	T 102	Physics	BS	4	0	0	4	25	75	100
3	T 103	Chemistry	BS	4	0	0	4	25	75	100
4	T 104	Basic Electrical and Electronics Engineering	ES	3	1	0	4	25	75	100
5	T 105	Engineering Thermodynamics	ES	3	1	0	4	25	75	100
6	T 106	Computer Programming	ES	3	1	0	4	25	75	100
Practical										
7	P 101	Computer Programming Lab	ES	0	0	3	2	50	50	100
8	P 102	Engineering Graphics	ES	2	0	3	2	50	50	100
9	P 103	Basic Electrical & Electronics Lab	ES	0	0	3	2	50	50	100
							30	300	600	900

SEMESTER – II										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	T 107	Mathematics – II	BS	3	1	0	4	25	75	100
2	T 108	Material Science	BS	4	0	0	4	25	75	100
3	T 109	Environmental Science	BS	4	0	0	4	25	75	100
4	T 110	Basic Civil and Mechanical Engineering	ES	4	0	0	4	25	75	100
5	T 111	Engineering Mechanics	ES	3	1	0	4	25	75	100
6	T 112	Communicative English	HS	4	0	0	4	25	75	100
Practical										
7	P 104	Physics lab	BS	0	0	3	2	50	50	100
8	P 105	Chemistry lab	BS	0	0	3	2	50	50	100
9	P 106	Workshop Practice	ES	0	0	3	2	50	50	100
Mandatory Course										
10	P107	NSS / NCC *	MC	0	0	0	-	-	-	-
							30	300	600	900

To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation

SEMESTER – III										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CET31	Probability and Statistics	BS	2	2	0	3	25	75	100
2	U19CET32	Data Structures	ES	3	0	0	3	25	75	100
3	U19CET33	Mechanics of Solids – I	PC	2	2	0	3	25	75	100
4	U19CET34	Surveying	PC	3	0	0	3	25	75	100
5	U19CET35	Fluid Mechanics and Machinery	PC	2	2	0	3	25	75	100
6	U19CET36	Concrete Technology	PC	3	0	0	3	25	75	100
Practical										
7	U19CEP31	Data Structures Laboratory	ES	0	0	2	1	50	50	100
8	U19CEP32	Surveying Laboratory	PC	0	0	2	1	50	50	100
9	U19CEP33	Fluid Mechanics and Machines Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CEC3X	Certification Course – I**	EEC	0	0	4	-	100	-	100
11	U19CES31	Skill Development Course 1: General Proficiency - I	EEC	0	0	2	-	100	-	100
12	U19CES32	Skill Development Courses 2 *	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19CEM31	Physical Education	MC	0	0	2	-	100	-	100
							21	700	600	1300

***** Certification courses are to be selected from the list given in Annexure III***

**** Skill Development Courses (2 and 4) are to be selected from the list given in Annexure IV***

SEMESTER – IV										
Sl. No.	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CET41	Numerical Methods	BS	2	2	0	3	25	75	100
2	U19CET42	Programming In Java	ES	3	0	0	3	25	75	100
3	U19CET43	Geotechnical Engineering - I	PC	2	2	0	3	25	75	100
4	U19CET44	Mechanics of Solids – II	PC	2	2	0	3	25	75	100
5	U19CEE4X	Professional Elective - I[#]	PE	3	0	0	3	25	75	100
6	U19XXO4X	Open Elective – I[$]	OE	3	0	0	3	25	75	100
Practical										
7	U19CEP41	Programming In Java Laboratory	ES	0	0	2	1	50	50	100
8	U19CEP42	Concrete Engineering Laboratory	PC	0	0	2	1	50	50	100
9	U19CEP43	Strength of Materials Laboratory	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CEC4X	Certification Course – II**	EEC	0	0	4	-	100	-	100
11	U19CES41	Skill Development Course 3: General Proficiency - II	EEC	0	0	2	-	100	-	100

12	U19CES42	Skill Development Courses 4 *	EEC	0	0	2	-	100	-	100
Mandatory Course										
13	U19CEM41	Indian Constitution	MC	2	0	0	-	100	-	100
							21	700	600	1300

[#] ***Professional Electives are to be selected from the list given in Annexure I***
[$] ***Open electives are to be selected from the list given in Annexure II***
***** Certification courses are to be selected from the list given in Annexure III***
*** Skill Development Courses (2 and 4) are to be selected from the list given in Annexure IV***

SEMESTER – V										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	U19CET51	Operations Research	BS	2	2	0	3	25	75	100
2	U19CET52	Structural Analysis – I	PC	2	2	0	3	25	75	100
3	U19CET53	Geotechnical Engineering - II	PC	2	2	0	3	25	75	100
4	U19CET54	Environmental Engineering - I	PC	3	0	0	3	25	75	100
5	U19CEE5X	Professional Elective - II[#]	PE	3	0	0	3	25	75	100
6	U19XXO5X	Open Elective-II[$]	HS	3	0	0	3	25	75	100
Practical										
7	U19CEP51	Numerical Methods Laboratory	BS	0	0	2	1	50	50	100
8	U19CEP52	REVIT Architecture	PC	0	0	2	1	50	50	100
9	U19CEP53	Geotechnical Engineering Laboratory	PC	0	0	2	1	50	50	100
10	U19CEP54	Estimation Costing and Valuation Engineering	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
11	U19CEC5X	Certification Course – III**	EEC	0	0	4	-	100	-	100
12	U19CES51	Skill Development Course 5: Foreign Language / IELTS - I	EEC	0	0	2	-	100	-	100
13	U19CES52	Skill Development Course 6: Presentation Skills using ICT	EEC	0	0	2	-	100	-	100
Mandatory Course										
14	U19CEM51	Essence of Indian Traditional Knowledge	MC	2	0	0	-	100	-	100
							22	750	650	1400

[#] ***Professional Electives are to be selected from the list given in Annexure I***
[$] ***Open electives are to be selected from the list given in Annexure II***
***** Certification courses are to be selected from the list given in Annexure III***

SEMESTER – VI										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CET61	Design of Steel Structures	PC	2	2	0	3	25	75	100
2	U19CET62	Structural Analysis – II	PC	2	2	0	3	25	75	100
3	U19CET63	Design of RC Elements	PC	2	2	0	3	25	75	100
4	U19CET64	Environmental Engineering - II	PC	3	0	0	3	25	75	100
5	U19CEE6X	Professional Elective - III[#]	PE	3	0	0	3	25	75	100
6	U19XXO6X	Open Elective – III[$]	OE	3	0	0	3	25	75	100
Practical										
7	U19CEP61	Environmental Engineering Laboratory	PC	0	0	2	1	50	50	100
8	U19CEP62	Modeling and Analysis Laboratory	PC	0	0	2	1	50	50	100
9	U19CEP63	Design and Drawing Laboratory (RCC and Steel)	PC	0	0	2	1	50	50	100
Employability Enhancement Course										
10	U19CEC6X	Certification Course – IV**	EEC	0	0	4	-	100	-	100
11	U19CES61	Skill Development Course 7: Foreign Language / IELTS - II	EEC	0	0	2	-	100	-	100
12	U19CES62	Skill Development Course 8: Technical Seminar	EEC	2	0	0	-	100	-	100
13	U19CES63	Skill Development Course 9: NPTEL / MOOC - I	EEC	0	0	0	-	100	-	100
Mandatory Course										
14	U19CEM61	Professional Ethics	MC	2	0	0	-	100	-	100
							21	800	600	1400

[#] ***Professional Electives are to be selected from the list given in Annexure I***
[$] ***Open electives are to be selected from the list given in Annexure II***
***** Certification courses are to be selected from the list given in Annexure III***

SEMESTER – VII										
Sl. No	Course Code	Course Title	Category	Periods			Credits	Max. Marks		
				L	T	P		CAM	ESM	Total
Theory										
1	U19CET71	Hydrology and Water Resource Engineering	PC	3	0	0	3	25	75	100
2	U19CET72	Transportation Engineering	PC	3	0	0	3	25	75	100
3	U19CEE7X	Professional Elective – IV[#]	PE	3	0	0	3	25	75	100
4	U19XXO7X	Open Elective – IV[$]	OE	3	0	0	3	25	75	100
Practical										
5	U19CEP71	Business Basics for Entrepreneur	HS	0	0	2	1	100	-	100
6	U19CEP72	Irrigation and Environmental Engineering Drawing	PC	0	0	2	1	50	50	100

7	U19CEP73	Transportation Engineering Laboratory	PC	0	0	2	1	50	50	100
8	U19CEP74	Comprehensive Viva Voce	PC	0	0	2	1	50	50	100
Project Work										
9	U19CEW71	Project Phase – I	PW	0	0	4	2	50	50	100
10	U19CEW72	Internship / Inplant Training	PW	0	0	0	2	100	-	100
							20	500	500	1000

[#] ***Professional Electives are to be selected from the list given in Annexure I***
[$] ***Open electives are to be selected from the list given in Annexure II***

SEMESTER – VIII										
Sl. No.	**Course Code**	**Course Title**	**Category**	**Periods**			**Credits**	**Max. Marks**		
				L	**T**	**P**		**CAM**	**ESM**	**Total**
Theory										
1	U19CET81	Construction Management	PC	3	0	0	3	25	75	100
2	U19CEEXX	Professional Elective – V[#]	PE	3	0	0	3	25	75	100
3	U19CEEXX	Professional Elective – VI[#]	PE	3	0	0	3	25	75	100
Practical										
4	U19CEP81	Entrepreneurship Management	HS	0	0	2	1	100	-	100
Project Work										
6	U19CEW81	Project phase – II	PW	0	0	16	8	40	60	100
Employability Enhancement Course										
7	U19CES81	Skill Development Course 10: NPTEL / MOOC -II	EEC	0	0	0	-	100	-	100
							18	315	285	600

[#] ***Professional Electives are to be selected from the list given in Annexure I***
[$] ***Open electives are to be selected from the list given in Annexure II***

Annexure - I

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)		
Sl. No.	**Course Code**	**Course Title**
1	U19CEE41	Engineering Geology
2	U19CEE42	Geographic Information System
3	U19CEE43	Building Services
4	U19CEE44	Renewable Energy Sources
5	U19CEE45	Alternative Building Materials and Technologies
Professional Elective – II (Offered in Semester V)		
Sl. No.	**Course Code**	**Course Title**
1	U19CEE51	Ground Improvement Techniques
2	U19CEE52	Fundamentals of Nano Science
3	U19CEE53	Smart City
4	U19CEE54	Air and Noise Pollution
5	U19CEE55	Prefabricated Structures
Professional Elective – III (Offered in Semester VI)		
Sl. No.	**Course Code**	**Course Title**
1	U19CEE61	Rock Engineering
2	U19CEE62	Intellectual Property Rights
3	U19CEE63	Shoring scaffolding and Form Work
4	U19CEE64	Municipal Solid Waste Management
5	U19CEE65	Advanced Structural Analysis
Professional Elective – IV (Offered in Semester VII)		
Sl. No.	**Course Code**	**Course Title**
1	U19CEE71	Site Investigation Methods and Practices
2	U19CEE72	Urban Planning and Development
3	U19CEE73	Bridge Engineering
4	U19CEE74	Pollution Control and Monitoring
5	U19CEE75	Advanced Design of RCC Structures

Professional Elective – V (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U19CEE80	Structural Dynamics and Earthquake Engineering
2	U19CEE81	Housing - Planning and Management
3	U19CEE82	Tall Structures
4	U19CEE83	Industrial Waste Disposal and Treatment
5	U19CEE84	Design of Industrial Structures
Professional Elective – VI (Offered in Semester VIII)		
Sl. No.	**Course Code**	**Course Title**
1	U19CEE85	Coastal and Offshore Structures
2	U19CEE86	Pavement Engineering
3	U19CEE87	Repair and Rehabilitation of Structures
4	U19CEE88	Environmental Impact Assessment
5	U19CEE89	Pre- Stressed Concrete Structures

Annexure – II

OPEN ELECTIVE COURSES

Sl. No	Course Code	Course Title	Offering Department	Permitted Departments
Open Elective – I (Offered in Semester IV)				
1	U19EEO41	Solar Photovoltaic Fundamentals and Applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics
2	U19EEO42	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, BME, IT, CSE
3	U19ECO41	Engineering Computation with MATLAB	ECE	ICE, EEE, MECH, CIVIL, BME, Mechatronics
4	U19ECO42	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics
5	U19CSO41	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U19CSO42	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U19CSO43	Programming in JAVA	CSE	ECE, MECH, Mechatronics
8	U19ITO41	Database System: Design & Development	IT	EEE, ECE, ICE, BME
9	U19ITO42	R programming	IT	EEE, ECE, ICE, BME, MECH, Mechatronics

10	U19ICO41	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL
11	U19ICO42	Control System Engineering	ICE	CSE, IT, MECH
12	U19MEO41	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME
13	U19MEO42	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
14	U19MEO43	Power Plants for Electrical Engineering	MECH	EEE
15	U19CEO41	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics
16	U19CEO42	Building Science and Engineering	CIVIL	EEE, MECH, BME
17	U19BMO41	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, MECH, Mechatronics
18	U19BMO42	Telemedicine	BME	EEE, ECE, CSE, IT, ICE
19	U19CCO41	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U19CCO42	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
Open Elective – II / Open Elective – III				
1	U19HSO51 / U19HSO61	Product Development and Design	MBA	**Common to B. Tech** (Offered in Semester V for **EEE, ECE, ICE, CIVIL, BME**) (Offered in Semester VI for **CSE, IT, MECH, Mechatronics**)
2	U19HSO52 / U19HSO62	Intellectual Property and Rights	MBA	
3	U19HSO53 / U19HSO63	Marketing Management and Research	MBA	
4	U19HSO54 / U19HSO64	Project Management for Engineers	MBA	
5	U19HSO55 / U19HSO65	Finance for Engineers	MBA	
Open Elective – II / Open Elective – III (Offered in Semester V for **CSE, IT, MECH, Mechatronics**) (Offered in Semester VI for **EEE, ECE, ICE, CIVIL, BME**)				
1	U19EEO53 / U19EEO63	Conventional and Non-Conventional Energy Sources	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics
2	U19EEO54 / U19EEO64	Industrial Drives and Control	EEE	ECE, ICE, MECH, Mechatronics
3	U19ECO53 / U19ECO63	Electronic Product Design and Packaging	ECE	EEE, CSE, IT, ICE MECH, BME, Mechatronics
4	U19ECO54 / U19ECO64	Automotive Electronics	ECE	EEE, ECE, ICE, MECH
5	U19CSO54 / U19CSO64	Platform Technology	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
6	U19CSO55 / U19CSO65	Graphics Designing	CSE	EEE, ECE, ICE, MECH, CIVIL, BME
7	U19ITO53 / U19ITO63	Essentials of Data Science	IT	EEE, ECE, ICE, MECH, CIVIL, BME
8	U19ITO54 / U19ITO64	Mobile App Development	IT	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics

9	U19ITO55 / U19ITO65	Data Structures	IT	MECH
10	U19ICO53 / U19ICO63	Fuzzy logic and neural networks	ICE	CSE, IT, CIVIL, BME
11	U19ICO54 / U19ICO64	Measurement and Instrumentation	ICE	ECE, Mechatronics
12	U19MEO54 / U19MEO64	Heating, ventilation and air conditioning system (HVAC)	MECH	EEE, ECE, ICE, CIVIL
13	U19MEO55 / U19MEO65	Creativity Innovation and New Product Development	MECH	EEE, ECE, ICE, CIVIL, BME, Mechatronics
14	U19CEO53 / U19CEO63	Disaster Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
15	U19CEO54 / U19CEO64	Air Pollution and Solid Waste Management	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
16	U19BMO53 / U19BMO63	Biometric Systems	BME	EEE, ECE, CSE, IT, ICE, MECH, Mechatronics
17	U19BMO54 / U19BMO64	Medical Robotics	BME	EEE, ECE, CSE, IT, ICE, MECH, CIVIL , Mechatronics
18	U19CCO53 / U19CCO63	Network Essentials	CCE	EEE, MECH, CIVIL, ICE, Mechatronics, BME
19	U19CCO54 / U19CCO64	Web Programming	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U19ADO51 / U19ADO61	Principle of Artificial Intelligence and Machine Learning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL
21	U19ADO52 / U19ADO62	Data science Application of Vision	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, Mechatronics
Open Elective – IV (Offered in Semester VII)				
1	U19EEO75	Hybrid and Electrical Vehicle	EEE	ECE, Mechatronics , MECH
2	U19EEO76	Electrical Energy Conservation and auditing	EEE	ECE, ICE, MECH, CIVIL, BME, Mechatronics
3	U19ECO75	IoT and its Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL
4	U19ECO76	Sensors for Industrial Applications	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics
5	U19CSO76	Artificial Intelligence	CSE	EEE, ICE, CIVIL, MECH
6	U19CSO77	Cloud Technology and its Applications	CSE	EEE, ICE, MECH, CIVIL, BME, Mechatronics
7	U19ITO76	Automation Techniques & Tools- DevOps	IT	EEE, ECE, ICE, CSE, MECH, CIVIL, BME, Mechatronics
8	U19ITO77	Augmented and Virtual Reality	IT	EEE, ICE, MECH, CIVIL, BME
9	U19ICO75	Industrial Automation	ICE	EEE, ECE, CSE, MECH, IT, CIVIL, BME, Mechatronics.
10	U19ICO76	Ultrasonic Instrumentation	ICE	EEE, ECE, MECH, Mechatronics
11	U19MEO76	Principles of Hydraulic and Pneumatic System	MECH	EEE, ECE, ICE, CIVIL

12	U19MEO77	Supply Chain Management	MECH	EEE, ECE, CIVIL, Mechatronics
13	U19CEO75	Energy Efficient Buildings	CIVIL	EEE, ECE, MECH
14	U19CEO76	Global Warming and Climate Change	CIVIL	EEE, ECE, CSE, IT, ICE, MECH, BME
15	U19MCO71	Building Automation	Mechatronics	MECH, CIVIL
16	U19MCO72	Automation in Manufacturing Systems	Mechatronics	MECH, CIVIL
17	U19BMO75	Internet of Things for Healthcare	BME	EEE, ECE, ICE
18	U19BMO76	Telehealth Technology	BME	EEE, ECE, ICE
19	U19CCO75	Data Science using python	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME,
20	U19CCO76	Mobile Applications Development using Android	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME,
21	U19ADO73	Data Science Application of NLP	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME, Mechatronics
22	U19ADO74	Artificial Intelligence Applications	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, BME

Annexure - III
EMPLOYABILITY ENHANCEMENT COURSES –(A).CERTIFICATION COURSES

Sl. No	Course Code	Course Title
1	U19CECX1	3ds Max
2	U19CECX2	Advance Structural Analysis of Building using E-tabs
3	U19CECX3	AutoCad for Civil
4	U19CECX4	Bridge Analysis
5	U19CECX5	Internet of Things
6	U19CECX6	Project Management
7	U19CECX7	Python Programming
8	U19CECX8	STAAD Pro V8i
9	U19CECX9	Total Station

Annexure - IV
EMPLOYABILITY ENHANCEMENT COURSES – (B).SKILL DEVELOPMENT COURSES

Sl. No	Course Code	Course Title
1	U19CES31	Skill Development Course 1 : General Proficiency – I
2	U19CES32	Skill Development Course 2 *
		1) MS Office – Word, Excel, Power Point
		2) Plane Table surveying
		3) Auto level survey
3	U19CES41	Skill Development Course 3 : General Proficiency – II
4	U19CES42	Skill Development Course 4 *
		1) Measurements and Conversion
		2) Air Quality Monitoring
		3) Experience with On-Site Construction Observation and Management
5	U19CES51	Skill Development Course 5 : Foreign Language/ IELTS –I
6	U19CES52	Skill Development Course 6 : Presentation Skills using ICT
7	U19CES61	Skill Development Course 7 : Foreign Language/ IELTS – II
8	U19CES62	Skill Development Course 8 : Technical Seminar
9	U19CES63	Skill Development Course 9 : NPTEL/MOOC – I
10	U19CES81	Skill Development Course 10 : NPTEL/MOOC-II

**** Any one course to be selected from the list***

Annexure III

REGULATIONS, CURRICULUM AND SYLLABUS

for

B. TECH

CIVIL ENGINEERING

(w.e.f. 2013-2014)

PONDICHERRY UNIVERSITY

PONDICHERRY - 605014

CURRICULUM

B.Tech. – CIVIL ENGINEERING

I SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
T 101	Mathematics – I	3	1	-	4	25	75	100
T 102	Physics	4	-	-	4	25	75	100
T 103	Chemistry	4	-	-	4	25	75	100
T 104	Basic Electrical & Electronics Engg	3	1	-	4	25	75	100
T 105	Engineering Thermodynamics	3	1	-	4	25	75	100
T 106	Computer Programming	3	1	-	4	25	75	100
	Practical							
P 101	Computer Programming Lab	-	-	3	2	50	50	100
P 102	Engineering Graphics	2	-	3	2	50	50	100
P 103	Basic Electrical & Electronics Lab	-	-	3	2	50	50	100
	Total	22	4	9	30	300	600	900

II SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
T 107	Mathematics – II	3	1	-	4	25	75	100
T 108	Material Science	4	-	-	4	25	75	100
T 109	Environmental Science	4	-	-	4	25	75	100
T 110	Basic Civil and Mechanical Engg	4	-	-	4	25	75	100
T 111	Engineering Mechanics	3	1	-	4	25	75	100
T 112	Communicative English	4	-	-	4	25	75	100
	Practical							
P 104	Physics lab	-	-	3	2	50	50	100
P 105	Chemistry lab	2	-	3	2	50	50	100
P 106	Workshop Practice	-	-	3	2	50	50	100
P 107	NSS / NCC *	-	-	-	-	-	-	-
	Total	22	2	9	30	300	600	900

III SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
MAT31	Mathematics III	3	1	-	4	25	75	100
CE T32	Geo Science Engineering	4	-	-	4	25	75	100
CET33	Building Technology	4	-	-	4	25	75	100
CET34	Mechanics of Solids-I	3	1	-	4	25	75	100
CET35	Mechanics of Fluids	3	1	-	4	25	75	100
CET36	Surveying-I	3	1	-	4	25	75	100
	Practical							
CEP31	Surveying Lab – I	-	-	3	2	50	50	100
CEP32	Material Testing Lab – I	-	-	3	2	50	50	100
CEP33	Building planning and drawing	2	-	3	2	50	50	100
	Total	22	4	9	30	300	600	900

IV SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
MAT41	Mathematics - IV	3	1	-	4	25	75	100
CET42	Concrete Technology	4	-	-	4	25	75	100
CET43	Environmental Engineering-I	4	-	-	4	25	75	100
CET44	Mechanics of Solids -II	3	1	-	4	25	75	100
CE T45	Hydraulic and Hydraulic Machinery	3	1	-	4	25	75	100
CET46	Surveying-II	3	1	-	4	25	75	100
	Practical							
CEP41	Surveying Lab II	-	-	3	2	50	50	100
CE P42	Fluid Mechanics & Machines Lab	-	-	3	2	50	50	100
CEP43	Geo ScienceEngineering Lab	-	-	3	2	50	50	100
SP P44	Physical Education*	-	-	-	-	-	-	-
	Total	20	4	9	30	300	600	900

V SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
CET51	Design of RCC structures	3	1	-	4	25	75	100
CE T52	Structural Analysis - I	3	1	-	4	25	75	100
CET53	Geotechnical Engineering – I	3	1	-	4	25	75	100
CE T54	Environmental Engineering – II	4	-	-	4	25	75	100
CET55	Transportation Engineering - I	3	1	-	4	25	75	100
	Practical							
CEP51	Geotechnical Engineering Lab	-	-	3	2	50	50	100
CEP52	Environmental Engineering Lab	-	-	3	2	50	50	100
CEP53	Material Testing Lab - II	-	-	3	2	50	50	100
HSP54	General proficiency – I	-	-	3	2	100	-	100
	Total	16	4	12	28	375	525	900

VI SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
MAT41	Mathematics - IV	3	1	-	4	25	75	100
CET61	Structural Analysis – II	3	1	-	4	25	75	100
CET62	Geotechnical Engineering – II	3	1	-	4	25	75	100
CET63	Transportation Engineering - II	3	1	-	4	25	75	100
CE TE1	Elective I	4	0	-	4	25	75	100
CE TE2	Elective II	4	0		4	25	75	100
	Practical							
CEP61	Transportation Engineering Lab	-	-	3	2	50	50	100
CEP62	Estimation Costing and Valuation Engineering Lab	2	-	3	2	50	50	100
CEP63	Computer Aided Design Lab	-	-	3	2	50	50	100
HSP64	General proficiency - II	-	-	3	2	100	-	100
CE SE1	Surveying Camp *	-	-	3	2	100	-	100
	Total	19	3	15	30	475	525	1000

VII SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
MAT31	Mathematics III	3	1	-	4	25	75	100
CET71	Design of steel structures	3	1	-	4	25	75	100
CET72	Hydrology and Water Resources Engineering	3	1	-	4	25	75	100
CE TE3	Elective III	4	0	-	4	25	75	100
CE TE4	Elective IV	4	0	-	4	25	75	100
	Practical							
CEP71	Design and Drawing (RCC & steel)	2	-	3	2	50	50	100
CE CV7	Comprehensive viva	-	-	3	2	50	50	100
CE PW7	Project Phase - I	-	-	6	6	50	50	100
	Total	16	2	12	26	250	450	700

VIII SEMESTER

Code No.	Name of the Subjects	Periods			Credits	Periods		
		L	T	P		IA	UE	TM
	Theory							
CE T 81	Construction management	4	-	-	4	25	75	100
CE TE5	Elective-V	4	0	-	4	25	75	100
CE TE6	Elective-VI	4	0	-	4	25	75	100
	Practical							
CE P81	Professional Ethical Practice	3	-	-	2	100	-	100
CE W8	Industrial Training/Internship	-	-	3	2	100	-	100
CE PW8	Project Phase - II	-	-	9	8	50	50	100
	Total	15	0	12	24	325	275	600

LIST OF ELECTIVES

CODE	TITLE
CEE01	DESIGN OF PRESTRESSED CONCRETE STRUCTURES
CEE02	COASTAL AND OFFSHORE STRUCTURES
CEE03	INDUSTRIAL WASTE DISPOSAL AND TREATMENT
CEE04	SAFETY PRACTICES IN CONSTRUCTION
CEE05	CONSTRUCTION METHODS AND EQUIPMENTS
CEE06	GEOTECHNICAL PROCESSES AND APPLICATIONS
CEE07	REMOTE SENSING AND GIS
CEE08	FINITE ELEMENT ANALYSIS
CEE09	ADVANCED DESIGN OF RCC STRUCTURES
CEE10	SITE INVESTIGATION METHODS AND PRACTICES
CEE11	COASTAL ENGINEERING
CEE12	TRAFFIC ENGINEERING AND MANAGEMENT
CEE13	HIGHWAY AND AIRPORT PAVEMENT DESIGN
CEE14	ADVANCED STRUCTURAL ANALYSIS
CEE15	GROUND WATER HYDROLOGY
CEE16	MACHINE FOUNDATIONS
CEE17	EARTH RETAINING STRUCTURES
CEE18	UNDERGROUND STRUCTURES
CEE19	AIR AND NOISE POLLUTION
CEE20	FAILURE ASSESSMENT AND REHABILITATION STRUCTURES
CEE21	BRIDGE ENGINEERING
CEE22	ADVANCED DESIGN OF STEEL STRUCTURES
CEE23	ENVIRONMENTAL IMPACT ASSESSMENT
HSE24	ENGINEERING ECONOMICS
CEE25	DESIGN AND CONSTRUCTION OF PREFABRICATEDSTRUCTURES
CEE26	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
CEE27	DESIGN OF INDUSTRIAL STRUCTURES
CEE28	FORMWORK FOR CONCRETE STRUCTURES
CEE29	DISASTER MITIGATION AND MANAGEMENT
CEE 30	IRRIGATION AND DRAINAGE ENGINEERING

T101 MATHEMATICS – I

OBJECTIVES:

- *To introduce the idea of applying calculus concepts to problems in Engineering .*
- *To familiarize the student with functions of several variables.*
- *To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.*
- *To introduce effective mathematical tools for the solutions of differential equations that model physical processes*

UNIT I – CALCULUS

Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.

UNIT II– FUNCTIONS OF SEVERAL VARIABLES

Partial derivatives, Total derivatives, Differentiation of implicit functions, Change of variables, Jacobians and their properties, Taylor's series for functions of two variables, Maxima and minima, Lagrange's method of undetermined multipliers.

UNIT III – MULTIPLE INTEGRALS AND APPLICATIONS

Multiple Integrals, change of order of integration and change of variables in double integrals (Cartesian to polar). Applications: Areas by double integration and volumes by triple integration (Cartesian and polar).

UNIT IV – DIFFERENTIAL EQUATIONS

Exact equations, First order linear equations, Bernoulli's equation, orthogonal trajectories, growth, decay and geometrical applications. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT V – DIFFERENTIAL EQUATIONS (Higher order)

Linear differential equations of higher order - with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients, simultaneous linear differential equations, solution by variation of parameters method simple application to electric circuits.

Text Books

1. Venkataraman M.K, Engineering Mathematics-First year, National Publishing Company, Chennai, 2010(For Units I, III, IV & VI only)
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41st Edition, 2011. (For Unit II only)

Reference Books

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Kandasamy P. et al, Engineering Mathematics, Vol.1 & 2, S. Chand & Co., New Delhi.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New Delhi, 8th Edition.
5. Bali N. and Goyal M., Advanced Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010.

T102 PHYSICS

OBJECTIVES:

- *To understand the concepts of physics and its significant contributions in the advancement of technology and invention of new products that dramatically transformed modern-day society.*
- *To expose the students to different areas of physics which have direct relevance and applications to different Engineering disciplines*
- *To understand the concepts and applications of Ultrasonics, optics and some optical devices, Lasers and Fiber optics, Nuclear energy sources and wave mechanics*

UNIT I – ACOUSTICS & NDT

ultrasonics - *U*ltrasonic Waves Productions (Piezoelectric & Magnetostriction method) – Detections (Acoustic Grating) *NDT applications – Ultrasonic* Pulse Echo Method - Liquid Penetrant Method

Acoustics - Factors affecting Acoustic of Buildings (Reverberation, Loudness, Focusing, Echo, Echelon Effect and Resonance) and their Remedies - Sabine's formula for Reverberation Time – Doppler effect and its applications to Radars.(elementary ideas)

UNIT II – OPTICS

Interference - Air Wedge – Michelson's Interferometer - Wavelength Determination – Interference Filter – Antireflection Coatings

Diffraction - Diffraction Grating – Dispersive power of grating - Resolving Power of Grating & Prism

Polarisation Basic concepts of Double Refraction - Huygens Theory of Double Refraction-Quarter and Half Wave Plates – Specific Rotary Power – Laurent Half Shade Polarimeter

UNIT III – LASERS & FIBER OPTICS

Lasers - Principles of Laser – Spontaneous and Stimulated Emissions - Einstein's Coefficients – Population Inversion and Laser Action – types of Optical resonators (qualitative ideas) – Types of Lasers - NdYAG, CO_2 laser, GaAs Laser-applications of lasers

Fiber Optics - Principle and Propagation of light in optical fiber – Numerical aperture and acceptance angle – Types of optical fibers (material, refractive index, mode)-applications to sensors and Fibre Optic Communication

UNIT IV – WAVE MECHANICS

Matter Waves – de Broglie Wavelength – Uncertainty Principle – Schrödinger Wave Equation – Time Dependent – Time Independent – Application to Particle in a One Dimensional potential Box – Quantum Mechanical Tunneling – Tunnel Diode.

UNIT V – NUCLEAR ENERGY SOURCE

General Properties of Nucleus (Size, Mass, Density, Charge) – Mass Defect – Binding Energy - Disintegration in fission –*Nuclear Reactor:* Materials Used in Nuclear Reactors. – PWR – BWR – FBTR. Nuclear fusion reactions for fusion reactors-D-D and D-T reactions, Basic principles of Nuclear Fusion reactors.

Text Books

1.V Rajendran, Engineering Physics, *2nd Edition*, TMH, New Delhi *2011* (For Units I to IV only)
2. Arthur Beiser, Concepts of Modern Physics, 6th Edition, TMH, New Delhi reprinted 2008. (For Unit V only)

Reference Books

1. Ajoy Ghatak, Optics, 5th Edition TMH, New Delhi, 2012.
2. K. Thyagarajan and Ajoy Ghatak, Lasers Fundamentals and Applications, 2nd Edition, Springer 2010.
3. R. Murugesan, Modern Physics, S. Chand & Co, New Delhi 2006.
4. K.R.Nambiar, Lasers, New Age International, New Delhi, 2008.
5. Science of Engineering Materials, 2nd Edition, C.M. Srivastava and C. Srinivasan, New Age Int. (P) Ltd, New Delhi, 1997
6. Avadhanulu M N , Engineering Physics, Vol-I, S. Chand & Co, 2009.

T103 CHEMISTRY

OBJECTIVES

- *To know about the importance of Chemistry in Engineering domain*
- *To understand the chemistry background of industrial process*
- *To apply chemistry knowledge for engineering disciplines*

UNIT I – WATER (9 Hours)

Hardness of water - units and calcium carbonate equivalent. Determination of hardness of water-EDTA method. Disadvantages of hardwater – boiler scale and sludge, caustic embrittlement, priming & foaming and boiler corrosion. Water softening methods – internal & external conditioning – Lime-Soda process, Zeolite process and Ion-exchange process. Desalination – reverse osmosis & electrodialysis.

UNIT II – POLYMERS

(9 Hours)

Classification, types of polymerization reactions – mechanism of radical, ionic and Ziegler-Natta polymerizations. Polymer properties – chemical resistance, crystallinity and effect of temperature, Mn and Mw. Thermoplastics and thermosets. Preparation, properties and uses of PVC, TEFLON, Nylons, Bakelite, Polyurithane, Rubbers – vulcanization, synthetic rubber, BuNa-S, BuNa-N, silicone and butyl rubber. Conducting polymers – classification and applications. Polymer composites – FRP – laminar composites. Moulding constituents of plastic, moulding techniques – compression, injection, transfer and extrusion moulding.

UNIT III - ELECTROCHEMICAL CELLS (9 Hours)

Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nernst equation. Electrolyte concentration cell. Reference electrodes – hydrogen, calomel, Ag/AgCl & glass electrodes. Batteries – primary and secondary cells, Leclanche cell, Lead acid storage cell, Ni-Cd battery & alkaline battery. Fuel cells – H_2-O_2 fuel cell.

UNIT IV - CORROSION AND ITS CONTROL (9 Hours)

Chemical & electrochemical corrosion – Galvanic, pitting, stress and concentration cell corrosion. Factors influencing corrosion – corrosion control methods – cathodic protection and corrosion inhibitors. Protective coating – types of protective coatings – metallic coating – tinning and galvanizing, cladding, electroplating and anodizing.

UNIT V -PHASE RULE (9 Hours)

Definition and derivation of phase rule. Application to one component system – water and sulfur systems. Thermal analysis, condensed phase rule.Two component systems – Pb-Ag, Cu-Ni, and Mg-Zn systems.

Text book

1.P.C. Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai and Sons, New Delhi 15th Ed, 2010.

Reference Books

1.S. S. Dara, A Textbook of Engineering Chemistry, 11th Ed, S.Chand & Co., Ltd. New Delhi, 2008.
2.B. K. Sharma, Engineering Chemistry, 3rdedition Krishna Prakashan Media (P) Ltd., Meerut, 2001.
3.P. Kannan and A. Ravi Krishnan "Engineering Chemistry" Hi-Tech Sri Krishna Publications, Chennai, 9th Ed, 2009
4.N. Krishnamurthy, P. Vallinayagam and D. Madhavan, Engineering Chemistry, 2ndEd. PHI Learning PVT., LTD, New Delhi, 2008.

T104 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

OBJECTIVES

- *To understand and gain basic knowledge about magnetic and electrical circuits, single* phase and three phase power measurement and the operating principles of stationary and rotating machines
- *To understand the basic operation, functions and applications of PN junction diode, transistor, logic gates and flip flops.*
- *To gain knowledge on various communication systems and network models and the use of ISDN*

PART A - ELECTRICAL

UNIT – I - DC CIRCUITS

Definition of Voltage, Current, Power & Energy, circuit parameters, Ohm's law, Kirchoff's law & its applications – Simple Problems - Division of current in Series & parallel circuits - star/delta conversion - Node and mesh methods of analysis of DC circuits.

UNIT – II - AC CIRCUITS

Concepts of AC circuits – rms value, average value, form and peak factors – Simple RLC series circuits – Concept of real and reactive power – Power factor - Introduction to three phase system - Power measurement by two wattmeter method.

UNIT – III – ELECTRICAL MACHINES AND POWER PLANTS

Law of Electromagnetic induction, Fleming's Right & Left hand rule - Principle of DC rotating machine, Single phase transformer and single phase induction motor (Qualitative approach only) - Simple layout of thermal and hydro generation (block diagram approach only).Fundamentals of fuses and circuit breakers

PART B – ELECTRONICS

UNIT – IV ELECTRONIC CIRCUITS

V-I Characteristics of diode - Half-wave rectifier and Full-wave rectifier – with and without capacitor filter - Transistor - Construction & working - Input and output characteristics of CB and CE configuration - Transistor as an Amplifier - Principle and working of Hartley oscillator and RC phase shift oscillator - Construction and working of JFET & MOSFET.

UNIT – V DIGITAL ELECTRONICS

Boolean algebra – Reduction of Boolean expressions - De-Morgan's theorem - Logic gates -Implementation of Boolean expressions - Flip flops - RS, JK, T and D.
Combinational logic - Half adder, Full adder and Subtractors.
Sequential logic - Ripple counters and shift registers.

UNIT – VI COMMUNICATION AND COMPUTER SYSTEMS

Model of communication system - Analog and digital - Wired and wireless channel.
Block diagram of various communication systems - Microwave, satellite, optical fiber and cellular mobile system.
Network model - PAN, LAN, MAN and WAN - Circuit and packet switching - Overview of ISDN.

Text Books

1. Kothari D P and Nagrath I J , Basic Electrical Engineering , Tata McGraw Hill,2009. (For Units I to III)
2. Rajendra Prasad , " Fundamentals of Electronic Engineering", Cengage learning, New Delhi, First Edition, 2011 (For Unit IV)
3. Morris Mano, "Digital design", PHI Learning, Fourth Edition, 2008 (For Unit V)
4. Wayne Tomasi, "Electronic Communication Systems- Fundamentals Theory Advanced", Sixth Edition, Pearson Education, 2004. (For Unit VI)

Reference Books

1. R.Muthusubramaniam, S.Salivahanan and K.A. Mureleedharan, Basic Electrical Electronics and Computer Engineering, Tata McGraw Hill, 2004..
2. J.B.Gupta, A Course in Electrical Power, Katson Publishing House, New Delhi, 1993.
3. David. A. Bell, "Electronic Devices and Circuits", PHI Learning Private Ltd, India, Fourth Edition, 2008

4. Donald P Leach, Albert Paul Malvino and Goutam Saha, “Digital Principles and Applications,” 6th edition, Tata McGraw Hill Publishing Company Ltd., New Delhi,2008.
5. S.K. Sahdev, Fundamentals of Electrical Engineering and Electronics, Dhanpat Rai & Co, 2013.
6. Jacob Millman and Christos C. Halkias, “Electronic Devices and Circuits” Tata McGraw Hill,2008
7. R.L. Boylestad and L. Nashelsky, “Electronic Devices and Circuit Theory”, PHI Learning Private Limited, Ninth Edition, 2008.
8. M.S.Sukhija and T.K.Nagsarkar, “ Basic Electrical and Electronics Engineering”, Oxford University Press, 2012.

T105 THERMODYNAMICS

OBJECTIVES

- *To understand the basics of the thermodynamic principles*
- *To establish the relationship of these principles to thermal system behaviors*
- *To develop methodologies for predicting the system behavior*
- *To establish the importance of laws of thermodynamics applied to energy systems*
- *To explain the role of refrigeration and heat pump as energy systems*
- *To develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world*

UNIT I - BASIC CONCEPTS AND DEFINITIONS

Energy conversion and efficiencies - System, property and state - Thermal equilibrium - Temperature - Zeroth law of Thermodynamics – Pure substance - P, V and T diagrams – Thermodynamic diagrams.

UNIT II - FIRST LAW OF THERMODYNAMICS

The concept of work and adiabatic process - First law of thermodynamics - Conservation of Energy principle for closed and open systems - Calculation of work for different processes of expansion of gases

UNIT III - SECOND LAW OF THERMODYNAMICS

Equilibrium and the second law - Heat engines - Kelvin-Planck statement of second law of thermodynamics - Reversible and irreversible processes - Carnot principle - Clausius inequality- Entropy

UNIT IV - GAS POWER CYCLES

Air standard cycles: The air standard Carnot cycle - Air standard Otto cycle, diesel cycle, dual cycle and Brayton cycles and their efficiencies

UNIT V - REFRIGERATION CYCLES AND SYSTEMS

Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system – Liquefaction – Solidification (only theory).

Text Books

1. Nag, P. K., “Engineering Thermodynamics”, 4th edition, Tata Mc Graw Hill Publishing Co. Ltd., New Delhi, 2008.

Reference Books

1. Arora, C.P., “Thermodynamics” , Tata Mc Graw Hill Publishing Co. Ltd., New Delhi,2010.
2. Burghardt, M.D., “Engineering Thermodynamics with Applications”, 4th edition, Harper & Row, N.Y.,2009.
3. Huang, F.F., “Engineering Thermodynamics” 2nd edition , Macmillan Publishing Co. Ltd., N.Y.,2011.
4. Cengel, Y.A. and Boles, M.A., "Thermodynamics - An Engineering Approach", 5th edition, Mc-Graw Hill, 2008.
5. Wark, K., “Thermodynamics”, 4th edition ,Mc Graw Hill, N.Y.,2009.

T106 COMPUTER PROGRAMMING

OBJECTIVES

- *To introduce the basics of computers and information technology.*
- *To educate problem solving techniques.*
- *To impart programming skills in C language.*
- *To practice structured programming to solve real life problems.*

UNIT – I

History of Computers – Block diagram of a Computer – Components of a Computer system –Classification of computers - Hardware – Software – Categories of Software – Operating System – Applications of Computers – Network structure – Internet and its services – Intranet – Study of word processor – Preparation of worksheets.

UNIT – II

Problem solving techniques – Program – Program development cycle – Algorithm design – Flowchart - Pseudo code.
Introduction to C – History of C – Importance of C - C tokens – data types – Operators and expressions – I/O functions.

UNIT – III

Decision making statements – branching and looping – arrays – multidimensional arrays – Functions – Recursion – Passing array to functions.
Storage classes – Strings – String library functions.

UNIT – IV

Structures – Arrays and Structures – nested structures – passing structures to functions – user defined data types – Union.
Pointers – pointers and arrays – pointers and functions - pointers and strings - pointers and Structures.

UNIT – V

Files – operations on a file – Random access to files – command line arguments.
Introduction to preprocessor – Macro substitution directives – File inclusion directives – conditional compilation directives – Miscellaneous directives.

Text Books

1. Balagurusamy. E, “Programming in ANSI C”, Tata McGraw Hill, Sixth edition, 2012.

Reference Book

1. Vikas Verma, “A Workbook on C “,Cengage Learning, Second Edition,2012

2. Ashok N Kamthane, “Computer Programming”, Pearson education, Second Impression, 2008.

P101 COMPUTER PROGRAMMING LAB

OBJECTIVES

- *To study and understand the use of OS commands*
- *To gain a hands on experience of compilation and execution of 'C' programs*

LIST OF EXERCISES:

1. Study of OS Commands
2. Write a C program to find the Area of the triangle.
3. Write a C program to find the total and average percentage obtained by a student for 6 subjects.
4. Write a C program to read a three digit number and produce output like

   1 hundreds

   7 tens

   2 units

   for an input of 172.
5. Write a C program to check whether a given character is vowel or not using Switch – Case statement.
6. Write a C program to print the numbers from 1 to 10 along with their squares.
7. Write a C program to find the sum of 'n' numbers using for, do – while statements.
8. Write a C program to find the factorial of a given number using Functions.
9. Write a C program to swap two numbers using call by value and call by reference.
10. Write a C program to find the smallest and largest element in an array.
11. Write a C program to perform matrix multiplication.
12. Write a C program to demonstrate the usage of Local and Global variables.
13. Write a C program to perform various string handling functions: strlen, strcpy, strcat, strcmp.
14. Write a C program to remove all characters in a string except alphabets.
15. Write a C program to find the sum of an integer array using pointers.

16. Write a C program to find the Maximum element in an integer array using pointers.
17. Write a C program to create student details using Structures.
18. Write a C program to display the contents of the file on the monitor screen.
19. Create a File by getting the input from the keyboard and retrieve the contents of the file using file operation commands.
20. Write a C program to pass the parameter using command line arguments.

P102 ENGINEERING GRAPHICS

OBJECTIVES

- *To convey the basics of engineering drawing*
- *To explain the importance of an engineering drawing*
- *To teach different methods of making the drawing*
- *To establish the importance of projects and developments made in drawing that are used in real systems*
- *To explain the role of computer aided design _Auto Cad*
- To develop an intuitive understanding of underlying significance of using these drawings

UNIT

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning

UNIT I

Conic sections, Involutes, Spirals, Helix. Projection of Points, Lines and Planes

UNIT II

Projection of Solids and Sections of Solids.

UNIT III

Development of surfaces - Intersection of surfaces (cylinder-cylinder, cylinder-cone)

UNIT IV

Isometric projections and Orthographic projections

UNIT V

Computer Aided Drafting: Introduction to Computer Aided Drafting hardware - Overview of application software - 2D drafting commands (Auto CAD) for simple shapes - Dimensioning.

Text Books

1. K.R. Gopalakrishna and Sudhir Gopalakrishna, Engineering Graphics, Inzinc Publishers, 2007.

Reference Books

1. N.D. Bhatt, Engineering Drawing, 49th edition, Chorotar Publishing House, 2006.
2. K. Venugopal, Engineering Drawing and Grahics + Auto CAD, 4th edition, New Age International Publication Ltd., 2004 .
3. David I cook and Robert N Mc Dougal, Engineering Graphics and Design With computer applications, Holt – Sounders Int. Edn. 1985.
4. James D Bethune and et. al., Modern Drafting, Prentice Hall Int., 1989.
5. K.V. Natarajan, A Text Book of Engineering Drawing, Dhanalakshmi Publishers, 2006.
6. BIS, Engineering Drawing practice for Schools & College, 1992.

P103 BASIC ELECTRICAL AND ELECTRONICS LAB

OBJECTIVES

- *To get an exposure on the basic electrical tools, applications and precautions*
- *To gain training on different types of wiring used in domestic and industrial applications.*
- *To detect and find faults in electrical lamp and ceiling fan*
- *To get an exposure on the measurements of voltage and phase using CRO, basic operation and applications of devices such as PN junction diode and transistor*
- *To gain a practical knowledge on the functions and application of basic logic gates and flip flops*

ELECTRICAL LAB

LIST OF EXPERIMENTS

1. Electrical Safety, Precautions, study of tools and accessories.
2. Practices of different joints.
3. Wiring and testing of series and parallel lamp circuits.
4. Staircase wiring.
5. Doctor's room wiring.
6. Bed room wiring.
7. Godown wiring.
8. Wiring and testing a ceiling fan and fluorescent lamp circuit.
9. Study of different types of fuses, circuits breakers and A.C and D.C meters.

ELECTRONICS LAB

LIST OF EXPERIMENTS

1. Study of CRO
   (a) Measurement of AC and DC voltages
   (b) Frequency and phase measurements (using Lissajou's figures)

2. Verification of Kirchoff's Voltage and Current Laws

   Determine the voltage and current in given circuits using Kirchoff"s laws theoretically and verify the laws experimentally.

3. Characteristics and applications of PN junction diode.

   Forward and Reverse characteristics of PN junction diode.

   Application of Diode as Half wave Rectifier – Measurement of ripple factor with and without capacitor filter

4. Frequency Response of RC Coupled Amplifiers

   Determination of frequency response of given RC coupled amplifier - Calculation of bandwidth.

5. Study of Logic Gates
   (a) Verification of Demorgan's theorems
   (b) Verification of truth tables of OR, AND, NOT, NAND, NOR, EX-OR, EX-NOR gates and Flipflops - JK, RS, T and D
   (c) Implementation of digital functions using logic gates and Universal gates.

T107 MATHEMATICS – II

OBJECTIVES

- *To develop the use of matrix algebra techniques for practical applications.*
- *To introduce the concepts of Curl, Divergence and integration of vectors in vector calculus which is needed for many application problems.*
- *To introduce Laplace transform which is a useful technique in solving many application problems and to solve differential and integral equations.*
- *To acquaint the students with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic.*

UNIT I – MATRICES

Eigenvalues and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigenvalues and Eigenvectors. Cayley-Hamilton Theorem, Diagonalization of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation. Nature of quadratic forms.

UNIT II – VECTOR CALCULUS

Gradient, divergence and curl, their properties and relations. Gauss divergence theorem and Stoke's theorem (without proof). Simple application problems.

UNIT III – LAPLACE TRANSFORM

Definition, Transforms of elementary functions, properties. Transform of derivatives and integrals. Multiplication by t and division by t. Transform of unit step function, transform of periodic functions. Initial and final value theorems.

UNIT IV – APPLICATIONS OF LAPLACE TRANSFORM

Methods for determining inverse Laplace Transforms, convolution theorem, Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms.

UNIT V – FOURIER TRANSFORM

Fourier Integral theorem (statement only), Fourier transform and its inverse, properties. Fourier sine and cosine transforms, their properties, convolution and Parseval's identity.

Text books

1. Venkataraman M.K., Engineering Mathematics, National Publishing Company, Chennai, 2012
2. Kandasamy P. et al, Engineering Mathematics, Vol.2 & 3, S. Chand & Co., New Delhi.

Reference Books

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
2. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 41st Edition, 2011.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, New Delhi.
5. Bali N. and Goyal M., Advanced Engineering Mathematics, Lakshmi Publications Pvt. Ltd., New Delhi, 7th Edition, 2010.

T108 MATERIAL SCIENCE

OBJECTIVES:

- *To understand the importance of Material Science as a subject that revolutionized modern day technologies*
- *To understand the significance of material science in the development of new materials and devices for all branches of Engineering*
- *To impart knowledge to the Engineering students about some of the important areas of Materials Science so as to enable them perceive the significant contributions of the subject in Engineering and Technology*

UNIT I - CRYSTAL STRUCTURE AND LATTICE DEFECTS

Crystal structure - Bravais Lattices , Crystal Systems - Coordination Number, Atomic Radius, Packing Factor for FCC & HCP structures – Miller Indices- Powder X Ray Diffraction Method
Lattice defects – Qualitative ideas of point, line, surface and volume defects

UNIT II – DIELECTRIC PROPERTIES

Dielectric Polarization and Mechanism –Temperature dependence of polarization, Internal or local Field - Clausius-Mossotti relation. Basic ideas of Dielectric loss - frequency dependence of dielectric constant – Measurement of Dielectric constant and loss using Scherring bridge – Elementary ideas of Piezoelectrics, Ferroelectrics and Pyroelectric materials and Applications

UNIT III – MAGNETIC PROPERTIES

Origin of atomic magnetic moment – Bohr magneton-Elementary Ideas of classification of magnetic materials (Dia, Para, Ferro, antiferro & Ferri). – Quantum theory of Para & Ferro Magnetism – Domain Theory of Hysteresis – Heisenberg Theory of Exchange Interaction (without derivation) – Qualitative ideas of Anti ferromagnetic Ordering – Structure and Properties of Ferrites – Properties of Soft & Hard Magnetic Materials – Applications. Magnetic data storage – Magnetic tapes, Hard disks, Magneto optical recording

UNIT IV – SEMICONDUCTORS AND SUPERCONDUCTORS

Semiconductors -Derivation of Carrier concentration in intrinsic Semiconductors –Basic ideas of Electrical conductivity in intrinsic and extrinsic semiconductors (without derivations) -temperature dependence of carrier concentration and electrical conductivity in semiconductors (qualitative ideas), Hall effect in Semiconductors -- Application of Hall Effect, Basic Ideas of Compound Semiconductors (II-VI & III-V)

Superconductivity - Basic concepts – transition temperature – Meissener effect – Type I and II superconductors – High Temperature Superconductors – 123 superconductor – Applications of superconductors.

UNIT V – ADVANCED MATERIALS

Liquid Crystals – Types – Application as Display Devices
Metallic Glasses – preparation by melt spinning. Twin roller system, properties and applications
Shape Memory alloys (SMA), Shape memory effect, Properties and applications of SMA
Nanomaterials- Nano materials (one, Two & three Dimensional) –Methods of synthesis (PVD, CVD, Laser Ablation, Solgel, Ball-milling Techniques), Properties and applications of nanomaterials. carbon nanotubes– synthesis, Properties and applications.

Text books

1. V Rajendran, Engineering Physics, *2nd Edition*, TMH, New Delhi *2011.*

Reference Books

1. Ali Omar M, Elementary Solid State Physics, Addison Wesley Publishing Co., 2009.
2. William D Callister Jr., Material Science and Engineering, 6th Edition, John Wiley and sons, 2009.
3. Charles Kittel, Introduction to Solid State Physics, 7th Edition, John Wiley & sons, Singapore, 2007.
4. V Raghavan , Materials Science and Engineering- A First Course, 5th Edition, Prentice Hall of India, 2008.
5. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, and James Murday, Text book of Nanoscience and Nanotechnology, Universities Press, Hyderabad 2012
6. M.N. Avadhanulu, Enginerring Physics- Volume-II, S.Chand &Co, New Delhi, 2009
7. Pillai S.O, Solid State Physics, 6th Edition – New Age International, 2005.

T109 ENVIRONMENTAL SCIENCE

OBJECTIVES

- *To know about the environment*
- *To understand about environmental pollution*
- *To apply the knowledge in understanding various environmental issues and problems*

UNIT I – ENVIRONMENT AND ENERGY RESOURCES

Environmental segments – atmosphere, hydrosphere, lithosphere and biosphere. Atmospheric layers. Pollution definition and classification. Pollutants classification. Forest resources – use and over exploitation, deforestation, forest management. Water resources – use and conflicts over water, dams – benefits and problems. Mineral resources – mineral wealth of India, environmental effects of extracting and using mineral resources. Food resources – world food problems, environmental impact of modern Agriculture – fertilizer and pesticides. Energy resources – growing needs, renewable and non-renewable energy resources and use of alternate energy sources. From unsustainable to sustainable development.

UNIT II - ECOSYSTEM AND BIODIVERSITY

Concept of an ecosystem - structure and function of an ecosystem.Producers, consumers, and decomposers.Energy flow in the ecosystem. Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of forest, grassland, desert and aquatic (fresh water, esturine and marine) ecosystems. Biodiversity – definition, genetic species and ecosystem diversity. Value of biodiversity - consumptive use, productive use, social, ethical, aesthetic and option values. Hot spots of biodiversity. Threats to biodiversity, habitat loss, poaching of wildlife, human wildlife conflicts. Endangered and endemic species. Conservation of biodiversity – in-situ and ex-situ conservation of biodiversity.

UNIT III - AIR POLLUTION

Definition and classification. Chemical and photochemical reaction in different layers of atmosphere. Causes, sources, effects and control measures of air pollutants - oxides of Nitrogen, oxides of Carbon, oxides of Sulfur, hydrocarbons, chloro-fluoro carbons and particulates. Mechanism and effects of air pollution phenomenon – Global Warming, Ozone Depletion, Acid Rain, Sulfurous Smog and Photochemical Smog.

UNIT IV- WATER AND LAND POLLUTION

Water pollution – causes and effects of organic water pollutants – pesticides, insecticides, detergents and surfactants. Causes and effects of inorganic water pollutants – heavy metal pollution due to Hg, Pb, Cr & Cu. Water pollution control and monitoring – DO, COD, BOD & TOC. Land Pollution – Solid waste management – causes, effect and control measures of urban and industrial wastes. Thermal and radioactive pollution.

UNIT V -POLLUTION CONTROL AND MONITORING

Basic concepts and instrumentation of IR, UV-VIS, atomic absorption spectrometry, Gas Chromatography and Conductometry. Analysis of air pollutants – NO_x, CO_x, SO_x, H_2S, Hydrocarbons and particulates.

Text Books:

1. K. Raghavan Nambiar, "Text Book of Environmental Studies" 2nd Ed, Scitech Publications (India) Pvt Ltd, India, 2010 (For Units I & II)
2. A. K. De, "Environmental chemistry" 7th Ed; New age international (P) Ltd, New Delhi, 2010. (For Units III, IV & IV)

Reference Books:

1. B.K. Sharma, "Environmental chemistry" 11th Ed, KRISHNA Prakashan Media (P) Ltd, Meerut, 2007.
2. S.S.Dara, and D.D. Mishra "A text book of environmental chemistry and pollution control, 5th Ed, S.Chandand Company Ltd, New Delhi, 2012.
3. Richard T. Wright, Environmental Science: Toward a Sustainable Future, 10th edition, Prentice Hall, 2008
4. G. S. Sodhi, Fundamental concepts of environmental chemistry, I Ed, Alpha Science International Ltd, India, 2000.

T110 BASIC CIVIL AND MECHANICAL ENGINEERING

OBJECTIVES

- *To be able to differentiate the types of buildings according to national building code.*
- *To understand building components and their functions as well as different types of roads, bridges and dams*
- *To explain the concepts of thermal systems used in power plants and narrate the methods of harnessing renewable energies*
- *To explain the role of basic manufacturing processes*
- *To develop an intuitive understanding of underlying working principles of mechanical machines and systems.*

PART-A CIVIL ENGINEERING

UNIT I - BUILDINGS, BUILDING MATERIALS

Buildings-Definition-Classification according to NBC-plinth area, Floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses.

UNIT II - BUILDINGS AND THEIR COMPONENTS

Buildings: Various Components and their functions. Soils and their classification. Foundation: function and types. Masonry- function and types. Floors: definition and types of floors. Roofs: definition f and types.

UNIT III - BASIC INFRASTRUCTURE

Surveying: classification, general principles, types, Uses, instruments used. Roads-types: components, types and their advantage and disadvantages. Bridges: components and types of bridges. Dams: Purpose, types of dams. Water supply-sources and quality requirements, need and principles of rainwater harvesting.

PART - B MECHANICAL ENGINEERING

UNIT - IV INTERNAL AND EXTERNAL COMBUSTION SYSTEMS

IC engines – Classification – Working principles - Diesel and petrol engines: two stroke and four stroke engines – Merits and demerits.

Steam generators (Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories – Merits and demerits - Applications.

UNIT - V POWER GENERATION SYSTEMS

Conventional and Non-Conventional: Hydraulic – Thermal – Nuclear power plants – Schemes and layouts (Description Only)
Solar – wind –Geothermal - Wave – Tidal and Ocean Thermal Energy Conversion systems – Basic power plant schemes and layouts (Description only).

UNIT - VI MANUFACTURING PROCESSES

Machines – Lathe – Drilling – Bending – Grinding – Shearing (Description only)
Machining Processes – Turning – Planning – Facing – Blanking – Drilling – Punching – Shearing – Bending – Drawing – Filing – Sawing – Grinding.
Moulding and Metal Joining - Pattern making – Green and dry sand moulding – Arc and Gas welding – Brazing – Soldering (process description only).

Text Books

1. Natarajan, K V, Basic Civil Engineering, 11th Edition, Dhanalakshmi Publications Chennai, 2011. (For Units I to III)
2. Venugopal , K and Prabhu Raja, Basic Mechanical Engineering, Anuradha Publisher , 2012(For Units IV to VI)

Reference Books

1. Purushothama Raj.P., Basic civil engineering, 3rd Edn., Dhanam Publications, Chennai, 2001
2. Rajput, R K, Engineering Materials, S Chand & Co. Ltd., New Delhi, 2012.
3. Punmia, B.C., et. al., Surveying , Vol-I, Laxmi Publishers, New Delhi, 2012.
4. Punmia, B.C., et.al Building Construction, Laxmi Publishers, New Delhi ,2012.
5. El.Wakil, M.M., Power Plant Technology, Mc Graw Hill Book Co.,1985.
6. Hajra Choudhry, et. al., Workshop Technology Vol I and II, Media Promoters Publishers Pvt. Ltd., Bombay, 2004.
7. Lindberg, R.A.Process and Materials of Manufacture, PHI, 1999.
8. H.N.Gupta, R.C.Gupta and Arun Mittal, Manufacturing Processes, New Age Publications, 2001
9. Nagpal, Power Plant Engineering, Khanna Publishers, Delhi, 1998.

T111 ENGINEERING MECHANICS

OBJECTIVES

- *To understand the vector and scalar representation of forces and moments, static equilibrium of particles and rigid bodies in two dimensions*
- *To comprehend the effect of friction on equilibrium*
- *To understand the laws of motion, the kinematics of motion and the interrelationship and to learn to write the dynamic equilibrium equation*
- *To emphasis the concepts through solved examples*

UNIT I - FUNDAMENTAL OF MECHANICS

Basic Concepts Force System and Equilibrium, Definition of Force, Moment and Couple, Principle of Transmissibility, Varignon's theorem, Resultant of force system – Concurrent and non concurrent coplanar forces, Condition of static equilibrium for coplanar force system, stability of equilibrium, , applications in solving the problems on static equilibrium of bodies.

UNIT II – PRACTICAL APPLICATION OF FORCE SYSTEM

Structural member: definition, Degree of freedom, concept of free body diagrams, types of supports and reactions, types of loads, Analysis of Trusses-method of joints, method of sections.

Friction: Introduction, Static dry friction, simple contact friction problems, ladders, wedges.

UNIT III - PROPERTIES OF SURFACES

Properties of sections – area, centroids of lines, areas and volumes, moment of inertia first moment of inertia, second moment of inertia and product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.

UNIT IV - KINEMATICS AND KINETICS OF PARTICLES

Equations of motion - Rectilinear motion, curvelinear motion, Relative motion, D'Alembert's principle, work- Energy equation – Conservative forces and principle of conservation of energy, Impulse – momentum, Impact – Direct central impact and oblique central impact.

UNIT V - KINEMATICS AND KINETICS OF RIGID BODIES

Plane motion, Absolute motion, Relative motion, translating axes and rotating axes, work and energy, impulse and momentum

Text Books

1. Rajesekaran, S and Sankara Subramanian., G., Engineering Mechanics, Vikas Publishing House Private Ltd., 2012.

Reference Books

1. Palanichamy, M.S. Nagan, S., Engineering Mechanics – Statics & Dynamics, Tata McGraw-Hill,2011.

2. Beer, F.P and Johnson Jr. E.R, Vector Mechanics for Engineers, Vol. 1 Statics and Vol.2 Dynamics, McGraw – Hill International Edition, 1997.

3. Bhavikatti,S.S and K.G.Rajashekarappa, Engineering Mechanics, New Age International (P) Ltd, New Delhi,2010

T112 COMMUNICATIVE ENGLISH

OBJECTIVES

- *To improve the LSWR skills of I B.Tech students*
- *To instill confidence and enable the students to communicate with ease*
- *To equip the students with the necessary skills and develop their language prowess*

UNIT I – BASIC COMMUNICATION THEORY

Importance of Communication – stages of communication, modes of communication – barriers to communication – strategies for effective communication – Listening: Importance, types, barriers – Developing effective listening skills.

UNIT II – COMPREHENSION AND ANALYSIS

Comprehension of technical and non-technical material – Skimming, scanning, inferring-Note making and extension of vocabulary, predicting and responding to context-Intensive Reading and Reviewing

UNIT III – WRITING

Effective sentences, cohesive writing, clarity and conciseness in writing – Introduction to Technical Writing – Better paragraphs, Definitions, Practice in Summary Writing – Four modes of writing – Use of dictionaries, indices, library references – making bibliographical entries with regard to sources from books, journals, internet etc.

UNIT IV – BUSINESS WRITING / CORRESPONDENCE

Report writing – Memoranda – Notice – Instruction – Letters – Resumes – Job applications

UNIT V – ORAL COMMUNICATION

Basics of phonetics – Presentation skills – Group Discussions – Dialogue writing – Short Extempore – Debates-Role Plays-Conversation Practice

Text Book

1. Robert J.Dixson. ,Complete Course in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2006.

Reference Books

1. Ashraf M.Rizvi., Effective Technical Communication. Tata-McGraw, 2005.
2. Boove, Courtland R et al., Business Communication Today. Delhi. Pearson Education,2002.
3. Meenakshi Raman and Sangeeta Sharma., Technical Communication Principles And Practice,OUP, 2007.
4. Robert J.Dixson., Everyday Dialogues in English, Prentice-Hall of India Pvt. Ltd., New Delhi,2007.
5. Sethi,J and Kamalesh Sadanand., A Practical Course in English Pronunciation, Prentice-Hall of India Pvt. Ltd, New Delhi,2007.

P104 PHYSICS LABORATORY

OBJECTIVES

- *To provide a practical understanding of some of the concepts learnt in the theory course on Physics.*

LIST OF EXPERIMENTS (ANY 10 EXPERIMENTS)

1. Thermal conductivity – Lee's DISC
2. Thermal conductivity - Radial flow
3. Spectrometer – Prism or Hollow prism
4. Spectrometer – Transmission grating
5. Spectrometer - Ordinary & Extraordinary rays
6. Newton's rings
7. Air – wedge
8. Half shade polarimeter – Determination of specific rotatory power
9. Jolly's experiment – determination of α
10. Magnetism: i – h curve
11. Field along the axis of coil carrying current
12. Vibration magnetometer – calculation of magnetic moment & pole strength
13. Laser experiment: wavelength determination using transmission grating, reflection grating (vernier calipers) & particle size determination
14. Determination of optical absorption coefficient of materials using laser
15. Determination of numerical aperture of an optical fiber
16. Electrical conductivity of semiconductor – two probe / four probe method
17. Hall effect in semiconductor

P105 CHEMISTRY LABORATORY

OBJECTIVES

- *To gain a practical knowledge of Engineering Chemistry in relevance to Industrial applications*

LIST OF EXPERIMENTS (ANY 10 EXPERIMENTS)

1. Determination of dissolved oxygen in water.
2. Determination of total hardness of water by EDTA method.
3. Determination of carbonate and bicarbonate in water.
4. Estimation of chloride content in water.
5. Estimation of magnesium by EDTA.

6. Estimation of acetic acid in vinegar.
7. Estimation of ferrous by permanganometry.
8. Estimation of ferrous and ferric iron in a solution mixture by dichrometry.
9. Estimation of available chlorine in bleaching powder.
10. Estimation of copper in copper sulphate solution.
11. Estimation of calcium by permanganometry.
12. Estimation of iron by colorimetry.

DEMONSTRATION EXPERIMENTS (ANY TWO OF THE FOLLOWING)

1. Determination of COD of water sample.
2. Determination of lead by conductometry.
3. Percentage composition of sugar solution by viscometry.

P106 WORKSHOP PRACTICE

OBJECTIVES

- *To convey the basics of mechanical tools used in engineering*
- *To establish hands on experience on the working tools*
- *To develop basic joints and fittings using the hand tools*
- *To establish the importance of joints and fitting in engineering applications*
- *To explain the role of basic workshop in engineering*
- *To develop an intuitive understanding of underlying physical mechanism used in mechanical machines.*

Sl. No.	Trade	List of Exercises
1.	Fitting	Study of tools and Machineries. Exercises on symmetric joints and joints with acute angle.
2.	Welding	Study of arc and gas welding equipment and tools – Edge preparation – Exercises on lap joint and V Butt joints – Demonstration of gas welding
3	Sheet metal work	Study of tools and Machineries – exercises on simple products like Office tray and waste collection tray.
4.	Carpentry	Study of tools and Machineries – Exercises on Lap joints and Mortise joints

LIST OF EXERCISES

I Fitting

1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting

II Welding

1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3. Single V butt welding (Arc)

III Sheet metal work

1. Study of tools and machineries
2. Frustum
3. Waste collection tray

IV Carpentry

1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint.

P107 NCC / NSS

NCC/NSS training is compulsory for all the Undergraduate students

1. The above activities will include Practical/field activities/Extension lectures.
2. The above activities shall be carried out outside class hours.
3. In the above activities, the student participation shall be for a minimum period of 45 hours.
4. The above activities will be monitored by the respective faculty incharge and the First Year Coordinator.
5. Pass /Fail will be determined on the basis of participation, attendance, performance and behavior. If a candidate Fails, he/she has to repeat the course in the subsequent years
6. Pass in this course is mandatory for the award of degree.

MATHEMATICS – III

Objective (s)

1. To provide the concepts of functions of a complex variable, conformal mapping, complex integration, series expansion of complex functions, Harmonic analysis and Fourier series.
2. To make the students understand and work out problems of constructing analytic functions, conformal mapping, bilinear transformation, contour integration and expanding functions into Fourier series including Harmonic analysis

UNIT – I Function of a complex variable Total Hours : 9

Continuity, derivative and analytic functions – Necessary conditions - Cauchy-Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions

UNIT – II Conformal mapping Total Hours : 9

Simple and standard transformations like $w = z+c$, cz, z^2, e^z, $\sin z$, $\cosh z$ and $z+1/z$ - Bilinear transformation and cross ratio property (excluding Schwarz-Christoffel transformation). Taylor's and Laurent's theorem (without proof) - Series expansion of complex valued functions - classification of singularities

UNIT – III Complex Integration: Total Hours : 9

Cauchy's integral theorem and its application, Cauchy's integral formula and problems. Residues and evaluation of residues – Cauchy's residue theorem – Contour integration: Cauchy's and Jordan's Lemma (statement only) - Application of residue theorem to evaluate real integrals – unit circle and semicircular contour (excluding poles on boundaries)

UNIT – IV Fourier Series: Total Hours : 9

Dirichlet's conditions – General Fourier series - Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

UNIT – V Root Mean Square Value Total Hours : 9

Parseval's theorem on Fourier Coefficients. Complex form of Fourier series – Harmonic Analysis.

Total Contact Hours : 45 Total Tutorials : 15

Total Practical Class : 0 Total Hours : 60

Programme Outcome

On successful completion of the module students will be able to:

1. Understand the concepts of function of a complex variable and complex integration and apply these ideas to solve problems occurring in the area of engineering and technology.
2. Expand functions into Fourier series which are very much essential for application in engineering and technology

Text Books

1. Veerarajan T., Engineering Mathematics for first year, Tata-McGraw Hill, 2010. 2. Venkataraman M.K., Engineering Mathematics, Vol. II & III, National Publishing Company, Chennai, 2012.

Reference Books

1. Kandasamy P. et al, Engineering Mathematics, Vol. II & III, S. Chand & Co., New Delhi, 2012.
2. Bali N. P and Manish Goyal, Text book of Engineering Mathematics, 3rd Edition, Laxmi Publications (p) Ltd., 2008.
3. Grewal B.S., Higher Engineering Mathematics, 40th Edition, Khanna Publishers, Delhi 2007.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 7Th Edition, Wiley India, (2007).

GEO SCIENCE ENGINEERING

1. To familiarize the students to interior of the earth, plate tectonics, geomorphological processes and their significance in civil Engineering.
2. To provide an insight on minerals, rocks and their geological characteristics to understand their effects and significance in various areas of civil Engineering.
3. Facilitate the students to understand various defects associate with geological formations and to emphasize their significance in the selection of site for various structures.

Unit - I : General Geology Total Hours : 12

Scope of geology in Civil Engineering – interior of the earth- Fundamentals of plate tectonics - geomorphological (surface) processes –weathering – types , weathered products, assessment of degree of weathering , Fluvial processes, glaciations , wind action, their land forms and their significance in Civil Engineering – earthquake, its causes, classification, earthquake zones of India, - Landslides, its causes, classification and remediation.

Unit - II : Mineralogy Total Hours : 12

Physical properties of minerals – classification - study of important rock forming minerals –Quartz family, feldspar family, Augite, Hornblend, Mica family, calcite, Iron oxide minerals, Augite, Hornblend, and Clay minerals - effect of minerals on the performance of soils and rocks.

Unit - III : Petrology Total Hours : 12

Classification of rocks - mode of formation – Texture, structure and forms of igneous, sedimentary and metamorphic rocks - Physical properties, Mechanical properties of rocks-. Study of important rocks - granite, syenite, diorite, gabbro, pegmatite, dolerite , basalt , sand stone, limestone, shale, breccia , conglomerate, gneiss, quartzite, marble, slate, schist, phyllite and conglomerate - role of petrology in the field of construction.

Unit - IV : Structural geology and Geophysical methods Total Hours: 12

Attitude of beds - out crops, study of structural features such as folds, faults, joints, unconformities ,their brief classification and their bearing on

engineering construction – principles of geophysical methods, electrical resistivity method , seismic method and its applications in civil engineering

Unit - V : Geological applications Total Hours : 12

Role of geology in site investigation, Geotechnical classification of rock, geological considerations in tunnels and dam site, reservoir site, buildings, road cuttings, study of air photographs and satellite images and interpretation for civil engineering projects, groundwater- types of aquifers , properties of geological formations affecting groundwater and its significance in construction.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

Student will be familiarized with plate tectonics, earthquakes, land forms, minerals, rocks, structural defects and their significance to find the engineering solutions to various problems in the field of construction.

Text Books

1. Chenna Kesavulu.N, "Engineering Geology ", Macmillan Publishers Pvt. Ltd., 2009
2. Varghese, P.C," Engineering Geology for Civil Engineers", Prentice-hall of India Pvt.Ltd., 2012 .

Reference Books

1. Leggot, R.F.," Geology and Engineers ", McGraw Hill , New York.2002
2. Blyth, F.G.M., "A Geology for Engineers", Arnold, London, 2003.
3. Bell.F.G, " Fundamentals of Engineering Geology" Butterworth - Heinemann, 1983.
4. Bell. F.G. " Engineering Geology" Elsevier publications, 2007

BUILDING TECHNOLOGY

1. To understand the building material, characterization and its application
2. To acquire knowledge on conventional and unique technology of construction in building

Unit - I : Building Materials TotalHours:12

Lime, Timber and its Products, Floor and Wall Tiles, Pozzolanas, Ferrous metals, Thermal Insulation Material, Acoustical Materials .

Unit - II : Finishing and Perfective materials TotalHours:12

Finishing Materials: Glass, Aluminium, Plastics, Paints, Varnishes, Distemper, Waterproofing and Damp Proofing Materials, Ferrocement and its application.

Unit - III : Components of building and Treatment TotalHours:12

Partition wall and Cavity wall, Composite Masonry, Doors, Windows, Ventilators, Stairs, Lift, Ramps, Escalators, Anti Termite Treatment

Unit - IV : Plumbing and Temp, Structures TotalHours: 12

Materials for Plumbing and Sanitation, Fire Protection, Temporary Structures, Introduction to Building Maintenance .

Unit - V : Modern Techniques TotalHours:12

Principles of Energy Efficient Buildings, Disasters Resistant Buildings (as per IS), Ventilation and Air Conditioning, Cost - effective Construction Techniques

Total ContactHours:60 TotalTutorials:0
Total Practical Class:0 Total Hours:60

Programme Outcome :

1. One should have required knowledge on certain special and finishing meterials .
2. Should have acquired, knowledge on construction techniques in both material and finishing.

TextBooks

1. Bhavikatti.S.S., Building Materials, Vikas Publishing House.Pvt. Ltd., New Delhi, 2012.
2. Punmia. B.C., Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publishing (P).Ltd., New Delhi-2, 2012.

ReferenceBooks

1. Rajput, R.K., Engineering Material, S.Chand &Co. Ltd., New Delhi, 2008.
2. Bhavikatti.S.S.,Building Technology, Vikas Publishing House. Pvt. Ltd., New Delhi, 2013.
3. Shrivastava.U.K, Building Materials Technology, Galgotia Publications Pvt., Ltd., 2012.
4. Varghese, P.C, Building Materials, Prentice-hall of India Pvt.Ltd., 2013.

MECHANICS OF SOLIDS - I

1. To develop an understanding of the relationship between external loads applied to a deformable body and the internal stress, strain and deformation induced in the body.
2. To show proficiency in mathematics and basic sciences required to solve structural engineering and mechanics problem.
3. To develop analytical and graphical problem solving skills.

Unit - I : Stresses & Strains Total Hours : 9

Simple Stresses and Strains – Tension, compression and shear stresses - Hooke's law - compound stresses -thermal stresses – Compound bars.

Unit - II : Bending Stresses Total Hours : 9

Shear force and bending moment diagrams for beams - Theory of simple bending –Bending stress distribution at sections. Beams of uniform strength.

Unit - III : Shear stress Total Hours : 9

Shear stress distribution due to bending – Shear Centre. Springs – Stiffness – parallel, series - Problems Complex stresses – Principal planes and stresses-Mohr's circle.

Unit - IV : Torsion Total Hours : 9

Theory of simple Torsion – Torsional rigidity – Torsion of non-circular sections – Composite shafts in series and parallel. Thin cylinders and shells – Thick cylinders.

Unit - V : Columns Total Hours : 9

Columns – Euler's theory – Rankine – Jordon formula – Columns with initial curvature and eccentric loads–Long columns- Laterally loaded columns, Stability Check for masonry dams and retaining walls

Total ContactHours:45 TotalTutorials:15
Total Practical Class:0 Total Hours : 60

Programme Outcome :

1. Calculate and understand the concepts of stress and strain;
2. Calculate, describe, and estimate external loadings, including axial load, shear force, bending, and torsion, and internal stresses associated with these external loadings;
3. calculate internal stresses and strains through the application of stress transformation equations and Mohr's circle;
4. Understand stability and buckling phenomena for a slender member under an axial loadcompressive force

TextBooks

1 Bhavikatti. S.S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, SecondEdition, 2012.

2 Bansal.R.K., A Text book of Strength of Materials, Laxmi Publications (P) Ltd, New Delhi, 2012.

ReferenceBooks

1 Shah.H.J. and Junnarkar.S.B., Mechanics of structures- Vol.I, Charotar Publishing house, Ltd,, 2012.

2 Surendra Singh, Strength of Materials, Vikas Publishing House, 2013

3 Rattan, S.S., Strength of Materials, Tata McGraw-Hill, 2011.

4 Ramasamy.V, Purushothama Raj.P, Strength of Materials, Pearson Education Ltd., 2012

MECHANICS OF FLUIDS

Objective(s)

1. To make the student to understand the basic properties of fluids and principles of mechanics of fluids.
2. To apply the above principle for solving typical elementary filed problems

Unit - I : Fluid properties Total Hours : 9

Density, Specific Weight, Specific Volume, Specific gravity, Compressibility, Viscosity, surface tension, capillarity, vapour pressure. Fluid Statics: Pressure in a fluid, pressure head, Measurement of pressure. Hydrostatic forces on submerged plane and curved surfaces, Buoyancy, Metacentre, Stability of floating and submerged bodies.

Unit - II : Fluid Kinematics Total Hours : 9

Stream line, streak line, path line and stream tube. Types of flow, steady , unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows. Equation of continuity for one, two, three dimensional flows, stream function and velocity potential function, flow net analysis.Dynamics of flow: Euler's equation of motion, Bernoulli's equation, simple applications of Bernoulli's equation, Momentum equation. Kinetic energy and Momentum correction factors.

Unit - III : Boundary Layer Theory Total Hours : 9

Boundary Layer thickness, Displacement thickness, Momentum thickness, Energy thickness, Boundary layer growth and separation. Laminar flow: Laminar flow through pipes, Hagen- poissuille flow, energy loss. Turbulent flow: Turbulent flow through pipes, Darcy's equation, Minor losses, Energy and Hydraulic gradients, pipes in series and parallel.

Unit - IV : Flow measurement Total Hours : 9

Pitot tube, Venturimeter, Orificemeter, Flow nozzle, and mouthpieces, flow over notches and weirs, Venturiflume and standing wave flume, Velocity measurement in open channel.

Unit - V : Dimensional Analysis and Similitude Total Hours : 9

Dimensional analysis- Rayleigh's method, Buckingham's fi theorem, Dimensionless numbers, Laws of similitude, Model Analysis, Distorted models, Principles of analogy.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Out come

The student should have a through basic understanding of mechanics of fluids and use the knowledge to identify elementary practical problems and solve them.

Text Books

1. Modi,P.N.,and Seth, S.M., Hydraulics, Fluid Mechanics and Hydraulic Machines, Standard Book House, New Delhi, 2014.
2. Rajput,R.K., Text Book of fluid Mechanics and Hydraulic Machinery, S.Chand & Company, (P)Ltd., New Delhi, 2014.

Reference Books

1. Douglas,J.F., Gasiorek,J.M and Swaffield,J.A., Fluid Mechanics 4thEdn.Pearson Education India,2008.
2. Das M.M Fluid Mechanics and Turbimachines, Prentice Hall of India(P) Ltd New Delhi, 2008.
3. Sukumar Pati, Text book of Fluid Mechanics & Hydraulic Machines, Tata McGraw-Hill, 2012.
4. Rajput, R.K., Fluid Mechanics & Hydraulic Machines, S.Chand Group, 2014

SURVEYING - I

Objective (s)

1. Understand the basic concepts of surveying and able to solve problems associated with linear measurements and error correction.
2. Gain the basics of compass surveying and able to understand the system of coordinates and angular measurement for the purpose of traversing.
3. Learn various methods of taking levels and reducing levels

UNIT – I Chain Compass and Plane Table Surveying Total Hours : 9

CHAIN : Definition – Principles – Classification – field and office work. COMPASS : Prismatic compass – Surveyor's compass – Bearing systems and conversions – Local attraction – Magnetic declination – dip PLANE TABLE SURVEYING : Plane table instruments and accessories – merits and demerits – methods – Radiation- Intersection – Resection

UNIT – II Leveling and applications Total Hours : 9

Basic terms and definitions – Methods of levelling – levels and staves- temporary and permanent adjustments – Direct levelling – Differential levelling - booking and reducing Levels – Balancing of sights curvature and refraction- reciprocal levelling- longitudinal and cross sections- traversing –Levelling problems – errors in Levelling Contouring – methods – characteristic and use of contours – plotting

UNIT – III Theodolite Surveying Total Hours : 9

Theodolite – Vernier and microptic – Description and uses – Temporary and permanent adjustments of vernier transit – Horizontal angles – Vertical angles – Trigonometrical Levelling- Heights and distances – Traversing – Closing error and distribution – Gale's tables – Omitted measurements .

UNIT – IV Area & Volume calculation , setting out works Total Hours : 9

Areas and Volumes-Areas enclosed by straight lines – Irregular figures – volume – earthwork calculations – capacity of reservoirs – mass – haul diagrams. Reconnaissance – preliminary and location surveys for engineering projects – Lay out – Setting out works – Route Surveys for highways – Railways and waterways

UNIT – V : Tacheometric Surveying Total Hours : 9

Tacheometric systems - Tangential, stadia and subtense methods - Stadia systems – Horizontaland inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants -Anallactic lens - Subtense bar

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

At the end of the course the students will posses knowledge about Chain surveying, Compass surveying, Plane table surveying, Levelling, Theodolite surveying and Engineering surveys

Text Books

1. Punmia .B.C . , et .al.." Surveying ", Vols, I, Laxmi Publications, 2012
2. Kanetkar, T.P. ,Surveying and leveling, Vols. I & II, United book corporation, Pune 2012

Reference Books

1. Kanetkar, T.P., and Kulkarni,S.V., Surveying and Levelling, Part I, United book Corporation, Pune. 2012.
2. Shahani, P.B., Text book of Surveying, Vol.I, Oxford &IBH Publications, 2012.

SURVEYING LABORATORY - I

Prerequisite Nil

Objective (s)

1. To train the students handling instruments used for surveying.
2. To make the students to understand various problems in linear and angular measurement associated with field application

List of Experiments

1. Simple chain survey – calculation of area using cross staff
2. Compass Surveying - Measurement of bearing of survey lines by prismatic compass
3. Plane Table Surveying - Radiation and Intersection methods
4. Reduction of Levels:
   (i) Height of Collimation
   (ii) Rise and Fall method
5. Taking levels of longitudinal section and cross sections of a road plotting
6. Plotting of perpendicular and Oblique offsets
7. Plotting of contours from Radial methods and block leveling
8. Setting out Grades for Road profile
9. Alignment of Sewer lines
10. Study on Tacheometeric Surveying using Electronic Theodolite
11. Determination of Heights and Distance by :
    (i) Stadia Hair Method
    (ii) Tangential Tacheometry

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 45

Programme Outcome

To provide hands on exercise and make the students to learn the basics of field oriented problems in surveying

MATERIALS TESTING LABORATORY - I

Objective(s)

To understand the preparation of a specimen for the desired strength of materials in relating to the analysis and design of various structural elements

1. Tension Test on Mild steel and Tor Steel rod specimens
2. Direct Shear Test on Steel Rod Specimens
3. Bend and Re-bend Test on Steel Rod Specimens
4. Brinell Hardness Test on Metal Specimens
5. Rockwell Hardness Test on Metal Specimens
6. Vickers Hardness Test on Metal Specimens
7. Impact Test on Metal Specimens using Izod arrangement
8. Impact Test on Metal Specimens using Charpy arrangement
9. Ductility Test on Sheet metals using Erichsen Cupping
10. Torsion Test on Metal Specimens-
11. Fatigue Test on Metal Specimens- Demonstration only
12. Spring Test- Demonstration only
13. Compression Test on wood Specimens- Parallel and Perpendicular to the Grains-
14. Direct Shear Test on Wood Specimens
15. Direct Tension Test on Wood Specimens
16. Static Bend Test on Wood Specimens

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 45

Programme Out come

The course will enable the students to evaluate the mechanical properties of materials subjected to the loads and report and verify the same as per Indian standards available and know where the mechanical property is used in the engineering design.

BUILDING PLANNING AND DRAWING

Objective(s)

1. To understand the Functional Planning and architectural design of buildings
2. To develop skills in manual and Autocad drafting of building plans, elevation and sections

Theory

1. Functional planning – Introduction to anthropometrics and ergonomics – Occupancy classification of Buildings –Essentials of National Building Code – Essentials of Building and development rules – Introduction to green building.
2. Building Physics : Sun's movement and building: Sun control devices – Exposed walls and Openings
3. Lighting and acoustics
4. Introduction to AutoCAD – Draw and modify tools- Dimensioning- Layers- Blocks-Printing- Two dimensional drawing *3D commands* .

Plates to be submitted in AUTOCAD

1. Door, Windows, Ventilators.
2. Foundation, Staircase
3. Residential buildings – Plan, Section, Elevations (Using Mini Drafter and AutoCad)
4. Public buildings like office, dispensary, post office, bank etc.
5. Industrial buildings

Total Contact Hours : 30 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 75

Programme Out come

- Ability to develop a concept drawing based on the requirements
- Ability to draft a Approval Drawing in AutoCAD.

MATHEMATICS - IV

Objective(s)

1. Importance of problems in Partial Differential Equations
2. Problem solving techniques of PDE
3. To make the students knowledgeable in the areas of Boundary Value Problems like vibrating string (wave equation), heat equation in one and two dimensions.
4. To acquaint the students with the concepts of Theory of sampling

Unit - I Total Hours : 9

Formation by elimination of arbitrary constants and arbitrary functions – General, singular, particular and integrals – Lagrange's linear first order equation – Higher order differential equations with constant coefficients

Unit - II Total Hours : 9

Solution of partial differential equation by the method of separation of variables – Boundary value problems – Fourier series solution – Transverse vibration of an elastic string.

Unit - III Total Hours : 9

Fourier series solution for one dimensional heat flow equation – Fourier series solutions for two dimensional heat flow equations under steady state condition – (Cartesian and Polar forms).

Unit - IV Total Hours : 9

Curve fitting by the method of least squares – fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large samples test for single proportions, differences of proportions, single mean, difference of means and standard deviations.

Unit - V Total Hours : 9

Small samples – Test for single mean, difference of means and correlations of coefficients, test for ratio of variances – Chi-square test for goodness of fit and independence of attributes.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Out come

On successful completion of the module students will be able to:

1. Understand the different types of PDE and will be able to solve problems occurring in the area of engineering and technology.
2. Know sampling theory and apply to solve practical problems in engineering and technology.

Text Books:

1. Venkataraman M. K, "Engineering Mathematics, Third year Part A& B", 12th Edition, The National Publishing Company, Madras 1996.
2. S. C. Gupta and V. K. Kapoor, "Fundamentals of Mathematical Statistics", Sultan Chand and sons, 1975.

Reference Books:

1. Kandasamy P. et al, Engineering Mathematics, Vol. II & III, S. Chand & Co., New Delhi, 2012.
2. Grewal B.S., Higher Engineering Mathematics, 40th Edition, Khanna Publishers, Delhi 2007.
3. Bali N.P., Manish Goyal, " Engineering Mathematics, 7 th Edition, Laxmi Publications, 2007.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 7 th Edition, Wiley India, 2007.
5. Ray Wylie C. , Advanced Engineering Mathematics, 6 th Edition, Tata McGraw Hill, 2003

CONCRETE TECHNOLOGY

Objective (s)

1. Should be able to understand the Engineering properties of materials, Cement, Aggregates, Admixtures
2. Understand the hydration mechanism of Cement & properties of fresh and Hardened concrete
3. To design concrete mixes.

Unit - I : Cement Total Hours : 12

Portland cement- chemical composition- hydration of Portland cement- heat of hydration- Test on Cement - hardening of cement paste- Types of Portland cement- special hydraulics cements.

Unit - II : Aggregates & Fresh Concrete Total Hours : 12

Aggregates- natural and mineral aggregates- characteristics of aggregate and their significant- testing of aggregates- admixture for concrete- concrete at early ages- Workability of concrete- early Volume changes- setting time.

Unit - III : Hardened Concrete Total Hours : 12

Concrete- introduction- components of concrete- types- properties of hardened concrete and their significance, structure of the hardened concrete- Compressive strength of concrete and factors affecting it- elastic behaviour of concrete- drying shrinkage and creep.

Unit - IV : Durability Properties Total Hours : 12

Durability of concrete- significant- causes of concrete deterioration- alkali-aggregate reaction- deterioration by chemical actions- concrete in marine environment.

Uni - V : Mix Design Total Hours : 12

Concept of proportioning concrete mixes- mix design- IS code method- ACI method. Testing evaluation and control of concrete quality.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Outcome :

Student should be able to understand the properties of concrete and to design the concrete mixes of various grades used in the construction

Text Books

1. Santhakumar.Ar, Concrete Technology, Oxford University Press, 2013
2. Shetty,M.S, Concrete Technology; Theory & Practice, S.Chand& Group, New Delhi, 2014.

Reference Books

1. Gambhir.M.I, Concrete Technology: Theory & Practice, Tata McGraw Hill Co., New Delhi,2013.
2. Gupta. Yp, Concrete Technology& Good Construction Practices, New Age International (p)Ltd., 2013.
3. Neville.Am.&BrooksJi.,Concrete Technology, Pearson Education Ltd., 2013.
4. Krishna Raju.N, Design of Concrete Mixes, CBS Publishers, New Delhi, 2013.

ENVIRONMENTAL ENGINEERING- I

Objective(s)

1. To study the water supply demand and distribution
2. To understand the quality of water from various sources
3. To carryout functional design of water treatment units.

Unit - I : Introduction Total Hours : 12

Water supply Scheme - objectives and requirements - Domestic, industrial, commercial and public requirements - Various methods of estimating population - Variations in rate of demand and its effects on design.

Unit - II : Sources of Water and intakes: Total Hours : 12

Surface and groundwater sources - Computation of storage capacity of reservoirs by analytical and graphical methods - Forms of underground sources like wells, Infiltration wells and galleries, Intake structures, tube wells - Sanitary protection of wells-transportation of water- Pipe flow formulae – pipe materials- laying of pipes-testing of pipes-

Unit - III : Quality of Water: Total Hours : 12

Indian and W.H.O. Standards for drinking water - impurities in water - Physical, chemical and bacteriological analysis of water - quality of water for trade purpose and swimming pools

Unit - IV : Water Treatment system: Total Hours : 12

Unit process of water treatment - Principles, functions and design of flocculators, sedimentation tanks, sand filters, principles of disinfection, water softening, aeration, Iron and manganese removal.

Unit - V : Distribution System Total Hours : 12

Service reservoir location, determination of capacity – Method of distribution - Layout of distribution systems- Design of distribution system, analysis of pipe networks by different methods, pipe appurtenance for distribution system – Plumbing works and layout of water supply system for buildings, waste detection and prevention, Effects of corrosion and its prevention.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

· An ability to apply knowledge of Environmental Science and Engineering to solve problems related to water supply and sanitation

Text Books

1. Duggal, K.N., Elements of Environmental Engineering, S. Chand & Company , New Delhi 2013
2. Punmia.B.C., Ashok K Jain and Arun K Jain., Water Supply Engineering: Environmental Engineering 1, Laksmi Publications (P) Ltd., 2013

Reference Books

1. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013
2. Venugopala Rao.P,Text book of Environmental Engineering, Prentice-hall of India Pvt Ltd., 2012
3. Santosh Kumar Garg, Water Supply Engineering: Environmental Engineering 1, Khanna Publishers, 2013
4. Modi, P.N, Water Supply Engineering: Environmental Engineering 1, Standard Publishers, 2011

MECHANICS OF SOLIDS-II

Objective(s)

1. Calculate & understand the concept of determination of deflection of beams & trusses
2. Calculate the stresses due to unsymmetrical loading
3. The student is to realize the three-dimensional nature of stress and strain and the relationships between strain and displacement.
4. To understand the concept of various theories of failure

Unit - I : Deflection of beams Total Hours : 9

Deflection of beams – Double Integration method - Macaulay's method, moment area method -conjugate beam Methods.

Unit - II : Energy methods Total Hours : 9

Strain energy due to axial, bending, shear and torsional forces – Impact loads. Principle of virtualdisplacement – principle of minimum potential energy – Castigliano's Theorems – Maxwell – Betti'stheorem.

Unit - III : Deflection of trusses Total Hours : 9

Deflection of trusses and frames – strain energy and dummy/unit load methods.

Unit - IV : Analysis of continuous beams& unsymmetrical bending Total Hours : 9

Analysis of continuous beams using generalized theorem of three moments – shear force and bendingmoment diagrams. Unsymmetrical bending – principal moments of inertia – stresses due to unsymmetrical bending.

Unit - V : Complex strain & Theories of failure Total Hours : 9

Complex strains – linear strains for tri-axial state of stress – principle strains in terms of stress – Mohr'sstrain circle – relationship between Mohr's strain and stress circles. Theories of failure – Brittle and Ductile materials.

Total ContactHours: 45 TotalTutorials:15
Total Practical Class:0 Total Hours : 60

Programme Outcome

1. Relate loading and deformation states to the proper components of stress and Strain
2. Determine the deflection of beams & trusses
3. Relate complex stress & strain
4. Apply knowledge of theories of failure for design.

TextBooks

1. Bhavikatti. S. S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, 2012.
2. Bhavikatti. S. S., Structural Analysis – I, Vikas Publishing House (P) Ltd., New Delhi, 2012.

Reference Books

1. Shah.H.J. and Junnarkar.S.B., Mechanics of structures- Vol.I& Vol.II, Charotar Publishing house, Ltd, 2012.
2. Rattan, S.S., Strength of Materials, Tata McGraw-Hill, 2011.Ramasamy.V, Purushothama Raj.P, Strength of Materials, Pearson Education Ltd., 2012.
3. Jindal.Uc., Strength of Materials, Pearson Education Ltd.,2012 4. Negi.L.S., Strength of Materials, Tata McGraw-Hill, 2012

HYDRAULICS AND HYDRAULIC MACHINERY

Objective (s)

1. To have a thorough understanding of open channel flow.
2. To understand the basic principles in the working and application of typical pumps and turbines.

UNIT – I Total Hours : 9

Open Channel flow: Types of channel, Velocity distribution, Chezy, Manning and Basin formulae, for uniform flow, Most economical section, critical flow, specific energy, specific force. Computation of uniform flow and critical flow.

UNIT – II Total Hours : 9

Open channel flow: Non-uniform flow, Dynamic equation for Gradually Varied flow, computation for length of backwater curve, Rapidly varied flow-hydraulic jump, types, uses. Surges in open channels.

UNIT – III Total Hours : 9

Basics of Turbo machinery: Impulse momentum equation, Hydrodynamics forces of jets on vanes, Velocity Triangles, Angular momentum principle, application to radial flow turbines.

UNIT – IV Total Hours : 9

Turbines: Classification, impulse and reaction turbines, characteristic curves, draft tubes, governing of turbines, specific speed, unit quantities concept, similarity, cavitation.

UNIT – V Total Hours : 9

Pumps: Centrifugal pumps- classification, work done, minimum starting speed, losses and efficiencies, specific speed, multistage pumps, specific speed, characteristic curves, NPSH, cavitation in pumps. Reciprocating pumps-types, effects of acceleration and frictional resistance, separation, Air Vessels, work saved by fitting air vessels.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

1. At the end of the course, the student should be able to compute the various parameters of channels like uniform flow, critical flow and use it for typical practical situations.
2. Further the student should be able to select the type of pumps, turbines for given practical situations, apart from understanding their typical characteristics.

Text Books

1. Modi,P.N.,and Seth, S.M., Hydraulics, Fluid Mechanics and Hydraulic Machines, Standard Book House, New Delhi, 2014.
2. Rajput,R.K., Text Book of fluid Mechanics and Hydraulic Machinery, S.Chand & Company, (P)Ltd., New Delhi, 2014.

Reference Books

1. Gupta.S.C, Fluid Mechanics & Hydraulic Machines, Pearson Education Ltd., 2013.
2. Bansal,R.K., Text Book of fluid Mechanics and Hydraulic Machines, Lakshmi Publications(P)Ltd., 2013.
3. Subramanya.K., Fluid Mechanics & Hydraulic Machines-Problems & Solutions, Tata McGraw-hill, 2013.
4. Khurmi,R.S., A Text book of Hydraulics Fluid Mechanics & Hydraulic Machines, S.Chand & Company, 2014

SURVEYING - II

Objective (s)

1. Solve sight specific problems such as determination of elevation by trignometric and tacheometric means of surveying .
2. Understand the concepts of setting out curves in the field by both angular and linear method of surveying.
3. Learn the working principles of electronic distance measuring instrument and handling of total station.
4. Understand the concepts of geographical information systems and the utilization of global positioning systems which will be very much useful for students project works which involves measurements.

UNIT – I Control Surveying Total Hours : 9

Working from whole to part - Horizontal and vertical control methods - Triangulation - Signals -Base line - Instruments and accessores - Corrections - Satellite station - Reduction to centre -Trignometriclevelling - Single and reciprocal observations - Modern trends – Bench marking

UNIT – II Engineering Survey Total Hours : 9

Setting out curves: Horizontal curves – Elements of a circular curve and notations –Designation of a curve – Setting out a simple circular curve – Compound curve – Reverse curve – Transition – vertical curve.

UNIT – III Survey Adjustments Total Hours : 9

Errors - Sources, precautions and corrections - Classification of errors - True and most probablevalues - weighted observations - Method of equal shifts - Principle of least squares – Normal equation - Correlates - Level nets - Adjustment of simple triangulation networks

UNIT – IV Advances in Surveying Total Hours : 9

Electro-optical system, Measuring Principle, Working Principle, Sources of error, Total station, Microwave system Measuring and working principle, Sources of error, GPS – Fundamentals – Introduction space, Control segments – Observation principle, Orbit Representation

UNIT – V Remote Sensing and GIS Total Hours : 9

Introduction of Remote Sensing - Electro Magnetic Spectrum - Types of Platforms – different types of aircrafts-Manned and Unmanned spacecrafts – sun synchronous and geo synchronous satellites – Types and characteristics of different platforms- Basic principles of data processing – GIS - Definition – Components of GIS – Data : Spatial and Non-spatial – Spatial Data- Data model input – Data analysis output .

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

At the end of the course the student will posses knowledge about Tachometric surveying, Control surveying, Survey adjustments, Photogrametry and understanding the concept of EDM , Remote sensing and GIS

Text Books

1. Punmia .B.C . , et .al..” Surveying “, Vols, I&II, Laxmi Publications, 2012
2. Kanetkar, T.P. ,Surveying and leveling, Vols. I & II, United book corporation, Pune,2012

Reference Books

1. Kanetkar, T.P. and Kulkarni,S.V., Surveying and Levelling, Part I & Part II , United bookCorporation, Pune. 2012.
2. Shahani, P.B., Text book of Surveying, Vol.I& II, Oxford &IBH Publications, 2012.
3. Lillesand,T.M., Kiefer R.W., Remote sensing and Image Interpretation, John Wiley and Sons, Inc, New York,2010.
4. Paul.R. Wolf, Elements of Photogrammetric with air photo interpretation, Tata McGraw –hill, 2012.

SURVEYING LABORATORY - II

Objective (s)

1. To train the students in handling angular measuring instruments used for surveying.
2. To make the students in determining the elevation of an objective by various means of surveying associated with vertical and horizontal control

List of Experiments

1. Closed traverse, plotting and adjustment using Electronic theodolite
2. Open traverse, plotting and adjustment using Electronic theodolite
3. Determination of Heights and Distances by trigonometric surveying using electronic theodolite
4. Setting out for building using Electronic theodolite
5. Setting out curves by Rankine's method using Electronic theodolite
6. Realignment of road curves
7. Total Station Surveying – Measurements of Distances and angles, Slope distances, Height, Traversing, setting out, etc
8. GPS Surveying – Co-ordinate Measurements

(B) List of Demonstration Only

1. Interpretation of Aerial Photographs- Demonstration

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 45

Programme Outcome

To provide hands on exercise and make the students to learn the concept of determining the elevation of an objective by various means of horizontal as well as vertical control survey

FLUID MECHANICS AND MACHINES LAB

Objective(s)

To determine the various parameters used in Fluid mechanics and Fluid Machinery

A. Fluid Flow Laboratory

1. Calibration of rectangular, triangular, trapezoidal notches
2. Determination of coefficient of discharge for orifices and mouthpieces
3. Calibration of venturimeters, orifice meters and Rota Meters
4. Verification of Bernoullis theorem
5. Determination of pipe friction
6. Determination of minor losses in pipe due to bends, elbows, sudden contraction, expansion etc.,
7. Determination of Metacentric height of various ship models
8. Determination of force due to Impact of jet on vanes

B. Fluid Machinery Laboratory

1. Study of performance characteristics of centrifugal pump (constant speed)
2. Study of performance characteristics of Reciprocating pump
3. Study of performance characteristics of Submersible pump
4. Tests on Turbine

Total Contact Hours : Total Tutorials : 0
Total Practical Class : 45

Programme Out come

(i) Students are able to measure the discharge through the channels and pipes, check fly stability of the floating bodies.

(ii) To design the various pumps and Turbines used in the power stations.

GEO SCIENCEENGINEERING LAB

Objective(s)

1. To familiarize the various types of minerals and rocks, their geological characteristics to understand their behavior/performance.
2. To impart hands on training in determination of properties of rocks.
3. To provide the knowledge on interpretation of data to arrive the solution.

1. Megascopic study of important rock forming/silicate minerals.
2. Megascopic study of important non-silicate minerals.
3. Megascopic study of important igneous rocks.
4 Megascopic study of important sedimentary rocks
5 Megascopic study of important metamorphic rocks
6 Elementary problems of true dip, apparent dip and strike of geological formations.
7 Establishing thickness, depth and structure of geological formations
8 Construction of topographic profile, geological sections and their interpretation
9 Electrical resistivity method (not recommended for examination).
10 Determination of soundness of rocks (not recommended for examination
11 Determination of weathering of rock
12 Determination of durability of rock

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 45

Programme Outcome Student should able to identify minerals/rocks, their characteristics and their bearing on the construction. Also, the student will be familiar with attitude of geological formations and preparation of geological sections to address the problems during site investigation process.

SP P44 PHYSICAL EDUCATION

Physical Education is compulsory for all the Undergraduate students

1. The activities will include games and sports / extension lectures.
2. Two Hrs. / Week will be allocated for physical education in the third and fourth semesters. The student participation shall be for a minimum period of 45 hours in both the semesters put together.
3. These activities will be monitored by the Director of Physical Education.
4. Pass /Fail will be determined on the basis of participation, attendance, and performance. If a candidate Fails, he/she has to repeat the course in the subsequent years Pass in this course is mandatory for the award of degree

DESIGN OF RCC STRUCTURES

Objective(s)

1. To understand design principles of reinforced concrete
2. To gain knowledge in the Limit state method of design of basic structural elements

Unit - I : Introduction and Design Philosophy Total Hours : 9

Introduction to Reinforced concrete structures- basic material properties- behaviour of concrete under uniaxial compression and tension-reinforcing steel- Design philosophy – Introduction to WSM,ULM,LSM-behaviour in flexure – Design for limit State Method: Concepts- Assumptions- Characteristic Strength and Load, Partial Safety Factors- Limit States- Limit State of Collapse in Flexure

Unit - II : Limit State Design of Beams and Slabs Total Hours : 9

Limit State of Collapse in Shear, Bond and Torsion- Design of beams and one way slab for flexure - Design of beams for flexure, shear, bond and torsion. Design of two way continuous slab systems. Design of Lintel Beams.

Unit - III : Limit State Design of Columns Total Hours : 9

Design of compression members – Effective length – Design short column under axial compression, axial compression with uniaxial bending, axial compression with biaxial bending, Design of slender columns – Braced slender column- un-braced slender column – Strength reduction coefficient method – additional moment method

Unit - IV : Limit State Design of Footings and Staircases Total Hours : 9

Design of footings – isolated footings with axial eccentric loading- combined rectangular footing – design of staircases- Introduction to fire resistant design – code provisions.

Unit - V : Design of Brick Masonry Walls Total Hours : 9

Design of brick masonry – strength of bricks – country-wire cut-hollow block-porotherm , aerocon bricks – code provisions – Specification for mortar, Design of Axially loaded walls, eccentrically loaded walls, Retaining walls.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Out come

1. An ability to design reinforced concrete members such as beams, columns, slabs, footings, staircases etc., by Limit state method of design.
2. An ability to design masonry walls as per IS 1905.

Text Books

1. Subramanian.N., Design of Reinforced Concrete Structures, Oxford University Press, 2013
2. Varghese.P.C, Limit State Design of Reinforced Concrete, Prentice-hall of India (p) Ltd.,2013

Reference Books

1. Arun Kumar Jain , Ashok Kumar Jain, Punmia.B.C, Limit state design of Reinforced Concrete, Lakshmi Publications (P) Ltd., New Delhi, First Edition, 2012
2. Ashok K. Jain, 'Reinforced Concrete Limit State Design', Nem Chand & Bros, 2012
3. Virendra Gehlot, Ram Chandra, Limit State Design of Concrete Structures, Standard Publishers, 2010.
4. Unnikrishna Pillai.S, Devdas Menon, Reinforced Concrete Design, Tata Mc Graw-hill, 2013.

STRUCTURAL ANALYSIS - I

Objective(s)

1. To develop an understanding of the static and kinematic indeterminacy of structures
2. To familiarize the students with various force and displacement methods of analysis
3. To analyse indeterminate structures with indirect/secondary stresses

Unit - I : Introduction Total Hours : 9

Types of structures – Behaviour of different structures- Static and kinematic indeterminacies – Analysis of statically indeterminate beams by consistent deformation/force method.

Unit - II : UNIT -II Analysis of Trusses Total Hours : 9

Analysis of plane trusses with one or two redundant members by force method - trusses with lack of fit - Thermal stresses.

UNIT -III Slope Deflection Method Total Hours : 9

Continuous beams and rigid frames, (with and without sway) - Symmetry and anti-symmetry- gable frames - Support settlement.

UNIT -IV Moment Distribution Method Total Hours : 9

Stiffness and carry over factors – Analysis of continuous Beams with and without support settlement - Plane rigid frames with and without sway

UNIT -V Miscellaneous Methods Total Hours : 9

Kani's method of analysis of beams and frames. Analysis of frames for lateral loads by portal and cantilever methods.

Total Contact Hours: 45 Total Tutorials : 15
Total Practical Classes: 0 Total Hours : 60

Programme Outcome

Student should able to identify the static and kinematic indeterminacy and analyse them by applying suitable force/ displacement method.

Text Books

1. Devdas Menon, Structural Analysis, Narosa Publishing House, 2014
2. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory of Structures, Vol. II, Laxmi Publications, New Delhi, 2004.

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, Tata Mc Graw Hill, 2013
2. Russell C Hibbeler, Structural Analysis, Pearson Education Ltd., 2013
3. Khurmi. R.S., Theory of Structures, S.Chand &Company ,2012.
4. Bhavikatti. S. S., Structural Analysis, Vol. I, Vikas Publishing House (P) Ltd., 2012..

GEOTECHNICAL ENGINEERING - I

Objective(s)

1. Provide the description of soil and to characterise soil as per IS Code.
2. To develop an understanding of the soil hydraulics, principles of stress distribution due to self-weight and applied loading conditions and its application to compressibility of soil.
3. Familiarize the students an understanding of strength of soils.

Unit - I : Index Properties Total Hours : 9

Soil formation – soil minerals – soil structure - three phase system – definitions- inter- relationships (derivations and problems) – Index properties determinations - IS soil classification – sol deposits in India.

Unit - II : Soil Hydraulics Total Hours : 9

soil water – capillary phenomenon – permeability – field and laboratory test - seepage and flow nets – geostatic stress - neutral and effective stress (problems).

Unit - III : Stress Analysis Total Hours : 9

Stress due to concentrated load, due to uniformly loaded area, line load strip load- pressure distribution diagrams - contact stress - Westergarrd's analysis.(Derivations and problems)

Unit - IV : Soil Compressibility Total Hours : 9

Compressibility : One dimension consolidation - consolidation process - consolidation theory – laboratory test – pre consolidation pressure. Compaction – laboratory tests – field compaction (problems)

Unit - V : Shear Strength Total Hours : 9

Shear strength- Mohr – coulomb theory – shear strength parameter – laboratory and field tests – pore pressure parameters - stress path - insitu shear strength - factors affecting shear strength - shearing characteristics of sand and clay (problems).

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Out come

The student should be able to classify the soil and evaluate the geotechnical properties of soil used in the design of geotechnical structure.

Text Books

1. Purushothama Raj. P, Soil Mechanics and Foundation Engineering, Pearson Education, 2010
2. Ashok Kumar Jain, Punmia, B.C., Soil Mechanics and foundations, Lakshmi Publications ,2013.

Reference Books

1. Braja M. Das Textbook of Geotechnical Engineering, Cengage Leaning, 2009
2. Venkataramiah. C., Geo Technical Engineering, NAIP, 2012.
3. Murthy. V.N.S., A Text Book of Soil Mechanics & Foundation Engineering, CBS publishers, 2013
4. Venkatramaiah.C, Geotechnical Engineering, New Age International (p) Ltd., 2014.

ENVIRONMENTAL ENGINEERING II

Objective(s)

1. To study the important aspects of sanitation
2. To understand the sewerage system and functional design of sewage treatment units.
3. To learn about the safe disposal of waste water

Unit - I : Introduction Total Hours : 12

Definitions - General considerations- Interdependence of water supply and waste water disposal – source and nature of waste water - Combined and separate system – surface drainage - storm water flow – Investigation and design of sewerage schemes – Data collection - Design flow for separate, storm and combined systems.

UNIT – II : Microbiology of sewage Total Hours : 12

Sewage Characteristics- Physical, chemical and biological characteristics of sewage – Chemical Analysis - D.O. and B.O.D. and its significance. Sampling, population equivalent-Significance of industrial wastes.

UNIT – III : Collection and transport of sewage Total Hours : 12

Collection and Transport of sewage - Materials for sewers –- Flow formulae - Self cleansing of sewers - Full and partial flow conditions - Sewer sections. Design of separate sewers - Storm drains and combined sewer systems.- Design principles and procedures, sewer construction: Sewer laying under various conditions,– Tests for sewers. Flushing equipment for removal of sand, grit – Sewer appurtenances - Manholes - Inlets - catch basins - Sand, grease and oil traps. Sewage pumps – Necessity of pumping and classification of pumps -Sanitary fixtures and fittings - General layout and street connection - Principles of design of anti syphonage device -Types - Inspection chamber - Fresh air inlet.

UNIT – IV : Treatment methods Total Hours : 12

Primary treatment : Basic principles of sewage treatment - Screens, Grit chamber - Principles of sedimentation - Design of settling tanks - Types of settling tanks - Chemical precipitation. Biological Treatment and unit Process : Contact beds - Trickling filter - Description and operation of low rate and

high rate filters, intermittent sand filter - Design of the above filters. Activated sludge Process: Theory – Diffuser and Mechanical aeration - Conventional, High rate and extended aeration process - Process modification –Oxidation ditch - Principles and design of waste stabilization lagoon - aerated Lagoon. Principle of Sludge digestion - Optimum conditions - Digestion tanks - Supernatant liquid - Sludge gas - Drying beds. Septic and Imhoff tanks

UNIT – V : Disposal of sewage Total Hours : 12

Wastewater Disposal and Reuse - Disposal of sewage - Land disposal - Discharge in to rivers. lakes, estuaries and ocean – River pollution - Oxygen sag curve - recycle and reuse of waste effluents. – Disinfection –Chlorination and odour prevention. Introduction to Low cost treatment methods -Special nature of problem of industrial water - Process modifications and by product recovery

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come .

An ability to use the techniques, skills, and modern engineering practices to solve problems related to Domestic and Industrial Waste Water management and Disposal.

Text Books

1.Duggal, K.N., Elements of Environmental Engineering ,S. Chand & Company , New Delhi 20132. Punmia.B.C., Ashok Jain and Arun Jain., Waste Water Engineering including Air Pollution, Laksmi Publications (P) Ltd., 2013

Reference Books

1. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013
2. Mackenzie L Davis, Water & Wastewater Engineering, Tata Mc Graw-Hill, 2013
3. Modi. Pn., Sewage Treatment & Disposal & Wastewater Engineering Vol.2, Standard Book House, 2013.

TRANSPORTATION ENGINEERING - I

Objective(s)

The student should have understood the various aspects of Highway Engineering including material characterization, pavement design and management

Unit - I : Highway Geometry Total Hours :9

Importance Road transportation, Highway alignment – Requirement, Engineering surveys for highway location. Maps & drawings to be prepared. Geometric design – Cross section element, width, camber, design – speed, sight distances, requirements and design of horizontal and vertical alignments.

Unit - II : Highway Materials Total Hours : 9

Highway materials – Properties of sub-grade pavement component materials – Tests on aggregates, sub- grade soil & bituminous materials. Design of Bituminous mixes as per M52

Unit - III : Flexible Pavements Total Hours : 9

Pavement analysis – flexible pavement – calculation of stresses – single layer, two layer theory – Computation of strain at the layers interface – computation of deflection.Rigid pavement - calculation of stresses – load and temperature effects - Westergaard's theory - Bradbury theory.

Unit - IV : Rigid Pavements Total Hours : 9

. Pavement Design Factors in the design of flexible and rigid pavements, CBR methods. IRC recommendations on flexible pavement design (IRC37) and Rigid pavement (IRC58). Design of Surface and subsurface highway drainage.

Unit - V : Construction and Maintenance Total Hours : 9

Pavement construction techniques – Types of pavements – WBM, WMM , GSB construction. Construction of bituminous pavements and rigid pavements. Pavement failures and their remedies. Pavement evaluation – structural, functional.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

Student will be familiarized with the terminology and fundamental ncepts of Highway Engineering.

Text Books

1. Veeraragavan.A, Khanna. S.K., Ceg Justo, Highway Engineering, Nem Chand & Brothers, 2014
2. Sharma, S.K. " Principles Practice and Design of Highway Engineering ", S. Chand & Co Ltd, 2013

Reference Books

1. Gupta B.L and Amith Gupta, Highway and Bridge Engg., Standard publishers, and Distributor, 2010.
2. Partha Chakroborthy and Animesh Das, Principles of Transportation Engineering, Prentice Hall of India Pvt. Ltd., 2013.
3. Lr Kadiyali, Lr Kadyali, Nb Lal ," Principles and practice of highway engineering ", Khanna Publishers. 2013
4. Rangwala.S.C, Highway Engineering, Charotar Book Distributors, 2013

GEOTECHNICAL ENGINEERING LABORATORY

Objective(s)

1. To provide the hands on training in determination of Index and Engineering and index properties of soils.
2. To familiarize the students to do the experiments as per the guidelines of BIS.
3. To provide the knowledge on interpretation experimental results to solve foundation problems.

1. Specific Gravity of CG and FG Soils
2. In-situ unit weight Determination – Core Cutter Method & Water content Determination
3. Grain Size Analysis – Mechanical Method - Dry Sieve Analysis / Wet Sieve Analysis
4. Grain Size Analysis – Sedimentation Analysis - Hydrometer Method
5. Atterberg Limits: Liquid Limit Test and Plastic Limit Test
6. Atterberg Limit: Shrinkage Limit Test & Free Swell Test
7. Laboratory Permeability Test: Constant and Variable Head
8. Standard Proctor Compaction Test
9. Direct Shear Test
10. Unconfined Compression Test
11. Triaxial Shear test – UU Test
12. Visual Soil Identification as per IS Code
13. Consolidation Test (Demo)

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 45

Programme Outcome

Student should able to conduct suitable experiment on soil to evaluate the index properties to classify the soil and to evaluate other geotechnical properties of soil used in design of geotechnical structures.

ENVIRONMENTAL ENGINEERING LAB

Objective(s)

1. To learn and practice on the various testing methods for water quality, waste water quality and other environmental parameters.
2. To correlate theoretical and practical and measures for visual understanding and practice

1. Determination of Turbidity, pH, Conductivity and Residual Chlorine.
2. Determination of Alkalinity.
3. Determination of Chlorides.
4. Determination of Hardness.
5. Determination of Iron
6. Determination of Manganese.
7. Determination of Fluorides.
8. Determination of Total Solids.
9. Determination of Suspended solids.
10. Determination of Dissolved Oxygen.
11. Jar test for the determination of optimum coagulant Dose.
12. Determination of B.O.D.
13. Determination of C.O.D.
14. Estimation of E-Coli.
15. Plate count (for bacterial analysis of water)
16. Determination of Residual Chlorine

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 45

Programme Out come

Students should capable of learning and conducting experiments on water, waste water and other environmental pollution and their by accessing them self on the process decision making with the help of suitable national and international coddle provision

MATERIAL TESTING LABORATORY-II

1. This course provides an understanding of the basic properties of construction materials, and presents laboratory standards and testing requirements for these materials.
2. Tofamiliarize the studentstodotheexperimentsas per theguidelinesofBIS.
3. Toprovidetheknowledge on mix proportioning of concrete as per theguidelinesofBIS.
4. To obtain practical knowledge about fresh and hardened properties of concrete
5. Develop skills for analyzing experimental data and working in teams. 6. Develop skills for analyzing experimental data and working in teams.

I. Tests on cement

1. Determination of specific gravity of cement.
2. Determination of standard consistency of cement paste.
3. Determination of initial and final setting times of cement.
4. Determination of soundness of cement.
5. Determination of compressive strength of cement mortar.

II. Tests on aggregates

6. Determination of specific gravity and water absorption of fine& coarse aggregate.
7. Sieve analysis of fine & coarse aggregates
8. Determination of maximum bulking and corresponding optimum moisture content of fine aggregate.
9. Determination of bulk density of fine and coarse aggregates.

III. Tests on fresh concrete

11. Determination of degree of workability: Slump cone test, compaction factor test, Vee Bee time test, flow table test

IV. Test on hardened concrete, tiles & bricks

12. Determination of Compressive strength of concrete
13. Determination of Flexural strength of concrete
14. Determination of Splitting tensile strength of concrete
15. Determination of water absorption and flexural strength of clay tiles.
16. Determination of water absorption and crushing strength of bricks.

Total Contact Hours :0 TotalTutorials : 0 Total PracticalClass:45 Total Hours:45

ProgrammeOutcome

Studentshouldabletoconductsuitableexperimenton construction materialsto test their properties as per BIS andto conduct proper test to evaluate the properties of fresh and hardened concrete.

GENERAL PROFICIENCY-I

Objective(s)

1. To hone the communication and non verba skis of the students
2. To improve their Listening, Speaking, Reading and writing skis of students
3. To help the students to get rid of the inhibitions and communicate with ease.
4. To enhance the employability prospects of students
5. To ensure the personality development of the students by sharpening their soft skills
6. To facilitate the students' entry into industry by grooming them holistically

Unit - I : Art Of Communication

Verbal and Non-verbal Communication – Barriers to Communication – Importance of Body Language – Effective Listening – Feedback

Unit - II : Introduction To Soft Skills

Attitude – Self-Confidence – Leadership Qualities – Emotional Quotient – Effective Time Management Skills – Surviving Stress – Overcoming Failure – Professional Ethics – Interpersonal Skills

Unit - III : Writing

Importance of Writing – Written Vs Spoken Language – Formal and Informal Styles of writing – Resources for improving writing – Grammar and Usage – Vocabulary Building – SWOT analysis

Unit - IV : Speaking Practice

Dialogue – Telephone Etiquette – Public Speaking – Debate – Informal Discussions – Presentations

Unit - V : Aptitude

Verbal and Numerical aptitude

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours :45

Programme Out come

On successful completion of the module, the students will be able to :1. Become good communicators, 2. Imbibe the requisite soft skills, 3. sharpen their writing skills, 4. Analyse contemporary issues from various perspectives

STRUCTURAL ANALYSIS - II

Objective(s)

1. To develop an understanding of the rolling loads and influence lines in determinate and indeterminate beams
2. To familiarize the students with analysis of arches and cables
3. To introduce the concept of plastic analysis of structures

Unit - I : Arches and Cables Total Hours : 9

Theory of arches - Analysis of three hinged and two hinged arches - rib shortening, temperature effects. Analysis of forces in cables - Suspension bridges.

Unit - II : Influence lines for determinate structures Total Hours : 9

ILD for simply supported and cantilever- shear, moment and support reaction. Moving loads –single and several point loads – maximum bending moment and maximum shear force –absolute maximum bending moment - determination of equivalent UDL.

Unit - III : Influence lines for indeterminate structures Total Hours : 9

Influence lines – Müller-Breslau Theorem - principle and its application. Influence lines for continuous beams. Introduction to bridge floor system- ILD for truss reaction, member forces and determination of maximum forces

Unit - IV : Plastic Analysis Total Hours : 9

Plastic Theory – Yield stress - Load Factor – Plastic Hinge – Moment redistribution - Shape factor – Upper and lower bound theorems – plastic analysis of beams and frames.

Unit - V : Introduction to Matrix methods of Analysis Total Hours : 9

Stiffness and flexibility characteristics of structures- stiffness and flexibility matrices- properties of stiffness matrix- stiffness and flexibility matrix relationship- comparison of stiffness and flexibility methods.

Total Contact Hours: 45 Total Tutorials : 15

Total Practical Classes: 0

Programme Outcome

Student should able to develop and apply influence lines in structural analysis. The students should also be able to appreciate plastic theory of analysis.

Text Books

1. Junnarkar. S.B.,Shah. H.J.,., " Mechanics of structures" Vol. II. Charotar publishers. 2013.
2. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory of Structures, Vol. II, Laxmi Publications (P) Ltd., 2012.

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, Tata Mc Graw Hill, 2013
2. Russell C Hibbeler, Structural Analysis, Pearson Education Ltd., 2013
3. Khurmi. R.S., Theory of Structures, S.Chand &Company, 2012.
4. Devdas Menon, Advanced Structural Analysis, Narosa Publishing House, 2012.

GEOTECHNICAL ENGINEERING - II

Objective (s)

1. Provide the students with a basic understanding of the essential steps involved in a geotechnical site investigation.
2. Introduce to the students, the principal types of foundations and the factors governing the choice of the most suitable type of foundation for a given solution. procedures used for :
   a) bearing capacity estimation, b) Pile carrying capacity.
3. To familiarize the concepts of earth pressure, design Earth Retaining structures and to determine stability of slopes.

UNIT – I Soil Exploration Total Hours : 9

Introduction - need, planning, stages - depth and spacing of soil-exploration - methods of exploration – Samples - samplers, sampling method – Insitu tests – SPT, CPT, VST, pressuremeter - exploration reports.

UNIT – II Lateral earth pressure Total Hours : 9

Active, passive and earth pressure at rest, Rankine and Coulomb's theory – Rebhann's Method. Earth pressure due to inclined back fill, line load and earth quake load - Cantilever sheet pile wall in granular and clay soil. (problems). Design of braced excavation (concept only).

UNIT – III Shallow foundation Total Hours : 9

Types and selection criteria – Shear failures - Bearing capacity Determination using Terzaghi and IS code formula (problems) – SBC form field tests - proportioning of foundation – BC of foundation subjected to moments and earthquake loading – Elastic and Consolidation settlement. Methods to increase BC (Concept only).

UNIT – IV Pile foundations Total Hours : 9

Introduction- classification-selection criteria- Individual carrying capacity-static and dynamic approach (problems) – lateral plié carrying capacity - pile group – group carrying capacity - pile load tests- - Under reamed piles-IS Codal provisions.

UNIT – V Stability of slopes Total Hours : 9

Introduction- slopes failure - stability of infinite slope – landslides. Finite slope analysis - Swedish circle method – stability number (problems) – Reinforced slopes.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 ` Total Hours : 60

Programme Outcome

To develop an understanding of the behavior of foundations for engineering structures and to gain knowledge of the design methods that can be applied to practical problems.

Text Books

1. Braja M. Das Principles of Foundation Engineering, Cengage\Delmar Learning India (P) Ltd., 2013.
2. Purushothama Raj. P, Soil Mechanics and Foundation Engineering, Pearson Education Ltd., 2010

Reference Books

1. Arora.Kr., Soil Mechanics & Foundation Engineering, Standard Publishers, 2012.
2. VargheseP.C. Foundation Engineering **,** Prentice-hall of India Pvt. Ltd, 2012.
3. Murthy. V.N.S., A Text Book of Soil Mechanics & Foundation Engineering, CBS publishers, 2013
4. Ashok Kumar Jain, Punmia, B.C., Soil Mechanics and foundations, Lakshmi Publications ,2013

TRANSPORTATIONENGINEERINGII

Objective(s)

1. Provide the students with a basic understanding of the railway and airport engineering.
2. Introduce to the students, the role of a Civil Engineer in the above modes of transport.

Unit - I Total Hours : 9

Permanent way – gauges, components of permanent way, rails; functions, requirements, types, failures, creep of rails; Sleepers - types, requirements; Ballast – functions requirements, track fittings and fastenings.

Unit - II Total Hours : 9

Geometric design of the track – gradients, grade compensation, speed, super-elevation, cant deficiency, negative cant transition curve Problems on geometric design..

Unit- III Total Hours : 9

Points and crossings – turn outs, switches, crossings, types of crossings, Design of turnouts; stations - site selection, requirements of a railway station, classification of stations; yards – types of yards,

Unit- IV Total Hours : 9

Airport planning – Aircraft characteristics –airport planning, obstructions, types of airport, Wind rose diagram, Runway orientation.

Unit-V Total Hours : 9

Basic runway length and corrections. Design of exit taxiway, Runway marking and lighting, LCN and PCN, airport drainage, Problems on LCN & PCN

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

The student should have learnt the basic definitions regarding Railway Engineering & Airport Engineering.

Text Books

1. Khanna S.K, Jain.S.S, Arora.M.G., Airport Planning and Design, Nem Chand and Bros., 2012
2. Saxena, S.C., S. Arora. S.P., Text Book of Railway Engineering, Dhanpat Rai Publications (P) Ltd., 2013.

Reference Books

1. Mundrey.J.S, Railway Track Engineering, Tata Mc Graw-hill, 2013.2. Subhash C Saxena, Airport Engineering Planning & Design, CBS Publishers, 20123. Agarwal, M. M., Agarwal, M. M, Indian Railway track, Standard Publishers, 2008.4. Kristi, Lal, Transportation Engineering, PHI, New Delhi, 2008.

TRANSPORTATION ENGINEERING LAB

Objective(s)

1. To develop an understanding of the highway material. 2. Familiarize the students with various test procedures a per

Cycle - I : Tests on soil and granular material

Optimum water content of soil, CBR test on the soil, tests on the GSB and WMM

Cycle - II : Tests on Aggregate

Crushing value test, impact value test, Specific Gravity and water absorption test, flakiness and elongation test, angularity test,

Cycle - III : Tests on Bitumen

Penetration test, softening point test, ductility test, specific gravity test, flash point test, viscosity test.

Cycle - IV : Tests on Bituminous mixes

Testing of BM, SDBC of mixes, arriving at Optimum bituminous content.

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 45

Programme Out come

The student should have learnt to characterize various highway materials

ESTIMATION COSTING AND VALUATION LAB

Objective(s)

1. To study the types of estimation
2. To study the analysis of rates and types of specification
3. To study the method of valuation

Unit - I : Introduction

Estimates – types of estimates – Advantages – Method of measurements – Unit of measurement for various item of work – Method of measurementas per IS 1200, method of estimation; Centre line method of estimation – Examples using above methods.

Unit - II Estimation of buildings

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, Color washing and painting for shops, single room & double room building and simple residential buildings with flat roof.

Unit - III : Estimation of other structures

Estimating of septic tank, soak pit – Sanitary and water supply installations – Water supply pipe line – Sewer line – Tube well – Open well – Estimate of bituminous and cement concrete roads – Various types of arches – Calculation of brick work and RCC works in arches - Estimate of retaining walls and box culvert.

Unit- IV : Specification and rate analysis

Specification: purpose and basic principles of general and detailed specification of various item of work – Earthwork excavation – Cement concrete – Damp proof course – Form work – Brick and stone masonry – Flooring- Painting of wood work.Analysis of rate – Purpose – Quantity of materials per unit rate of work – Requirement of labour and materials for different works – Obtaining the rate for different works using local schedule of rates – Cement mortar – Cement concrete – RCC- Brick masonry – Plastering – Flooring – Painting.

Unit - V : Valuation

Valuation – Purpose, definition of common terms used in valuation such as free and lease hold property – Gross income, net income, outgoings, sinking fund, scrap value, salvage value, market value, book value, capital cost and depreciation methods – Valuation of building using different methods with examples – Fixation of rent for a building - Valuation of land.

Total Contact Hours : 30 Total Tutorials : 0
Total Practical Class : 45 Total Hours : 75

Programme Out come

Based on PWD PSR & CPWD plinth area rates the student should be able to prepare the detailed estimate and valuation of given building.

COMPUTER AIDED DESIGN LAB

Objective(s)

1. To gain basic knowledge in modelling of structures.
2. To familiarize and give hands on training to students using woksheets and databases.

1. Structural analysis and Design : Introduction to STAAD Pro V 8i – Preprocessor, creating geometry, editing tools, load and support definition and structuring of output file. Types of analysis, use of post processor and report generation.
2. Analysis of continuous beams- beams with different loads, internal hinges, elastic supports, support settlement and moving loads.
3. Analysis of trusses – lack of fit and temperature stresses, wind load generation, moving loads and industrial trusses.
4. Analysis of rigid jointed frames- different types of loads, inclined supports, elastic supports, support settlement, moving loads and moment envelop.
5. Special Topics- 3-D modelling tools, modelling of hybrid structure- imparting structure from library
6. Comparison with ETABS, STRUDS software (Demo only)

Total Contact Hours: 0 Total Tutorials : 0
Total Practical Classes: 45 Total Hours : 45

Programme Outcome

Student will able to model, analyse and design structures using structural analysis software.

GENERAL PROFICIENCY-II

1. To develop the students' critical thinking and analytical skills
2. To help the students to equip themselves with the necessary skill sets.
3. To improve the students' problem solving skills
4. To help the students to prepare for interviews and face them with confidence
5. To make the students industry-ready and employable
6. To enable the students to be more participative in Group Discussions and other activities.

Unit – I : Composition Analysis

Technical and Non-Technical Passages (GRE Based) – Differences in American and British English – Analyzing Contemporary issues – Expanding Terminology

Unit – II : Writing

Job Application Letter Writing – Resume Writing Unit –

III : Oral Skills

Group Discussion – Introduction and Practice – Team Work – Negotiation Skills – Organizing and Attending Meetings – Facing Interviews

Unit – IV : Adapting To Corporate Life

Corporate Etiquette – Grooming and Dressing

Unit – V : Aptitude : Verbal and numerical aptitude

Total Contact Hours : Total Tutorials : 0
Total Practical Class : Total Hours :

Programme Out come

On successful completion of the module students will be able to:• Communicate better• Confidently face the placement process

SURVEY CAMP

1. Be able to apply the Knowledge gained during the Surveying courses I & II
2. Able to take decisions to tackle the site specific problems Reconnaissance, selection of main stations- measurement of horizontal and vertical angles- measurement ofbase line-determination of R.L. of main station by double leveling from B.M.- measurement of bearing of anyone line- computation of coordinates of station points- plotting of details- interpolation of contours

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours :45

Programme Out come

At the end of the Camp the students should be able to understand the practical implementation of theoretical knowledge gained in Surveying subject.

DESIGN OF STEEL STRUCTURES

Objective (s)

(1) To understand the principles of design philosophy
(2) To understand the provisions in Codes and learn follow Codal practices

UNIT – I : Introduction to limit state design Total Hours : 9

Design of tension members – single and compound sections – tension splices – design of lug angles. Failures in bolted and welded joints – design of joints with bolts and welding.

UNIT – II : Compression Members Total Hours : 9

Design of axially and eccentrically loaded members, Built-up columns, Design of Lacings and Battens, Design of Column Splices. Design of column bases.

UNIT – III : Design of flexural members Total Hours : 9

Laterally supported and unsupported members design of purlins.

UNIT – IV : Design of built-up Beams Total Hours : 9

Design of gantry girders and plate girders.

UNIT – V : Design of Eccentric Joints Total Hours : 9

Design of eccentric joints by bolting and welding – design of stiffened and unstiffened seated connections.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

At the end of the course the students would develop confidence and adequate capability in simple practical design.

Text Books

1. Shiyekar, M.R., Limit State Design in STRUCTURAL STEEL, Second Edition, PHI Learning Private Ltd., Delhi, 2013.
2. Shah, V.L., and Veena Gore, LIMIT STATE DESIGN OF STEEL STRUCTURES, Structures Publications, Pune, 2012.

Reference Books

1. Subramanian, P., Design of steel structures, Oxford Publishers, New Delhi, 20072. Bhavikatti, S.S., Design of Steel Structures, IK International Publishing House Pvt Ltd, New Delhi, 2014.
3. Sai Ram K.S., Design of Steel Structures, Pearson Education Ltd., 2013.
4. Virendra Gehlot, Ram Chandra, Design of steel structures, Vol.I & II, Standard Publishers, 2012.

HYDROLOGY AND WATER RESOURCES ENGINEERING

To understand the various physical processes in the hydrologic cycle and the methods of estimation thereof.

Unit - I : Precipitation Total Hours : 12

Hydrologic cycle, precipitation, stream flow, evaporation, transpiration and infiltration, types and measurement of precipitation, gauge networks, hyetographs, average depth of precipitation over the basin, mass rainfall curves, intensity duration curves – estimates of missing data and adjustment of records.

Unit - II : Evapo-transpiration and Infiltration Total Hours : 12

Evaporation, factors affecting, measurement and estimation of evaporation, transpiration, factors affecting and determination of transpiration, methods of estimating evapo-transpiration, factors affecting and measurement of infiltration, infiltration indices.

Unit - III : Groundwater Total Hours : 12

Occurrence and movement of ground water, Darcy's law, aquifers – types and specific yield of aquifers and basin, steady & unsteady flow in wells in confined and unconfined aquifers, well loss and specific capacity of a well.

Unit - IV : Runoff Total Hours : 12

Factors affecting runoff, Hydrograph analysis – Unit hydrograph theory and analysis, Space distribution and variability of runoff, stream flow measurement – selection of site, velocity and discharge measurements – base flow separation methods. Probability Concepts : Rainfall frequency, Flood frequency, Stream flow synthesis – Elements of stochastic methods.

Unit- V : Floods Total Hours : 12

Design flood, estimation by empirical and statistical methods, Flood control Measures – Levees and flood walls, Flood control reservoirs, Water shed management, Flood forecasting methods, Flood routing (elementary treatment only). Planning for Water Resources Development: Level, phases, objectives, Project formulation, systems analysis, multipurpose projects.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

At the end of the course the student should be able to estimate the effective rainfall, flood magnitude etc and relate it to the filed situations.

Text Books

1. Santosh kumar Garg, Hydrology and Water Resources Engineering, Khanna Publishers, 2013.
2. Satyanarayana murthy.C., Water Resources Engineering Principles & Practice, New Age International (P) Ltd, 2014.

Reference Books

1. Subramanya.K, Engineering Hydrology, Tata McGraw-Hill, 2013.
2. Varshney, R.S., Engineering Hydroloy, Nem Chand & Bros., 2012.
3. Larry W Mays, Ven Te Chow, David R Maidment, Applied Hydrology, Tata McGraw-Hill, 2012.
4. Jayarami Reddi.P, Text Book of Hydrology, Lakshmi Publications, 2013.

DESIGN AND DRAWING (RCC & STEEL)

Objective(s)

1. To prepare working drawings for steel and concrete structures.
2. Preparation of layout of the structure with detailed design details.
3. Preparation of working drawings with all dimensions required for execution / fabrication of structures.

Detailed Design and Drawing of the following RCC elements/ Structures:1. Continuous beams and slab systems.2. Rectangular Combined footings.3. Cantilever retaining walls4. Elevated - circular and rectangular water tanks (excluding staging)5. Staircases. **Detailed Design and Drawing of the following Steel elements/Structures:** 1. Roof trusses and joints including purlins .2. Stiffened welded seat connections – moment resisting welded connections for beams.3.Welded plate girder.4. Gantry girder.5 .Self supporting chimney.

Total Contact Hours : 30 Total Tutorials : 0
Total Practical Class : 45 Total Hours :75

Programme Out come

An ability to design, draft and detail various concrete and steel structures / members.

COMPREHENSIVE VIVA VOCE

Objective(s)

To verify the overall knowledge that the student has gained during the course The student will be tested for his understanding of basic principles of the core Civil Engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective or short questions type from the all the core subjects. The external university examination, which carries a total of 50 marks, will be a Viva Voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 45 Total Hours :45

Programme Out come

The students will be able to attend the various Competitive examinations such as GATE, IES examination etc.

PROJECT PHASE - I

Objective(s)

The students are encouraged to get hands on experience to work in various area of civil engineering.

The objective of the design project is to enable the students to work in groups of not more than four membersin each group on a project involving analytical, experimental , design or combination of these in the areaof Civil Engineering. Each project shall have a guide. The student is required to do literature survey,formulate the problem and form a methodology of arriving at the solution of the problem. The evaluationis based on committee for 100 marks.

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 90 Total Hours :90

Programme Out come

The students will be able to perceive the problems and to find suitable solutions

CONSTRUCTION MANAGEMENT

Objective (s)

1. To understand construction management importance
2. To become aware on organization, planning, scheduling and analysis
3. To study the M.I.S and labour, safety and related regulation

Unit - I : Construction Project Management Total Hours : 12

Construction Project- Project Categories, Management objectives, functions – Project Development Process-Project Life Cycle- Project Team-Role of Project Manager-Management failure

Uni - II : Organization and Planning Total Hours : 12

Definition, Levels of Organization, Principles of Organization, process of organizing, Span of Control, Authority, Responsibility and Delegation –Forms of Organizations-merits and demerits of each..

Unit - III : Scheduling and Network Analysis Total Hours : 12

Scheduling: Definition, objectives, Importance of Planning, Scheduling and Controlling of Projects.Network Techniques in Construction Management-Bar Chart, Gaint Chart, PERT, CPM, Time& cost optimization

Unit - IV : Contracts Total Hours : 12

Types of Contract, Contract document, Specification, Condition of Contract, Tender and Tender documents-Deposits by the Contractor- Arbitration-M.Book-Muster roll-Stores.

Unit - V : M.I.S Applications and Construction Total Hours : 12

Labour Legislations-Safety in Construction: Objectives, Steps in Safety Programme, Safety Costs, Safety Codes, Occupational Safety and Hazards, Accidents- Causes of Accident

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

One should aware on importance of construction management having the various influence factors in the process of management

Text Books

1. Clifford J Schexnayder, Kraig Knutson, Construction Management Fundamentals, Tata McGraw-Hill, 2011.
2 .Ps Gahlot, Bm Dhir, Construction Planning & Management, New Age International (P) Ltd., 2014

Reference Books

1. Chitkara.K.K., Construction Project Management Planning Scheduling and Controlling,Tata McGraw-Hill, 2014.
2. Shrivastava. U.K, Construction Planning & Management, Galgotia Publications Pvt. Ltd.,2014.
3. Kumar Neeraj Jha, Construction Project Management Theory & Practice, Pearson Education Ltd., 2014.
4. Ravindra.S.V., Krishnamurthy.K.G., Construction & Project Management, CBS Publishers, 2010.

PROFESSIONAL ETHICAL PRACTICE

Objective(s)

1. To create an awareness of ethical concerns and conflicts and to Enhance familiarity with codes of conduct
2. To Increase the ability to recognize and resolve ethical dilemmas

Unit - I Total Hours : 12

Indian Constitution : Structure – Preamble - Fundamental Rights – Directive Principles of State policies - Fundamental Duties – overview of articles & Schedules.

Unit - II Total Hours : 12

Ethics - Ethical Behaviour : Moral Sensitivity – Moral Judgement – Moral Motivation – Moral Courage. Ethical Decision Making – Check points – Steps – Moral Compass

Unit - III Total Hours : 12

Professional Ethics as applied to Engineering – Characteristics of Professional and Professional Ethics – Engineering Ethics. Professional Code of Ethics – IEI & NSPE.

Unit - IV Total Hours : 12

Engineering Ethics : Honesty – Responsibility to Employer – Rights of Engineers – Responsibility towards public – Risk and Liability

Unit - V Total Hours : 12

Responsibility towards Environment. International Engineering Professionalism

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

1. The students will be exposed to the ethical practices in Civil Engineering.
2. The student will be aware to duties and responsibilities as a citizen
3. Educated in identifying ethical problems and Ethical solutions.

Reference Books

1. Charles E Harris Jr, Michael S Pritchard, Michael J Rabins, Engineering Ethics Concepts and Cases, Cengage Learning 2012.
2. Mike W.Martin, Roland Schinzinger, Ethics in Engineering, Tata MaGraw Hill Education (P) Ltd., 2012

INDUSTRIAL TRAINING/INTERNSHIP

Objective (s)

During the course of study from 3rd to 7th semester each student is expected to undertake a minimum ofsix industrial visits (or) undertake a minimum of four weeks of industry/field training. The students areexpected to submit a report, which shall be evaluated by an internal assessment committee at the end ofseventh semester for 100 marks.

Total Contact Hours : 0 Total Tutorials : 0
Total Practical Class : 160 Total Hours :160

Programme Out come

After the Training programme, the student should have developed self-confidence, so that he/she becomes employable

PROJECT WORK –PHASE- II

The students will be encouraged to handle the field problem independently Project work phase II will be an extension of the project work Phase-I started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee for 50 marks. The external university examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.

Total Contact Hours : 15 Total Tutorials : 0
Total Practical Class : 135 Total Hours :135

Programme Out come

Students by the end of the course would have confidence to tackle any problems in the field and will become employable.

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

Objective(s)

1. To make the students understand the basic concept of pre stressed concrete structures.
2. To analyse a few important pre stressed concrete elements
3. To understand the various codal provisions for the design of prestressed concrete structures.

Unit - I : Basic Principle of preadressing Total Hours : 9

Introduction-Principles of pre-stressing-Materials-Losses-Systems of pre-stressing-Simple cable profiles-Load balancing method.

Unit – II Prestressed Concrete Beams Total Hours : 9

Pre-tensioned and Post-tensioned beams-Principles of designs-Design for flexure, bond and shear – IS Code provisions-Ultimate Strength of pre-stressed concrete beams in flexure and shear- Design of end anchorage Zones using I S Code method.

Unit – III Deflections and Composite Beams Total Hours : 9

Deflection of pre-stressed concrete members – Methods of pre-stressing-principles of partial pre-stressing –non-pre-stressed reinforcements-Analysis and Design of composite beams.

Unit-IV Axial and Circular prestressing Total Hours : 9

Design of Tension and Compression members-Circular pre-stressing-Pipes-Water Tanks- Analysis and design –IS-Code provisions

Unit- V Prestressed continuous Beams Total Hours : 9

Analysis of continuous beams –Primary moment-secondary moment-cable layout-Linear Transformation – Concordant cable.

Total Contact Hours : 45 Total Tutorials : 15

Total Practical Class : 0

Programme Out come

The student shall have a basic knowledge of the prestressed concrete elements, design of beams, bridge elements and water tanks.

Text Books

1. Krishna Raju. N., Prestressed Concrete, Tata McGraw-Hill, 2013.
2. Sinha.N.C, Roy.S.K, Fundamentals of Prestreesed Concrete, S.Chand & Company (P) Ltd.,2013.

Reference Books

1. Rajagopalan.N., Rajagopalan.N, Prestressed Concrete, Narosa Publishing House, 2013.
2. Dayaratnam. P. Prestressed Concrete Structures, Oxford & I B H, 2013.
3. Pandit. G.S, Gupta. S.P, Prestressed Concrete, CBS Publishers and Distributors, 2013.
4. Lin. T.Y. , Ned H Burns, Design of Pre-stressed Concrete Structures, John Wiley & Sons, 2013.

COASTAL AND OFFSHORE STRUCTURES

Objective(s)

1. To introduce the various components in Harbour and offshore structures.
2. Introduce to the students, planning and design principles of various components in Docks and harbours.
3. To develop an idea about types off offshore structures forces on offshore structures design concepts and foundation for offshore structures.

UNIT – I Growth of Ports Total Hours : 12

History of Port – Classification of Harbours - Factors affecting the growth of Port. Requirement of a Harbour - General Planning - Site investigation. Description of selected Indian ports.

UNIT – II Harbour Planning (Technical): Total Hours : 12

Harbour entrance - Navigational Channel – Depth of harbour – Turning basin – berthing area – Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals. Navigational aids – Light house.

UNIT – III Harbour Structures Total Hours : 12

Break waters: Types – Selection – Forces and – Design principles of break waters. Berthing structures: Types – Loads – Selection and design principles of berthing structures –Selection and Design principles of Dock fenders and Mooring accessories. Types of dock structures, Dredging.

UNIT – VI Offshore Structure Total Hours :12

Types of offshore structures – selection – function - Physical, environmental and geotechnical aspects of marine and offshore construction – Loads and responses of offshore structures.

UNIT – V Construction of Offshore Structures Total Hours : 12

Foundations for offshore structures – Introduction to design and installation of offshore piled platforms, concrete offshore platforms, Moored floating structures and Submarine pipelines

Total Contact Hours : 60 Total Tutorials : 0

Total Practical Class : 0 Total Hours : 60

Programme Outcome

Student will be familiarized with the terminology and fundamental concepts of planning designing coastal and offshore structures.

Text Books

1. Narasimhan & S. kathiroli, Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol – II, NIOT- Chennai
2. Chakrabarti.,S.K., Hand Book of Offshore Engineering (Vols. 1 & 2)" Elsevier Publications

Reference Books

1. Gerwick, C., Construction of Marine and Offshore structures, CRC Press.
2. Alonzo Def. Quinn., Design and construction of Port and Marine structures McGraw Hill Book co.

INDUSTRIAL WASTE DISPOSAL AND TREATMENT

Objective(s)

1. To have a knowledge on the uses of water by industries
2. To understand the process involved in industries and their waste water production
3. To learn about the treatment of waste water and safe disposal of treated effluents

Unit - I : Introduction Total Hours : 12

Uses of water by Industry - Sources and types of wastewaters, quality criteria, effluent standards- Individual and common effluent treatment plants - Population equivalent, Effects of industrial wastes on streams, land, air and waste water treatment plants

Unit - II : Pretreatment methods Total Hours : 12

Pretreatment Methods: Process modification – methods and materials changes – Reduce, reuse and recycle methods, house keeping etc. to reduce waste discharge and strength of the waste and established methods for by products recovery within the plant operations

Unit - III : Treatment methods of industrial wastes Total Hours : 12

Equalization – Neutralization - Oil separation – Floatation – Precipitation – Adsorption - Aerobic and anaerobic biological treatment - High rate reactors. Chemical oxidation – Ozonation –Ion Exchange – Membrane technologies

Unit - IV : Treatment methods of residuals Total Hours : 12

Residuals of Industrial waste treatment —Characteristics of sludge – Thickening, digestion, conditioning, dewatering and disposal of sludge.

Unit - V : Case studies Total Hours : 12

Industry and power plants - manufacturing process description - wastewater characteristics and wastetreatment flow sheet for typical industries – Textiles – Tanneries – Pulp and Paper –Metal finishing – Petroleum refining – Chemical industries - Sugar and distilleries –Dairy –Iron and Steel- Fertilizers –Nuclear power plants.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come .

An ability to use the recent techniques, skills, and modern engineering practices to solve problems related to Industrial Waste Water management and Disposal.

Text Books

1. Eckenfelder. W.W., Industrial Water Pollution Control, McGraw Hill, 2000.2. Arceivala.S.J. Wastewater Treatment for Pollution Control, Tata Mc.Graw Hill. 2008.

Reference Books

1. Nemerow,N.L., Theories and Practices of Industrial Wastes Treatment, Addissonand Wesley, 1963.2. Gurnham,C.F., Principles of Industrial Waste Treatment, John Wiley, New York,1948.

SAFETY PRACTICES IN CONSTRUCTION

Objective(s)

1. To study and understand the various safety concepts and requirements applied to construction projects.
2. To study of construction accidents, safety programmes, contractual obligations
3. To study safety procedures to be followed for various construction activities

Unit - I : Accidents and Related Law Total Hours : 12

Construction accidents - Construction Safety Management: Importance - causes of accident, Construction industry related laws. Legal and financial aspects of accidents in construction – occupational and safety hazard assessment.

Unit - II : Safety Procedures Total Hours : 12

Elements of an Effective Safety Programmes - Job-site assessment - Safety Meetings -Safety Incentives. Contractual Obligations - Substance Abuse - safety Record Keeping Safety Culture - Safe Workers-.

Unit - III : Safety Workers and Managements Total Hours : 12

Safety and First Line Supervisors - Safety and Middle Managers - Top Management Practices, Company Activities and Safety - Project Coordination and Safety Procedures - Workers Compensation -Accident prevention-cost of accidents-accident reporting investigation

Unit - IV : Safety Methods Total Hours : 12

Total loss control and damage control-Safety sampling- safety audit - safety equipment -planning and site preparation- safety system of storing construction materials-Excavation - blasting- timbering-scaffolding- safe use of ladders

Unit - V : Safety Equipments Total Hours : 12

Safety in hand tools- Safety in Hoisting apparatus and conveyors- Safety in the use of mobile cranes-Manual handling- Safety in demolition work-Trusses, girders and beams- Fire hazards and preventing methods.

Total ContactHours :60 TotalTutorials:0
Total Practical Class:0 Total Hours : 60

ProgrammeOutcome

On completion of this course the students will be able to know various constructions safety concepts and safety procedures

TextBooks

1. Mishra. R.K., Construction Safety, Aitbs Publishers, 2012.
2. Jimmy W. Hinze, Construction Safety, Prentice Hall Inc., 1997

Reference Books

1. Tamilnadu Factory Act, Department of Inspectorate of factories, Tamil Nadu. Health Management, Prentice Hall Inc., 2001.
2. Bhattacharjee. S.K., Safety Management in Construction Principles & Practice,Khanna Publishers, 2011.
3. Hand Book on Construction Safety Practices, SP:70, BIS, 2001.
4. Muraleedharan Pillai.K, Construction Safety Hand Book, Sujatha Publishers, 2012.

CONSTRUCTION METHODS AND EQUIPMENT

Objective (s)

1. To introduce various construction equipments, selection and apply scientific principles for effectively utilizing them
2. To make aware of the various techniques and practices on construction of various civil engineering structures.
3. To study and understand the latest construction techniques applied to engineering Construction

UNIT – I Excavation Total Hours : 12

Excavations for foundations and Basement floors – Methods – temporary earth retaining structures: braced wall, sheet pile wall, soil nail wall – Dewatering methods – water proofing methods – Trenching - Excavators – pumps.Under water concreting.

UNIT – II Sub structures Total Hours : 12

Methods and equipments for: Pile foundation, well foundation, cofferdam. Shoring and under pinning – Pile wall - RCC Diaphragm walls.

UNIT – III Super Structures Total Hours : 12

Methods and equipments for: Scaffolding, Form work, Hoisting and Rigging (cranes), plastering and flooring. Concrete: Aggregates, RMC plants, pumping, finishing, - shotcreting – Building Demolition Techniques.

UNIT – IV Bridges Total Hours : 12

Methods and equipments for RCC & Cable stayed Bridges: Balanced cantilever method, Span by Span Method, Incremental lunching methods.

UNIT – V Roads and Tunnels Total Hours :

Methods and equipments for construction Flexible and rigid pavements, Tunnels in soft ground- Cut and cover method, TBMs, Tunnel Lining.

Total Contact Hours : 60 Total Tutorials : 0

Total Practical Class : 0 Total Hours : 60

Programme Outcome

To develop an understanding of the methods adopted in construction of high rise buildings with basement floors and to optimize the construction by using right equipments.

Text Books

1. Antil J.M., Civil Engineering Construction, McGraw Hill Book Co., 1982
2. Peurifoy, R.L., Clifford.J.,et al.,Construction Planning, Equipment and Methods McGraw Hill Co, 2011

Reference Books

1. Varma., M., Construction Equipment and its Planning & Application, Metropolitan Book Co., 1979
2. Smith, R.C, Andres, C.K Principles and Practice of Heavy Construction, Prentice Hall, 1986
3. Chew, M. Y. L., Michael Chew Yit Lin Construction Technology for Tall Buildings, 3rd Ed., World Scientific Publishing Co. Pte. Ltd., 2009

GEOTECHNICAL PROCESSES AND APPLICATION

Objective (s)

1. To provide the students the basic understanding of various ground improvement techniques
2. To introduces the students the concept of physical, chemical modification of soil using various techniques.

UNIT – I Total Hours : 12

Introduction: Need – methods – suitability – Mechanical modification : principle - Surface compaction: Field compaction and equipments, compaction specification and controls. Vibration methods: dynamic consolidation, vibratory rollers, Vibro floatation.

UNIT – II Total Hours : 12

Drainage methods: Well point systems, deep well drainage, vacuum dewatering system, design of dewatering system – field permeability tests, dewatering by electro osmosis. Preloading, sand drains, wick drains- Thermal methods case studies.

UNIT – III Total Hours : 12

Grouting: Classification – Methods – Types – grouts – equipments, grouting design and layout, grout monitoring – applications – Case studies.

UNIT – IV Total Hours : 12

Stabilization: cement stabilization, Lime stabilisation – chemical stabilistion - methods, principles, applications and field control. Stabilization using reinforcement – rock anchor- soil tie backs.

UNIT – V Total Hours : 12

Geo synthetics: Geotextiles, Geogrids, Geomembranes, Geonets, Geomats, Geomeshes, principles Design and applications – Case studies.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Outcome

Students are expected to identify problematic soil and their associated problems, propose suitable remedial techniques and design.

Text Books

1. Purushothama raj. P. Ground improvement techniques, Laxmi Publications (P) Ltd, India, 2007
2. Hausmann. M.R. Engineering principles of Ground Modification, McGraw-Hill, 2009

Reference Books

1. Koerner, R.M., Construction & Geotechnical methods in foundation engineering, MGH, New York,1985
2. Jones.C.J.F.P., Earth reinforcement and soil structures, Butter worth &co., London,1985
3. Sivakumar babu. G.I., Introduction to Soil Reinforcement & Geosynthetics, Universities Press Ltd., 2013

REMOTE SENSING AND GIS

Objective (s)

1. To introduce the students to the basic concepts and principles of various components of remote sensing.
2. To provide an exposure to GIS and its practical applications in civil engineering.

UNIT – I EMR and its interaction with atmosphere & earth material Total Hours : 12

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions, important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein s Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

UNIT – II Platforms and sensors Total Hours : 12

Types of sensor systems-Types of remote sensing platforms – remote sensing satellite orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and space-borne TIR and microwave sensors.

UNIT – III Image interpretation and analysis Total Hours : 12

Types of Data Products – types of image interpretation – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

UNIT – IV Geographic information systems Total Hours : 12

Introduction – Maps – Definitions – Map projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).

UNIT – V Data entry, storage and analysis Total Hours : 12

Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Outcome

The students will be familiarized with basic concepts of remote sensing and GIS and their applications in Civil Engineering.

Text Books

1. Kumar.S., Basics of Remote Sensing &GIS, Lakshmi Publications, 2014.
2. Narayana.L.R.A, Remote sensing and its applications, University Press (India)Ltd., 2011.

Reference Books

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman. (2004). Remote Sensing and Image Interpretation.V Edn. John Willey and Sons (P) Ltd., 2013.
2. Ghosh.S.K., Chandra.A.M, Remote Sensing & Geographical Information System, Narosa Publishing House, 2006.
3. Kali Charan Sahu, A Text Book of Remote Sensing & Geographical Information Systems, Atlantic Publishers, 2008.
4. Anji Reddy.M., Textbook of Remote Sensing and Geographical Information System,. BS Publications, 2014.

FINITE ELEMENT ANALYSIS

Objective(s)

1. To gain basic knowledge in modeling of structures using finite element Methods
2. To understand the concepts of developing finite elements and FE packages

Unit -I : Introduction Total Hours : 9

Need for Numerical Technique – Solutions to Differential Equations –Finite Difference Methods – Limitations Variation and Weighted Residual and Potential energy formulations – Finite Element Method – Basic steps.

Unit - II : I-D elements Total Hours : 9

Shape functions – convergence Criteria –Geometric Invariance – Pascal's Triangle – Shape Functions forone Dimensional Structures - Formulation of Element Matrix - Formation of Element Nodal load Vector - Coordinate systems –Global , Local & Natural – Formation of global stiffness matrix - Formation of global load vector .

Unit - III : II – D Elements Total Hours : 9

Two dimensional elements – Plane stress – Plane strain – 3,6 Nodded Triangular elements – Rectangular elements – Lagrange and serendipity elements –Isoparmetric elements -shape functions, Element stiffness Matrix – Load vector formulations –Gauss Quadrate rule.

Unit - IV : Beam & III-D Elements Total Hours : 9

Beam elements –Axisymmetric elements Tetrahedral, hexahedral elements – Formation of shape functions only.

Unit - V : Solution Techniques Total Hours : 9

Mesh generation techniques – static condensation. Solution Techniques-Gauss elimination –Matrix Decomposition – Frontal solvers. Requirements of Pre and post processor in GUI based FE packages. Demo of modelling using FEM pakages.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Out come

An ability to generate the shape functions of various elements used in FE packages understand the assembly and solution techniques.

Text Books

1. Rajasekaran.S, Finite Element Analysis in Engineering Design, S.Chand Company (p) Ltd.,2013.
2. Krishnamoorthy,C.S, Finite Element Analysis – Theory and Programming , Tata Mc Graw-Hill, 2014.

Reference Books

1. Reddy.J.N., Introduction to the Finite Element Method, Tata Mc Graw-Hill, 2013.
2. Cook, R.D, M.E.Plesha, D.S.Malkus, Concepts and applications of Finite element Analysis, John Wiley and Sons, 2013.
3. David V Hutton, Finite Element Analysis, Tata Mc Graw-Hill, 2012.
4. Bhavikatti.S.S., Finite Element Analysis, New Age International (P) Ltd.,2013.

ADVANCED RCC STRUCTURAL DESIGN

Objective(s)

To understand the design of special RCC structures in civil engineering, by using the basic concepts of design of RCC structural elements as per Indian standards

Unit - I : Design of Wall and Beam-Column Joint Total Hours : 9

Design of Cantilever and Counterfort Retaining walls, Design of Plain Concrete Walls, Design of Beam Column Joints.

Unit - II : Design of Slabs and Floors Total Hours : 9

Design of Flat Slabs, Design of Slabs by Yield Line theory and Hillerborg's Strip method, Design of Grid floors by Approximate Analysis

Unit - III : Design of Beams and Serviceability Requirements

Total Hours :9

Design of Deep Beams, Design of beams curved in Plan, Deflection of RCC beams, Estimation of Crack width in RCC Beams, Redistribution moments in RCC beams

Unit - IV : Design of Storage Structures for dry and liquid materials

Total Hours : 9

Design of Bunkers and Silos, Design of Overhead Circular and Rectangular Water Tanks (without staging)

Design of Formwork, Composite beam and Beam with fire resistance

Total Hours : 9

Introduction to Formwork, Design of Formwork for wall, column, beam and slab elements, Introduction to Composite Construction, Design of Steel-Concrete Composite beams, Design of beams with cast in situ slab.

Total Contact Hours : 45 Total Tutorials : 15

Total Practical Class : 0 Total Hours : 60

Programme Out come

Student should able to design industrial structures and formwork for construction.

Text Books

1. Varghese,P.C., Advanced Reinforced Concrete Design, Prentice-hall of India (p) Ltd., 2012.
2. K. N.Jha, "Formwork for Concrete Structures" Mc Graw Hill Education Pvt Ltd, New Delhi 2012

Reference Books

1. Shah.V.L and Karve S.R, Limit State Theory & Design of Reinforced Concrete-IS 456 2000,Standard Publishers, 2013.
2. Sinha, S.N., Reinforced Concrete Design, Tata Mc Graw-Hill, 2014.
3. Johnson, R.P, Composite Structures of steel and concrete, Black Well Publishing, 2011.
4. Unnikrishna Pillai.S, Devdas Menon, Reinforced Concrete Design, Tata Mc Graw-hill, 2013

SITE INVESTIGATION METHODS AND PRACTICES

Objective (s)

1. To introduce the various stages of site investigation.
2. To familiarize the students to various provisions in IS codes, methods of investigation, interpretation of data and final recommendations for various construction works.

UNIT – I Total Hours : 12

Objectives of site investigation - various stages in site investigation process. Planning and Desk Study - topographic maps, aerial photographs - interpretation of aerial photographs, applications in site investigation , Geological maps, minerals and mining records, soil planning maps, site reconnaissance and local enquiries.

UNIT – II Total Hours : 12

Geological methods - different stages, Geological exploration methods –Areal mapping , site mapping and construction mapping-Rock mass characterization- Discontinuities in rocks ,Rock core descriptors , Rock mass classification, RQD, Rock mass rating, Rock structure rating , Q-system- General principle distribution of physical field in subsurface - Electrical resistivity, Seismic refraction methods, their principle, methods of survey, correction to field data, Interpretation and limitations. Index and Mechanical properties of rocks, Laboratory and insitu tests.

UNIT – III Total Hours : 12

Trial pits, shafts, tunnels, auguring, and different types of drilling methods, their merits and demerits, Bore hole logging techniques (subsurface geophysical exploration) - Need for logging techniques, classification and different types logging methods.

UNIT – IV Total Hours : 12

Soil Exploration methods, samples, sampling procedure, sample disturbances, samplers, Factors controlling spacing and depth of bore hole, Insitu tests, SPT, SCPT, Pressure meter tests, interpretation and application, Index properties , Laboratory testing.

UNIT – V Total Hours : 12

Technical Report writing, report format, recommendations for earth work structures, highway excavationsand drainage works, dams, check report site preparation, investigation during construction and operation.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Outcome

Student is expected to have ability to carry out the investigations required under various stages, interpret the field data and arrive at final recommendations for different types of construction works.

Text Books

1. Joyce, M.D. ‘Site Investigation Practice;, ESFN. SPON Publishers, 1982.

Reference Books

1. Hunt, R.E., Geotechnical Engineering Analysis and Evaluation, McGraw Hill Book Company, 1986.
2. Bell.F.G., Engineering Geology, Elsevier India Pvt.Ltd., 2007.
3. Blyth, F.G.H. and Freitas, M.H.D.E., Geology for Engineers, Elsevier India (P) Ltd.,2006.
4. Legget and Karrow, Hand book of Geology in Civil Engineering, McGraw Hill Publishers, 1983.

COASTAL ENGINEERING

Objective (s)

1. To enable students apply these engineering principles to solve the problems in this environment such as shoreline erosion, natural flooding hazards, water quality deterioration and coastal habitat evanescence.
2. To know the basics and features of coastal waters and coastal ecosystems.
3. To study classification, characteristics, and theories of waves, tides and currents.
4. To learn about coastal processes and manmade structures.

UNIT – I Coastal zone Total Hours :12

Definition and sub division – Factors influencing coastal topography - Waves: Definitions - Classification – Liner wave theory – Assumptions and derivations of relationships – Pressure within progressive wave – Wave energy - Problems

UNIT – II Wave Transformation Total Hours : 12

Wave generation – Shoaling – Refraction – Reflection – Diffraction – Breaking of waves – Near shore currents – Tides - Tsunamis - Wave Hindcasting – forecasting - Sea level changes.

UNIT – III Wave forces on Structures Total Hours : 12

Force due to non breaking, breaking and broken waves on vertical, sloping, curved, stepped barriers and on piles – Problems.

UNIT – IV Sediment Movement Total Hours : 12

Types – Littoral Drift – Erosion process – Near shore, long shore currents and effects - Beach profile changes – case studies – Beach process - Environmental parameters- Coastal erosion in India - Dredging – Dredgers - Environmental effects of dredging - Remote sensing and GIS application in coastal engineering

UNIT – V Coastal Protection Total Hours : 12

Methods – Function – Types - Design concepts – Sea walls – Bulkhead – Revetment – Groins – Artificial beach nourishment – Scour – Maintenance of coastal structures.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Outcome

1. To provide an overview of the analysis and design procedures used in the field of coastal engineering.
2. To introduce the processes of including coastal and estuarine circulation, coastal and shelf waves, surf zone hydrodynamics, sediment transport, beach nourishment etc

Text Books

1. Shore Protection Manual (Vol – I, II, III) U.S. Army Crops of Engg. USA.
2. Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol – II; S. Narasimhan & S. kathiroli, NIOT- Chennai

Reference Books

1. Ippen, A.T., Estuarine and coastline Hydrodynamics, McGraw Hill Book Co., New York
2. Wiegel. R.L. Oceanographical Engineering., Prentice Hall, Eagle Wood Cliffs, New Jercy
3. Dean .R.G. and Darymple, R.A. Water Mechanics for Engineers and scientists.

TRAFFIC ENGINEERING AND MANAGEMENT

Objective(s)

Students are expected to learn the importance of traffic engineering and relationship between the traffic engineering & management.

Unit - I : INTRODUCTION Total Hours : 9

Significance and scope, characteristics of vehicles and Road users, Skid Resistance and braking Efficiency(Problems), Components of Traffic Engineering-Road, traffic and land Use characteristics

Unit - II : Traffic Surveys and analysis Total Hours : 9

Surveys and analysis- Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety level of Services- Basic Principles of Traffic Flow

Unit - III : Traffic Control Total Hours : 9

Traffic Signs, Road Markings, Design of Traffic Signals and Signal Co ordination(Problems), Traffic Control Aids and Street Furniture, Street Lighting, Computer applications in signal design

Unit - IV : Geometric Design of Intersections Total Hours : 9

Conflicts at Intersections, Classification of 'At Grade Intersections,- Channelized Intersections-Principles of Intersection Design, Elements of Intersection design, Rotary Design, Grade Separation and interchanges- Design principles

Unit - V : Traffic Management Total Hours : 9

Traffic Management- Transportation System Management (TSM) – Travel Demand Management (TDM), Traffic Forecasting Techniques, Restrictions On Turning Movements, One Way Streets, Traffic Segregation, Traffic Calming, Tidal Flow Operations, Exclusive Bus Lanes, Introduction To Intelligent Transportation System(ITS)

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Out come

1. Student should have learnt basic terminology of traffic engineering .
2. He should have learnt the importance of carrying out traffic surveys & its interpretation.
3. Should appreciate the importance of Management concepts.

Text Books

1. Kadiyali L. R., Traffic Engineering and Transport plannnng, Khanna publications, 2014.
2. Khanna K and Justo CEG, Highway Engineering, Khanna publishers, Roorkee, 2014

Reference Books

1. IRC Specifications: guidelines and special Publications on Traffic planning and Management
2. Jotin Khisky C. and Kent Lall B, Transportation Engineering, Prentice Hall of India Pvt. Ltd. 2012
3. Hutchinson C., Urban transport Planning, John Wiley publications, 2012

HIGHWAY AND AIRPORT PAVEMENT DESIGN

Objective(s)

1. Students are expected to understand the difference between highway airport pavements.
2. He should understand the analysis and design of pavement for the above two cases

UNIT – I Pavement types Total Hours : 9

Stress distribution in pavements – theoretical subgrade conditions and traffic loadings Basic difference between flexible and rigid pavements – design factors – wheel load – equivalent single wheel load – repetition of loads – elastic modulii – climatic variations.

UNIT – II Flexible Pavements Total Hours : 9

Design of flexible pavements: group index method – CBR method – IRC – 37 recommendations – Me Load method – Burmister's layer theory, FEM method

UNIT – III Rigid Pavements Total Hours : 9

Design of rigid pavements: radius of relative stiffness – critical load positions – Westergaard's stress equation – Bradley's stress coefficients – design charts, FEM method.

UNIT – VI Concrete Pavements Total Hours : 9

Temperature stresses in concrete pavements: Westergaard's concept – wrapping stress – functional stress – combination of stresses.Design of joints in concrete pavements: expansion joints – construction joints – design of dowel bars – tie bars – IRC recommendation.

UNIT – V Condition Assessment Total Hours : 9

Evaluation of pavement condition: pavement instrumentation – types of pavement distress – roughness and skid resistance. Environmental influence and effects- pavements maintenance and overlays

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

By the end of the course the student should have understood the difference between the flexible and rigid pavement.

Text Books

1. Khanna O.P, Justo C.G., Highway Engineering, Nem Chand Publishers, 2014
2. Sharma, S. K., Principles practice and design of highway engineering, S. Chand & Co., New Delhi, 2013.

Reference Books

1. IRC - 37 Tentative guidelines for the design of Flexible pavements, 2012
2. IRC-58 Tentative guidelines for the design of rigid pavements 20123. Yoder. E.J, Witczak.M.W., Principles of Pavement design, Wiley India (P) Ltd., 2012.

ADVANCED STRUCTURAL ANALYSIS

Objective(s)

1. To cover the advanced methods of analysis of pin jointed and rigid jointed structures.
2. To introduce the students the importance of computer aided computing tools.

Unit - I : Introduction to stiffness and flexibility methods Total Hours : 9

Stiffness and flexibility characteristics of structures- stiffness and flexibility matrices- properties of stiffness matrix- stiffness and flexibility matrix relationship. Transformation matrices.

UNIT -II Analysis of continuous beams Total Hours : 9

Analysis of continuous beams with two or three unknowns by stiffness and flexibility method- support settlement- comparison of methods

UNIT -III Analysis of rigid jointed frames Total Hours : 9

Analysis of rigid jointed plane frames with two or three unknowns by stiffness and flexibility method- support settlement- choice of methods

UNIT -IV Analysis of pin jointed frames Total Hours : 9

Analysis of pin jointed plane frames with two or three unknowns by stiffness and flexibility method- lack of fit and temperature stress- comparison of methods

UNIT -V Introduction to finite element method Total Hours : 9

Bandwidth of stiffness matrix- static condensation – introduction to computed aided structural analysis and finite element method

Total Contact Hours: 45 Total Tutorials : 15
Total Practical Classes: 0 Total Hours : 60

Programme Outcome

Student will able to apply matrix method of analysis for indeterminate structures and will understand the need for the computer aided analysis.

Text Books

1. Natarajan, C and Revathi, P, "Matrix methods of structural analysis- Theory and problems", PHI learning Pvt Ltd. New Delhi 2014.
2. Pandit, G.S and Gupta S.P, "Structural Analysis- A matrix approach", Tata McGraw Hill Publishing, New Delhi 2014.

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, Tata Mc Graw Hill, 2013
2. Russell C Hibbeler, Structural Analysis, Pearson Education Ltd., 2013
3. Khurmi. R.S., Theory of Structures, S.Chand & Company, 2012
4. Devdas Menon, Advanced Structural Analysis, Narosa Publishing House, 2012.

GROUNDWATER HYDROLOGY

Objective (s)

1. Provide the basic understanding about the rock/soil properties affecting storage and transmission of groundwater and the fundamental principles governing the groundwater flow.
2. Introduce various methods to carry out pumping tests to assess aquifer characteristics.
3. To familiarize the concepts of well design, construction, development, completion and groundwater exploration and recharge techniques.

UNIT – I Fundamentals of groundwater Total Hours :12

Introduction - need for ground water development, advantages of Groundwater, Groundwater in Hydrological cycle - types of aquifers- Rock properties affecting groundwater movement- Porosity, Specific yield , specific retention , Storage coefficient - Permeability and transmissibility - Laboratory and field measurement of permeability - Basic Principles and Fundamental Equation of continuity - Darcy's law - General differential equation governing groundwater flow for steady and unsteady flows - Application of aquifers- Flow nets.

Unit - II : Well Hydraulics Total Hours : 12

Steady flow to a well in a confined aquifer, unconfined aquifer and a leaky confined aquifer - Unsteady flow to a well in a confined aquifer, an unconfined and a leaky confined aquifer— Partially penetrating wells - Method of images - Analysis of pump test data for the above aquifers - Problems.

Unit - III : Water wells Total Hours : 12

Types of wells - well design - construction - well development - Testing of wells for yield - well completion and sanitary protection of wells.

Unit - IV : Groundwater exploration techniques Total Hours : 12

Surface investigations- geological , geophysical exploration, Remote sensing- Subsurface exploration methods (well logging methods)

Unit - V : Groundwater quality and salt water intrusions

Total Hours : 12

Physical , chemical and biological quality of groundwater- salinisation of groundwater, quality criteria for groundwater use, salt balance- saltwater intrusion – prevention and control - Artificial Recharge methods.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Outcome

The student should be able to carry out pumping test and interpret the result to find out the aquifer characteristics, recharge and barrier boundaries. Also, the student should be able to carry out groundwater exploration, design, construction, development and completion of wells.

Text Books

1. Todd . D.K., Groundwater Hydrology, John wiley and Sons, 2014.
2. Raghunath, H.M. ,Ground water, New Age International (P) Ltd., 2014.

Reference Books

1. Schwartz.F.W., Zhang.H., Fundamentals of Ground Water, John Wiley & Sons (P) Ltd., 2012.
2. Walton W.C., Groundwater Resources Evaluation, McGraw Hill Book Co., 2012.
3. Abdel, Aziz Ismail Kashef, Groundwater Engineering, McGraw Hill Book Co., 2012.
4. Karanth KR, groundwater assessment, development and management, Tata McGraw Hill, 2009.

MACHINE FOUNDATIONS

Objective (s)

1. To provide the student the basic concept of soil dynamics
2. Introduce the students the concept of analysis and design foundations subjected to dynamic loads.
3. To introduce the techniques to resolve problems associated with machine foundations

UNIT – I Theory of vibration Total Hours : 9

Introduction, nature of dynamic loads free vibrations of spring mass systems, forced vibrations viscous damping, principles of vibration measuring equipments.

UNIT – II Dynamic soil properties and behaviour Total Hours : 9

Dynamic properties of soils: Elastic properties of soils, coefficient of elastic uniform and non-uniform compression and shear, effect of vibration on the dissipative properties of soils , determination of dynamic properties of soils , Codal provisions.

UNIT – III Foundations Of Reciprocating Machines Total Hours : 9

Types of Machines and Foundations – General requirements – Modes of vibration of a rigid foundation, block method of analysis – Linear Elastic weightless spring method – Elastic half – space method – Analog models ; Design of Block foundation — Codal Recommendations.

UNIT – IV Foundation For Impact And Rotary Machines

Total Hours : 9

Dynamic analysis of impact type machines – Design of Hammer foundations – use of vibrator Absorbers – design – Codal recommendation. Special consideration for Rotary machines – Design criteria – Loads on T.G. Foundation – method of analysis – Design; Dynamic soil – structure – Interaction, Codal Recommendations.

UNIT – V Vibration Control Total Hours : 9

Vibration isolation, passive and active isolation, use of springs and springs and damping materials, construction aspects of machine foundations.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Outcome

To understand the basics of dynamics – dynamic behaviour of soils – effects of dynamic forces and the various design methods.

Text Books

1. Srinivasulu.P., C. V. Vaidyanathan, Handbook Of Machine Foundations, Tata McGraw-Hill, 2012.
2. Bhatia.K.G., Foundations for Industrial Machines D-CAD Publishers, 2008
3. Kameswara Rao, N.S.V., Dynamics soil tests and applications, Wheeler Publishing , New Delhi, 2012.

Reference Books

1. Braja M. Das, G. V. Ramana Principles of Soil Dynamics Cengage Leaning,2011
2. Shamshar Prakash , Vijaykumar Puri, Foundations for machines: analysis and design, John Wiley& Sons (P) Ltd, 2012.
3. Barkon,D.D., Dynamics of basis of foundation, MGH,1974.
4. Swami Saran, Soil Dynamics and Machine Foundation, Galgotia publications Pvt. Ltd., 2012.

EARTH RETAINING STRUCTURES

Objective(s)

1. To familiarize the concept of earth pressure, design of earth retaining structures.
2. To introduce the students the essential steps involved in design of temporary ERS
3. To introduce the techniques involved in construction temporary ERS.

UNIT – I Earth Pressures Total Hours :9

Introduction, development of earth pressure theory, classical solutions, graphical techniques, active, passive cases, earth pressure due to external loads, Empirical approaches, arching of soil, stress distribution in shafts, around tunnels, buried conduits.

UNIT – II Retaining Walls Total Hours : 9

Gravity and cantilever Retaining walls, stability of retaining walls and check for stability, Earth quake forces - Mechanically stabilised retaining walls – General design methods – stability – walls with geotextile and geo grid.

UNIT – III Sheet Pile Walls Total Hours : 9

Types of sheet pile walls, analysis and design of cantilever and anchored sheet pile walls, construction methods.

UNIT – IV Coffer dams Total Hours : 9

Types and uses of coffer dams- analysis, design and stability of braced cofferdams – analysis, design and stability of cellular cofferdams - trenches - soil anchor - Design and construction.

UNIT – V Diaphragm Wall Total Hours : 9

: Analysis, design, Equipment and Construction method of Diaphragm wall – Slurry walls - pile wall, soldier pile and lagging walls, soil nailing wall- Design and construction.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0

Programme Outcome

At the end of this course, students are expected to analyse and design rigid, flexible earth retaining structures, slurry supported trenches and deep cuts

Text Books

1. Braja M. Das Principles of Foundation Engineering, Cengage Leaning, 2009.
2. Robert M. Koerner Designing with Geosynthetics 6 th Edition, Volume 1 and Volume 2, Xlibris, Corp., 2012

Reference Books

1. Hajnal, I., Marton, J. and Regele, Z., Construction of diaphragm walls, A Wiley – Interscience Publication, 1984.
2. Militisky, J. and Woods, R., Earth and Earth retaining structures, Routledge, 1992.
3. Clayton, C.R.I., Militisky, J. and Woods, R.I., Earth pressure and Earth-Retaining structures, Second Edition, Survey University Press, 1993.

UNDER GROUND STRUCTURES

Objective (s)

1. To introduce the students the concept of design of underground structures.
2. To introduce the various construction techniques in construction of underground structures.

Unit - I : Tunnel Planning Total Hours : 12

Tunnel – Types - elements - Layout – Survey and Alignment – Geotechnical Investigation – Deep Shafts Rock tunneling – Methods– Lining

Unit - II : Tunnel Construction Methods Total Hours : 12

Soft Ground Tunneling- Methods – TBMs - monitoring ground movement - Lining. Tunneling in Difficult Ground. Tunnel Boring Machines – Material Handling and construction plant.

Unit -III : Safety Provisions Total Hours : 12

Fire life safety – Tunnel Ventilation – tunnel Lighting – Drainage in tunnels – Tunnel Rehabilitation.

Init - IV : Underground structures: Total Hours : 12

Advantages – Planning– planning for underground parking – civic facilities – Liquid storage facilities. – Construction Methods: cut and cover methods

Unit - V : Buried Structures Total Hours : 12

Design of buried pipelines – Box jacking - Trenchless Technology: construction Methods and Machines – Repair and rehabilitation of buried pipelines -

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

To understand the basics of design and construction of underground structures.

Text Books

1. Tunnel Engineering Handbook 0002 Edition (Paperback) Authors: Thomas R. Kuesel, Elwyn H. King, John O. Bickel.CBS Publishers, New Delhi.
2. Trenchless Technology: Pipeline and Utility Design, Construction, and Renewal: Pipeline and Utility Design, Construction, and Renewal. Mohammad Najafi - McGraw Hill Professional

Reference Books

1. Introduction to Tunnel Construction. David N. Chapman, Nicole Metje, and Alfred Strk (Paperback) Alfred Stark, David N. Chapman, Nicole Metje. Applied Geotchnique Vol-3. Taylor and Francis.
2. Practical Tunnel Construction, Gray B. Hemphill, John Wiley & Sons.2013.
3. Technical Manual for Design and Construction of Road Tunnels—civil Elements – American Association of State Highway and transportation official (AASHTO) Washington DC. ISBN:978-56051-457-2.
4. Underground Infrastructures: Planning, Design, and Construction (Hardcover) Bhawani Singh, R. K. Goel, Jian Zhao. Butterworth – Heinemann-Elsevier ISBN: 978-0-12-397168-5

AIR AND NOISE POLLUTION

Objective(s)

1. To have a basic knowledge on the air pollution on environment
2. To understand the interaction of air pollutants on the meteorological parameters
3. To study about the control measures of air pollutants from various sources

Unit - I : Introduction Total Hours : 12

Definition of clean air –air pollutants - Sources and classification - Effects of air pollution on man, animal, vegetation and properties -Ambient Air Quality Standards, Air pollution control legislation.

Unit - II : Meteorology and Air pollution Total Hours : 12

Meteorology and Air pollution – Atmospheric stability – Inversions – Mixing height–Plume behaviour– Plume rise estimation – Effluent dispersion theories –Air pollutants Modelling.

Unit - III : Control of particulate pollutants Total Hours : 12

Control of Air pollutants: particulates – Filters – Gravitational settling chambers – Centrifugal-multiple type cyclones – Collection efficiency - Electrostatic precipitators – Wet collectors-Centrifugal spray scrubbers - Venturi scrubbers.

Unit - IV : Control of gaseous pollutants Total Hours : 12

Gaseous pollution control – Absorption - Principles – Description of equipment, Adsorption – Principal adsorbents – Equipment descriptions – Condensation – Contact condensers, Incineration –Equipment description

Unit - V : Control of Noise pollution Total Hours : 12

Sound and noise - Source of noise pollution - Environmental and industrial noise -Effects of noise pollution - Fundamentals of sound - generation, propagation, etc., Sound measurement, sound level meters – Measures for prevention and control of noise -Environmental and industrial noise - Noise control legislation.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

An ability to formulate, analyze and solve problems related air environment caused by infrastructure development.

Text Books

1. Rao.M.N. et al., Air Pollution, Tata Mc.Graw Hill, 2013.
2. Rao.C.S., EnvironmentalPollution Control Engineering , New Age International Publishers, 2014.

Reference Books

1. Noel de Nevers, Air Pollution Control Engineering, Mc.Graw Hill, New York. 2012.
2. Stern, A.C., Air Pollution , Vol.I, II and III, Academic Press, 2012.
3. Cunniff, P.F., Environmental Noise Pollution, John Wiley and Sons, 2010.

FAILURE ASSESSMENT AND REHABILITATION OF STRUCTURES

Objective (s)

1. To understand the deterioration process of materials
2. To know about repair materials
3. To assess the condition of the structure

UNIT – I Assessment of Structures Total Hours : 12

Condition Assessment – Procedure for assessment – survey – Field visits – inspection – Sampling – structural capacity – load testing – condition assessment of structures – NDT methods – Evaluation and health monitoring.

UNIT -II Deterioration Process Total Hours : 12

Agencies causing material deterioration - shrinkage, settlement, weathering, chemical attack, creep, fire, honey combing etc., durability of materials – Safety evaluation of existing structures

UNIT-III Cracks Total Hours : 12

Structural and non structural cracks -Types of structural distress in foundations, roofs, floors, walls.

UNIT -IV Repair Materials and Techniques Total Hours : 12

Repair Techniques - Materials for repair – Repair of concrete structures - bridges and water retaining structures – water proofing methods and materials - Non-structural repairs.

UNIT -V Corrosion Process & Monitoring of Structures

Total Hours : 12

Factors influencing corrosion of rebar steel – Corrosion protection in concrete / steel structures – Masonry deterioration, Seismic retrofitting, introduction to health monitoring of structures.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come Ability to analyse
The distress structure and propose repair methodology

Text Books

1. Ransom,W.H., Building Failures, Tayloar & Francis, 2002.
2. Perkins.P, Repair, Protection and Waterproofing of Concrete Structures , CRC Press, 2002.

Reference Books

1. Ravindra.V, Jeffrey.G, Protection of Concrete, CRC Press, 2003.
2. Richardson,B.A., Remedial Treatment of Buildings, Butterworth-Heinemann, 1995.
3. Breysse.D, Non-Destructive Assessment of Concrete Structures: Reliability and Limits of Single and Combined Techniques, Springer Publishers, 2012.

BRIDGE ENGINEERING

Objective(s)

1. To know the investigation of Bridges (2) to know the design of Bridge foundation (iii) To know the bridge loads (iv) to know the Bridge construction and maintenance

Unit - I : Introduction Total Hours : 9

History and Development of Bridges, Classification of Bridges-Investigations for culverts and minor bridge, Investigations for major bridge – Topography, catchment, hydrology, Geotechnical aspects, Construction Resources – Design Flood Discharge-Methods, Linear waterway.

Unit - II : Bridge Foundation Total Hours : 9

Choice of Foundation for piers and abutments –Types - relative suitability. Load on Foundation - Well foundation – types –Design well foundation – Scour Depth – Stability of well foundation - well sinking - methods – Tilt correction – Case studies

UNIT –III Loads on Bridge Total Hours : 9

Loading standards for road and railway bridges- Setting out for piers and abutments, Minor Bridges and Culverts, Single span Bridge, Multispan Bridge, Major/Important Bridges.

UNIT –IV Construction of Bridges Total Hours : 9

Bridge superstructure – supports and centering for RC bridges – erection process of RC girders and steel girder bridges .

UNIT –V Maintenance of Bridges Total Hours : 9

Maintenance-Inspection of bridges, Maintenance of substructure girders-Load testing on bridges-Temporary and movable bridges- Re-building of bridges-bridge failure.

Total Contact Hours : 15 Total Tutorials : 0
Total Practical Class : 45 Total Hours :60

Programme Out come

At the end of the course, the student is able to select the type of bridge, design and its construction

Text Books

1. Ponnuswamy S, "Bridge Engineering" Tata McGraw Hill Publishing Co., 2013.
2. Rangwala.S.C, Rangwala.P.S, Rnagwala.K.S., Bridge Engineering, Charotar Books Publishers, 2013.

Reference Books

1. David Blockley, Bridges, Oxford University Press,2010.
2. Singh, V.P ,Wells and Caissons, Nemchand & Brothers,1981.
3. Victor.D.J., Essentials of Bridge Engineering, Oxford IBH Publishers, 2013.

ADVANCED DESIGN OF STEEL STRUCTURES

Objective(s)

1. To analyse the few important steel structures
2. To understand the codal provisions for design of various steel structures.

Unit - I : Beam-Columns Joints Total Hours : 9

Behaviour – torsional buckling in beam-columns- interaction under biaxial loading- design of beam-columns – design of eccentrically loaded base plates.

Unit - II : Industrial Structures: Total Hours : 9

Loads – wind load calculations - design of Trusses, knee braced trusses, design of braced and unbraced portal and gable portal frames including joints. Design of gantry girders, and gantry girder columns.

UNIT -III Steel chimneys &Towers Total Hours : 9

Chimneys: loading and load combinations – design and stability considerations – design of baseand foundations for chimneys.Towers: Analysis and design of lattice towers- transmission line towers- configurations- types- loadsand load combinations- temperature effect-design principles.

UNIT – IV Bridges Total Hours : 9

Design of Plate girder bridges – influence line diagram - IRC guidelines- effect of wind. Design of truss girder bridges- types of bearings and design of bearings.

UNIT - V Fatigue resistant design Total Hours : 9

Factors affecting fatigue life- fatigue assessment – fatigue analysis.Pre-Engineered Buildings: Advantages – design principles. Design in light gauge steel sections.Introduction to various software for design of steel structures.

Total Contact Hours : 45 Total Tutorials : 15

Total Practical Class : 0 Total Hours : 60

Programme Out come

1. At the end of this course the student is able to design the industrial steel structures.

Text Books

1. Shiyekar, M.R., Limit State Design in Structural Steel, Second Edition, PHI Learning Private Ltd., Delhi, 2013.
2. Shah, V.L., and Veena Gore, Limit State Design Of Steel Structures, Structures Publications, Pune, 2012.

Reference Books

1. Subramanian, P., Design of steel structures, Oxford Publishers, New Delhi, 2007
2. Bhavikatti, S.S., Design of Steel Structures, IK International Publishing House Pvt Ltd, New Delhi, 2014.
3. Sai Ram K.S., Design of Steel Structures, Pearson Education Ltd., 2013.
4. Virendra Gehlot, Ram Chandra, Design of steel structures, Vol.I & II, Standard Publishers, 2012

ENVIRONMENTAL IMPACT ASSESSMENT

Objective(s)

1. To have a knowledge on the impact of various developmental Projects on environment
2. To decide appropriate technologies to quantify the impact.
3. To have a knowledge on the various mitigation measures.
4. To prepare the BIS and EMP.

UNIT -I Laws and Acts Total Hours :12

Historical perspective of environmental protection laws and acts in India - Definition of EI, EIA, EIS - Industrial policy statement of the Government of India. Legal and Regulatory aspects in India - Types and Limitations of EIA - Minimum National Standards – Bureau of Indian Standards - WHO standards.

UNIT - II Methodologies Total Hours : 12

EIA methodologies – Appropriate Methodologies, Quantification, - Cost benefit analysis - Risk assessment, Test Model format - Preliminary assessment

UNIT - III Air quality impact Total Hours : 12

Background - Typical considerations and factors, air quality impact of industry, transport systems, mitigation methods. Water quality impact: Water quality criteria and standards, Field Surveys waterquality- impacts by developmental projects –Land and soil quality impacts- Soil fertility and remediation. Noise impact: Noise and sound, the effects of noise on people, noise scales and rating methods, estimating transportation noise impact.

Unit - IV : Energy Impact Total Hours : 12

Energy impact considerations, data sources, energy conservation data,EIA of hydro, thermal and nuclear power plants, Vegetation and Wild life impact: Biological concepts and terms, impact on flora and fauna, mitigating measures, alternatives - Types, steps in performing socio economic impact assessment, analysis of public services and facilities, impacts, social impacts

Unit - V : Summarization of environmental impacts

Total Hours :12

Environmental Management plan, Public involvement - impacts of economic profile of the community, Exchange of information - comparison of alternatives-Training

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

1. An ability to indentify and quanitify the impacts due to various projects on environment and plan mitigation measures; to safeguard the environment.

Text Books

1. Trivedi.P.R, Trivedi, P.R, Environmental Impact Assessment, APH Publishing, 2011.

Reference Books

1. Canter, L.W., Environmental Impact Assessment, Mc Graw Hill, 1996.
2. Petts, J., Handbook of Environmental Impact Assessment Vol.I and II, Blackwell Science, London, 1999.
3. Environmental assessment of development projects, United Nations Asia and Pacific Development Centre, Kuala Lampur, 1983.
4. John, G. Rau and David C. Wooten (Ed), Environmental Impact Analysis Hand Book, McGraw Hill Book Co., 1980.

ENGINEERING ECONOMICS

Objective (s)

UNIT – I Introduction to Economics Total Hours :12

Flow in an Economy, Law of Supply and Demand, Concept of Engineering Economics - Engineering Efficiency, Economic Efficiency, Scope of Engineering Economics, Elements of Costs, Marginal Cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-Even Analysis, P/V ratio, Elementary Economics Analysis- Material selection for product, Design selection for a product, Building material selection, Process Planning,

UNIT – II Value Engineering Total Hours : 12

Make or Buy Decision, Value Engineering-Function, Aims, Value Engineering procedure, Interest Formulasand their Applications - Time Value of Money, Single Payment Compound Amount Factor, Single PaymentPresent Worth Factor, Equal Payment Series Compound Amount Factor, Equal Payment, Series SinkingFund Factor, Equal Payment Series Present Worth Factor, Equal Payment Series Capital Recovery Factor,Uniform Gradient Series Annual Equivalent Factor, Effective Interest Rate, Examples in all the methods.

UNIT – III Cash Flow Diagram Total Hours : 12

Methods of Comparison of Alternatives- Present Worth Method (Revenue Dominated Cash Flow Diagram,Cost Dominated Cash Flow Diagram), Future Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Annual Equivalent Method (Revenue Dominated Cash Flow Diagram,Cost Dominated Cash Flow Diagram), Rate of Return Method, Examples in all the methods

UNIT – VI Replacement and Maintenance Analysis

Total Hours : 12

Types of Maintenance, Types of Replacement Problem,Determination of Economic Life of an Asset, Replacement of an Asset with a New Asset - Capital Recoverywith Return and Concept of Challenger and Defender, Simple Probabilistic Model for items which failCompletely.

UNIT – V Depreciation Total Hours :

Introduction, Straight Line Method of Depreciation, Declining Balance, Method ofDepreciation, Sum-of-the-Years-Digits Method of Depreciation, Sinking Fund Method ofDepreciation/Annuity Method of Depreciation, Service Output Method of Depreciation, Evaluation ofPublic Alternatives-Introduction, Examples, Inflation Adjusted Decisions- Procedure to Adjust Inflation,Examples on comparison of alternatives and Determination of Economics Life of asset.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Outcome

Text Books

1. Pannerselvam, R., Engineering Economics, Prentice-Hall of India Pvt. Ltd., 2013.
2. Pravin.K, Fundamentals of Engineering Economics, Wiley India (P) Ltd., 2012.

Reference Books

1. Degarmo, E.P., Sullivan, W.G. and Canada, J.R.. Engineering Economy, Macmillan, 1984.
2. Grant, E.L., Ireson,.W.G. and Leavenworth, R.S., Principles of Engineering Economy, Ronald Press,1976.
3. Smith G.W. En :'Engineering Economics, Iowa State Press, Iowa, 1973

DESIGN AND CONSTRUCTION OF PREFABRICATED STRUCTURES

Objective(s)

1. To familiarize the design of basic elements in precast construction.
2. To familiarize the students with various prefabrication construction techniques adopted in practice.

Unit- I : Materials in Precast Structures Total Hours :9

Materials, admixtures, pigments - Modular co-ordination, standardization and tolerances-system of pre-fabrication. Pre-cast concrete manufacturing techniques, Moulds –construction design, maintenance and repair.

UNIT -II Precast Construction Techniques Total Hours : 9

Pre-casting techniques - Planning, analysis and design considerations - Handling techniques -Transportation Storage and erection of structures.Curing techniques including accelerated curing such as steam curing, hot air blowing, etc

UNIT -III Precast concrete floors and beams Total Hours : 9

Simplified frame analysis, Precast concrete flooring options, flooring arrangements, structural design of individual units, design of composite floors, Composite and non-composite reinforced beams

UNIT -IV Precast concrete columns and connections Total Hours : 9

Precast concrete columns and their design. Basic mechanism of joints and connections, compression joints, shear joints, tension joints. Connections-pin jointed and moment resisting connections.

UNIT -V Application of Prefabricated structures Total Hours : 9

Pre-cast and pre-fabricating technology for low cost and mass housing schemes. Small pre-cast products like door frames, shutters, Ferro-cement in housing - Water tank service core unit.

Total Contact Hours: 45 Total Tutorials : 15
Total Practical Classes: 0 Total Hours : 60

Programme Outcome

Student should able to design precast elements and be able to execute the construction sequence in a project with precast elements.

Text Books

1. Levitt. M., Precast concrete - Materials, Manufacture Properties and Usage, Applied Science Publs. 2007,
2. Konex.T., Handbook of Pre-cast Construction, Vol..1.2&3.
3. Kim S Elliott, Precast Concrete Structures, Butterworth Heinemann Publishers, 2002.

Reference Books

1. Richardson,J.G., Pre-cast concrete Production, Cement and Concrete Association, London, 1973.
2. Madhava Rao.A-G., Modern Trends in Housing in Developing Countries, Oxford & UBH Publishing co., 1985. -
3. Lewicki.B., Building with Large Pre-fabrications, Elsevier Publishers

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

Objective(s)

1. To study the effect of earthquake loading on the behaviour of structures.
2. To provide a basic understanding of Engineering seismology and dynamics of structures.
3. To learn the provisions in the IS codes for earthquake resistant design of structures.

Unit - I : Elements of Engineering Seismology Total Hours :9

Elements of engineering seismology - characteristics of earthquake- earthquake size- plate tectonics – types of seismic waves – seismographs - effect of earthquake - earthquake history- seismicity of India.

UNIT - II Theory of Vibrations Total Hours : 9

Theory of vibrations - formulation of equation of motion- single degree of freedom system- free and forced vibrations - damped and undamped vibrations - Basic introduction to multiple degree of freedom systems.

Unit - III : Structural Systems Total Hours :9

Performance of structures under past earthquakes- lessons learnt from past earthquakes–soil liquefaction - Principles of earthquake resistant design - Structural system requirements of buildings – Plan and vertical irregularities .

Unit - IV : Introduction to IS Codes Total Hours : 9

Behaviour of reinforced concrete and steel elements under cyclic loading – Confinement- ductility and energy dissipation- Introduction to Indian Standard Codes -IS:4326 – 1993 and IS13920-1993.

Unit - V : Computation of Design lateral loads Total Hours : 9

Design of RC frames for earthquake loads – equivalent static force procedure as per IS 1893 – 2002 – Load combinations - Design of beams and columns for earthquake resistance.

Total Contact Hours : 45 Total Tutorials : 15

Programme outcome

Students are expected to compute design lateral loads for seismic analysis and to adopt detailing of reinforcement in accordance with codal provisions.

Text Books

1. Pankaj Agrarwal & Manish Shrikhande "Earthquake resistant Design of Structures" Prentice Hall of India Pvt Ltd. New Delhi, 2013
2. Duggal.S.K. Earthquake Resistant Design of Structures, Oxford University Press, 2014.

Reference Books

1. Leigh.W.,Mario Paz. "Structural Dynamics – Theory & Computations", Springer Verlag, 2010.
2. A K.Chopra, "Dynamics of Structures Theory and Applications to EarthquakeEngineering" Prentice Hall of India (P) Ltd., 2008.
3. Pauley T and Priestley M.J.N, Seismic Design of Reinforced Concrete and MasonryBuildings, John Wiley & Sons, New York, 2012.
4. Stratta, J.L "Manual of seismic Design", Pearson Education Ltd.,2004.

DESIGN OF INDUSTRIAL STRUCTURES

Objective(s)

(1) To understand the planning aspects of industrial structures.
(2) To understand the design principles of industrial structures.

UNIT I Total Hours : 9

Classification of Industrial Structures - Layout requirements - lighting and Ventilation - protection against noise and vibration - fire safety - factories act.

UNIT II Total Hours :9

Roofing configuration – types of trusses - Beams and lattice trusses - Type of roof covering materials - purlins - detailed design.

UNIT III Total Hours :9

Silos and Bunkers - Shape of hopper for different materials - design of vertical sides - hopper bottom - stiffening girder - staging -design - Conveyors and supporting structures.

UNIT IV Total Hours :9

Gable frames of uniform cross sections - varying depth – pin-jointed knee bracings - design of joints - analysis by various methods.

UNIT V Total Hours :9

Design of pre-engineered structures – design examples.

Total Contact Hours : 45 Total Tutorials : 15
Total Practical Class : 0 Total Hours : 60

Programme Out come

The students would become confident of design of practical industrial design problems.

Reference Books

1 Punmia .B.C., Jain A.K, Arun Kumar Jain ,"Comprehensive R C C Designs", Laxmi Publications (P) Ltd., New Delhi, 2012.
2. Lother, "Advance Design in Steel Structure", Prentice Hall, USA, 1980
3. Salmon. C.G. and Johnson J.E. "Steel Structure - Design and Behaviour", Harper and Row - 1980
4. Wiliam McGuire - "Steel Structures", Prentice Hall of India New Jersey, 1968
5. Arya and Ajmani, "Design of Steel Structures" Nem Chand Bros, 2012.

FORMWORK FOR CONCRETE STRUCTURES

Objective(s)

1. To emphasis on the importance of formworks in construction industry.
2. To familiarize the students with various forms of formworks suitable for concrete structures.

UNIT - I Formwork materials and design concepts Total Hours :12

Introduction, requirements, selection and classification of formworks. Formwork materials – Timber, Plywood, Plastic, steel and other materials. Form coatings and linings.Design Concepts-Loads on formwork- estimation of permissible stresses. Maximum Bending Moment, Shear Force, and Deflection

UNIT -II Forms for footings, walls and columns Total Hours :12

Conventional Formwork for Foundation, Conventional Wall Formwork, Design illustrations. Conventional Column Formwork, Modular Column Formwork System, Disposable Column Formwork, All Metal Column Formwork, Achieving Formwork Economy in Column Construction, Design illustration for Column Form

UNIT -III Slab and Beam Formwork Total Hours :12

Traditional Slab and Beam Formwork, Various Slab and Beam Formwork Solutions Offered, Achieving Economy in Slab Construction, Design of Slab and Beam Formwork, Illustration of Slab and Beam Formwork Design

UNIT -IV Formwork for special structures Total Hours :12

Formwork for Shells, Domes, Overhead Water Tanks, Tunnel, Bridge formwork and flying formwork, Advantages and Limitations of Flying Forms, Slip formsForm failures-causes, Avoiding Formwork Failure

UNIT -V Formwork Supports and Scaffold Total Hours :12

Shores/Props and Dropheads, Multi-Legged Shoring Towers, Design of Vertical Supports for Formwork, Classification of Scaffolds, Timber Scaffolds and Metal Scaffolds

Total Contact Hours: 60 Total Tutorials : 0

Total Practical Classes: 0 Total Hours : 60

Programme Outcome

Student will able to appreciate the pros and cons of various formworks and identify suitable formwork for specific purpose.

Text Books

1. K. N.Jha, “Formwork for Concrete Structures” Mc Graw Hill Education Pvt Ltd, New Delhi, 2012

Reference Books

1. Robert L Peurifoy and G D Oberlender, “Formwork for Concrete Structures” Mc Graw Hill, New York, 1995

DISASTER MITIGATION AND MANAGEMENT

Objective(s)

1. To provide students an exposure to disasters, their significance and types.
2. To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
3. To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
4. To enhance awareness of institutional processes in the country and5. To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live,with due sensitivity

Unit - I Understanding disaster Total Hours : 12

Concept of disaster - Different approaches - Concept of Risk - Levels of disasters - Disaster phenomena and events *(Global, national and regional)*

Unit - II Hazards and Vulnerability Total Hours : 12

Natural and man-made hazards - response time, frequency and forewarning levels of different hazards- Characteristics and damage potential of natural hazards-hazard assessment-Dimensions of vulnerability factors- vulnerability assessment- Vulnerability and disaster risk- Vulnerabilities to flood and earthquake hazards.

Unit III : Disaster Management Mechanism Total Hours : 12

Concepts of risk management and crisis management - Disaster management cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness- Planning for relief

UNIT - IV Capacity building & Coping with disaster Total Hours :12

Capacity building-Concept- Structural and nonstructural measures- Capacity assessment; strengthening capacity for reducing risk - Counter disaster resources and their utility in disaster management- Legislative support at the state and national levels-Coping strategies- Industrial safety plan.

UNIT - V Planning for disaster management Total Hours :12

Strategies for disaster management planning- Steps for formulating a disaster risk reduction plan- Disaster management Act and Policy in India-

Organisational structure for disaster management in India- Preparation of state and district disaster management plans.

Total Contact Hours : 60 Total Tutorials : 0
Total Practical Class : 0 Total Hours : 60

Programme Out come

At the end of this course, the students will be able to recognize the increasing vulnerability of the planet in general and India in particular to disasters. Also, would create a basis to work towards preparedness and also helps to develop a culture of safety and prevention

Text Books

1. Leelakrishna Rao.K, Siddhartha Gautam, Murthy.N.J, Disaster Mitigation, Vista International (P) Ltd., 2012.
2. Tilottama Senapati, Rajan Kumar Sahoo, Disaster Management & Mitigation, Dominant Publishers, 2014.

Reference Books

1. Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.
2. Chakrabarty, U. K. Industrial Disaster Management and Emergency Response, Asian Books Pvt. Ltd., New Delhi 2007
3. Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

IRRIGATION AND DRAINAGE ENGINEERING

Objectives(s)

1. To familiarize the students with various irrigation practices adopted
2. To identify the irrigation requirements of various crops and to design irrigation channels

Unit - I : Types of Irrigation Systems Total Hours :12

Introduction: Need, advantages and disadvantages of Irrigation - Environmental effects - Types of Irrigation systems - Gravity irrigation, canals, Tanks, Wells and Irrigation galleries - Water lifts. Soil -water - plant relationship: Soil and its function - Physical properties of soil and their importance in relation to irrigation - Classes and availability of soil water - Movement of water in soils - Measurement of soil moisture - Crop growth and moisture relationship - Salt problems in soil and effect of salts on plant growth.

UNIT -II Irrigation Water Requirement Total Hours :12

Evaporation, Evapo transpiration, Consumptive use and its estimation - Crop factor - Lysimeters - Effective rain fall and irrigation requirements - Water requirements of various crops - Duty of water - Quality of irrigation water.

UNIT -III Methods of Irrigation Total Hours : 12

Surface, subsurface and overhead methods - Check basin, border & furrow, Drip and sprinkler irrigation - Irrigation efficiency, Depth, Rate and frequency of irrigation - Irrigation schedule.

UNIT -IV Design of Irrigation Channels Total Hours :12

Design of unlined and lined channels for irrigation - Location and design of canal regulation structures - Cross drainage structures - Measuring devices.

UNIT -V Land Development and Management Total Hours :12

Land Development: Reclamation and management of saline & alkaline soils, water logging, Causes and remedial measures - Design, construction and maintenance of drainage systems. Irrigation Management: Management of irrigation system - water charge assessment and water use management.

Total Contact Hours: 60 Total Tutorials : 0

Total Practical Classes: 0 Total Hours : 60

Programme Outcome

Student should able to identify the suitable method of irrigation and water requirement for a given soil and crop. Students should also be able to design and manage irrigation systems.

Text Books

1. Basak.K.N, Irrigation Engineering, Tata Mc-Graw-Hill, 2013.
2. Sharma.R.K., and Sharma. T.K., Irrigation Engineering ,S.Chand & Company Ltd, 2014.

Reference Books

1. Punmia B.C, Ashok Kumar Jain, Pande Bb Lal, Irrigation & Water Power Engineering, Lakshmi Publications, 2013.
2. Arora.,K.R., Irrigation Water Power & Water Resources Engineering, Standard Publishers, 2013.
3. Raghunath. H.M., Irrigation Engineering, Wiley India (P) Ltd., 2012.
4. Das, M.M, Saikia, M.S Irrigation and water power Engineering, PHI, Learning, (P) Ltd, New Delhi, 2009

Annexure IV

SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE
(An Autonomous Institution)
(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)
Madagadipet, Puducherry - 605 107

DEGREE OF DOCTOR OF PHILOSOPHY (Ph.D.)

Ph.D. Regulations: 20-2021

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2. GENERAL ELIGIBILITY
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13. SUBMISSION OF SYNOPSIS
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15. THESIS EVALUATION
16. PUBLIC VIVA-VOCE (ORAL EXAMINATION)
17. AWARD OF PH.D. DEGREE
18. CANCELLATION OF REGISTRATION

1. PREAMBLE

The Doctor of Philosophy (Ph.D.) degree is the highest academic degree which requires prolonged study and wide academic effort. Ph.D. degree is awarded to a candidate who, as per these regulations, has submitted a thesis or dissertation on the basis of original and independent research in any particular subject / discipline or involving more than one discipline (inter-disciplinary) that makes a contribution to the advancement of knowledge, which is approved by Board of Examiners as required. The regulations of Sri Manakula Vinayagar Engineering College is based on Pondicherry University research guidelines 2018-19 and UGC (Minimum Standards and Procedure for award of Ph.D. degree) Regulations May 2016 starting from the admission to the Ph.D programme to the award “Degree of Doctor of Philosophy”.

2. GENERAL ELIGIBILITY

Educational Qualifications (Full-time and Part-time)

- Master’s Degree of the University or any other qualification recognized as equivalent thereto in the fields of study notified from time to time by the University.
- A minimum of 55% marks or CGPA of 5.5 on a 10 point scale in the qualifying examination. In case of SC/ST/ differently –Abled candidates, 50% marks or CGPA of 5.0 on a 10 point scale.
- Candidates of Indian origin or overseas students who have qualified for a Master’s Degree of an accredited overseas university, having secured a minimum of 55% marks (or equivalent grade).

EDUCATIONAL QUALIFICATIONS

Sl.No	Programme	Qualification for Admission
1	Ph.D. Degree in Engineering/ Technology	M.E. / M.Tech. / M.S. (By Research) in the relevant branch of Engineering or Technology

2	Ph.D. Degree in Science and Humanities	M.Sc. / M.A. / M.S. (By Research) /M.Phil in the relevant branch of Science and Humanities/ M.C.A
3	Ph.D. Degree in Management Sciences	MBA / Post Graduate Diploma in Business Management or Administration awarded by Indian Institute of Management (IIM) / M.S. (By Research) in Management Sciences

3. CATEGORIES OF PH.D. SCHOLARS

Two categories of Ph.D. programme available are: Full-time and Part-time.

Candidates who satisfy the eligibility criteria

a. Full-time Research Scholars

- Candidates who pursue their Full-time doctoral research under the guidance of a Research Supervisor in the Departments
- Candidates who are sponsored by AICTE under Quality Improvement Programme for teachers of Engineering Colleges and who satisfy the eligibility conditions shall apply for Full-time category only, in the specializations as notified in the AICTE guidelines.
- Full-time scholars shall necessarily sign in the attendance register on all working days at the respective place of research.

b. **Part-time Research Scholars**

- Candidates who are presently employed either Regular or Temporary basis with a minimum of one year of continuous service / Guest lecturers with the minimum of 2 years' service with break (4 semesters) are allowed in any department / college / institute / industry / organization may pursue their doctoral research under the guidance of a Research Supervisor
- The extramural candidate has to submit the No Objection certificate from the institution/ Industry/ Organization, before admission.

4. MODE OF SELECTION

- Admission for Ph.D. programmes shall be advertised in leading newspapers and also in the Pondicherry University's website once each year.
- Depending on number of available Research Supervisors, specialized areas and the vacant Ph.D. seats under each discipline shall be notified in the institute website.
- The candidates seeking admission have to fill in the prescribed admission form and submit the same within the prescribed date specified in the admission notification. The admission shall be based on the criteria notified by the University and taking into account the reservation policy of the Central/State Government from time to time.
- The Centre for Research shall screen the applications as per the eligibility norms, and the Centre for Entrance Examinations shall conduct the written test for eligible candidates. Candidates appearing for the written test should obtain minimum marks as specified by the University to qualify for the interview process.
- To conduct the interview for the selection of the Ph.D. candidates, an Admission Committee for each Department shall be constituted consisting of all the faculty members eligible to guide in that Department and a Director nominee. The Head of the Department will convene the meetings of the Admission Committee. One member of the Committee shall belong to the SC/ST category. If no SC/ST faculty is available in the Department concerned, a SC/ST member from other Departments may be co-opted as a Member.
- The admission shall be based on the criteria notified by the University and taking into account the reservation policy of the Central/State Government from time to time**.**

5. ADMISSION

- The selected candidate shall be admitted for the Ph.D. programme in the respective discipline based on his/her PG qualification. The Research Board constituted by the Diector shall approve and recommend the short listed candidates for admission to the Ph.D.
- The Scholar, Supervisor, Joint Supervisor, Doctoral Committee members and Examiners shall not be relatives to one another.

6. DURATION OF THE RESEARCH

- The duration of the Ph.D. Full-Time programme shall be a minimum period of three years from the date of registration, and two years for those with M. Phil. or equivalent degree.
- Part-Time candidates, both Internal and External, shall have to complete a minimum of three years from the date of registration
- All candidates shall publish minimum of two research paper in UGC approved journals or standard journal
- Women candidates and Persons with Disability (more than 40% disability) may be allowed a relaxation of two years in the maximum duration. In addition, the women candidates may be provided Maternity Leave/Child Care Leave once in the entire duration of the Ph.D. up to 240 days as per Government of India norms from time to time

7. MAXIMUM NUMBER OF CANDIDATES UNDER A RESEARCH SUPERVISOR

Designation	**Total number of Ph.D. candidates including Full-time and Part-time**
Professor	8
Associate Professor	6
Assistant Professor	4

8. RESPONSIBILITIES OF SUPERVISORS

- The Supervisor carries the major responsibility of guiding the academic progress of the Candidate throughout the period of study
- Maintaining the copies of records of the reports/minutes of the Doctoral Committee
- To ensure the successful and timely completion of the programme, it is essential that

  Supervisors and their Scholars maintain regular contact. Supervisors must give their Scholars advance notice if they plan to be absent from the college for an extended period of time, of at least six months, and make suitable arrangements for the continued supervision of the Scholar.

9. CHANGE OF SUPERVISOR

- In case of the absence of the allotted supervisor for more than 6 months and up to 1 year, a Supervisor in-charge may be allotted from the same Department or related Department with the approval of the Doctoral Committee.
- In case of the Supervisor leaving the University permanently or on deputation elsewhere or otherwise for a period of more than one year, the Candidate may be permitted to change the topic of research, if necessary, with a change of the guide.
- Based on the recommendation of the Doctoral Committee, HOD and Director may approve a change of Supervisor under conditions such as non-availability of the Guide for more than one year or any other extraordinary condition

10. DOCTORAL COMMITTEE

- When the Candidate is accepted for provisional registration, a Doctoral Committee will be constituted in each case.
- Research Supervisor shall furnish for every scholar a panel of three experts with doctoral qualifications in the field of proposed research,

from the faculty members of the University / Other premier institutions / R&D Departments from which one will be recommended by the Vice-Chancellor as Doctoral committee member.

- Supervisor of the research scholar shall function as the convener of the Committee.
- The doctoral committee should conduct once per year and four DC meeting required for submission of synapsis
- The committee shall have the following responsibilities:
    - To review the research progress and confirm the topic of research.
    - To guide the research scholar to develop the study design and methodology of research and identify the courses that he/she may have to do.
    - To periodically review and assist in the progress of the research work of the Research scholar

11. COURSE OF STUDY

- Two theory (each 4 credits) subject of course work that is prescribed by the Doctoral Committee for the scholar to undergo as a part of the programme research.
- The course content shall be formed such that each credit content course takes at least 15 teaching contact hours.
- The course work shall typically include courses on research methodology, specific research areas and any other course(s) shall be prescribed to the research scholar by the recommendations of the Doctoral Committee
- The scholar shall attend classes along with PG students and will be evaluated in the same relative grading scale of the course work.
- No change in the course works prescribed shall be made without the approval of the Doctoral Committee and if any change, the same should be informed to the Centre in advance.
- The scholars shall secure a CGPA of 7.0 on 10-point scale in the course work in order to be eligible to continue in the program and to submit thesis

- The prescribed course work shall normally be completed within one year from the date of provisional registration in the case of full-time research scholars and two years in the case of part-time research scholars.

12. EXTENSION OF RESEARCH

- Scholars who do not submit the thesis within the maximum duration of the programme (six years) shall apply for extension of time three months prior to the completion of six years with the recommendation of the Supervisor.
- In such cases, a maximum grace period of one year, beyond the normal maximum period of six years shall be granted by the Director to enable the scholar to submit the Synopsis and Thesis.
- Extensions will be given to the candidates based on the recommendations of their Doctoral Committee along with the Extension and Annual Fees.
- However, the final six months grace period shall be granted by the Director if the scholars submit the synopsis and apply for extension with the recommendation of the Supervisor, at least one month prior to the expiry of the previous extension.

13. SUBMISSION OF SYNOPSIS

- The scholar shall be permitted to submit the Synopsis only after obtaining the confirmation of provisional registration and completion of the minimum duration of the programme applicable to the scholar.
- Scholar should have published two research articles (and the journal concerned) in the regular issue of the referred impact factor journals in the field of specialization as first author or second author (if the Supervisor is first author) based on his/her research work
- Publications of the scholars where a PG student is a corresponding author shall not be considered for processing of his/her Synopsis. The scholar shall not publish research articles with similar contents in part or full in more than one journal, which would result in Self Plagiarism.
- If the Doctoral Committee approves the research work reported in the Synopsis and submitted to the Research coordinator along with a panel of examiners at the level of Associate Professor and above / equivalent

scientist grade with minimum five years of post-PhD experience with fairly good publication record (H index).

- Examiners should be from IISc / IITs / ISER / NITs / State Universities / Central Universities
- The candidate should submit **Six copies** of the synopsis of the proposed thesis along with the virus-free soft copy in PDF format **on a CD**
- submit the synopsis within 15 days from the date of presentation along with signatures of attendees
- The synopsis will not be accepted if it does not fulfill the above requirements. In such case, synopsis will be returned to the candidate

14. SUBMISSION OF THESIS

Ph.D. candidate should submit four copies of the thesis along with the virus-free soft copy as a single file having a maximum of 20MB on a CD only in PDF format. The hard and soft copy must be exactly same. Thesis must be signed by the Research Supervisor (Co-supervisor, if included in the Ph.D. registration) and forwarded by Head of the Department / Institution / Organization, as the case may be.

Thesis format

a. 80GSM, A4 size paper printed on both sides except titles and certificate pages

b. Supervisor, Candidate and Plagiarism-free certificates

c. Times Roman font with 2.0 Line space should be provided

d. Thesis shall not exceed 300 pages, including appendix, tables, figures etc.

e. Three copies with soft binding

Thesis shall be scrutinized to assess the overall layout, contents and the quality of presentation of the Thesis. The deviation, if any, shall be rectified by the scholar in consultation with the Supervisor and the same shall be approved by the Director.

15. THESIS EVALUATION

- Thesis shall be referred to two examiners (one from India and another from abroad) nominated by the Vice-Chancellor from the panel of examiners recommended by the Doctoral Committee.
- Recommend the acceptance of the Thesis. However, the scholar shall incorporate the corrections indicated in the detailed report and place the corrected copy to the Oral Examination Board but the corrected Thesis need not be sent to the examiner
- Defer the recommendation at this stage and the scholar shall incorporate the suggested modifications in the Thesis and the corrected Thesis along with the scholar's clarifications shall be sent to the respective examiner.
- Reject the Thesis for the reasons set out in the detailed report
- If both the examiners recommended for the award of the degree, Thesis shall be provisionally accepted. Any minor revision, modification, etc., suggested by the examiners shall be carried out before the Oral Examination Board.
- If any examiner recommends resubmission of the thesis after revision, the scholar shall be permitted to revise and resubmit the Thesis along with the resubmission fee within six months; failing which the revised thesis shall not be accepted and his/her registration shall stand cancelled.
- If both the examiners recommend rejection, the Thesis shall be rejected and the registration of the scholar shall stand cancelled.

16. PUBLIC VIVA-VOCE (ORAL EXAMINATION)

On receipt of the evaluation reports, the Doctoral Committee shall meet **within three months** and recommend a panel of three experts (Other than the Parent Institution) from different recognized institutions within India, along with their publication details in the last five years for constitution of an Oral Examination Board.

The scholar shall be asked to make a brief presentation before the audience and answer all the questions raised by the examiners and the audience. A pass in the viva-voce is compulsory. If a scholar fails in the viva-voce examination, he / she shall be allowed to re-appear after 3 months from

the date of first viva-voce before a panel constituted for this purpose by the Director. If he / she fail again, his / her candidature for Ph.D. Degree will be rejected.

17. AWARD OF PH.D. DEGREE

The two-member board shall then forward its consolidated recommendations with the classification "Highly commended / commended" to The Director-Research, along with other documents as may be required by the University for its Consideration. The consolidated recommendation will be placed before the syndicate for approval and the Ph.D. degree for the approved candidates will be awarded in Convocation either in person or in absentia.

18. CANCELLATION OF REGISTRATION

- The registration of a scholar who has not submitted his/her thesis before the end of the maximum duration including the extension period for the programme. In all the above cancellation cases, the fees paid by the scholar shall not be refunded
- The registration is liable for cancellation administratively by the Director, if
    - The scholar has not paid the semester fees within the stipulated time
    - Two semesters progress reports are not submitted or not satisfactory
    - The performance is not satisfactory to the Doctoral Committee and accordingly recommended for cancellation.
    - Prior permission is not obtained for break of study from the Director
    - Submission of Thesis beyond three months from the date of approval of Synopsis by the Doctoral Committee.
    - The act of plagiarism involved in the journal publication/Synopsis/Thesis
    - Non-disclosure of relieving from the present job and taking up new job elsewhere by Scholar/Supervisor