INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Accredited by NBA | Affiliated to JNTUH)

Dundigal, Hyderabad - 500 043, Telangana

OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY
CIVIL ENGINEERING

ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI UNDER AUTONOMOUS STATUS

B.Tech Regular Four Year Degree Programme

(for the batches admitted from the academic year 2016- 2017)

&

B.Tech (Lateral Entry Scheme)

(for the batches admitted from the academic year 2017 - 2018)

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

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"Take up one idea.
Make that one idea your life-think of it, dream of it, live on that idea. Let the brain muscles, nerves, every part of your body be full of that idea and just leave every other idea alone.
This is the way to success"

Swami Vivekananda

PRELIMINARY DEFINITIONS AND NOMENCLATURES

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and one supplementary semester.

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Hyderabad) and State Government.

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry, Biology etc., are considered to be foundational in nature.

Betterment: Betterment is a way that contributes towards improvement of the students' grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

Board of Studies (BOS): BOS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible for curriculum design and updation in respect of all the programs offered by a department.

Branch: Means specialization in a program like B.Tech degree program in Civil Engineering, B.Tech degree program in Computer Science and Engineering etc.

Certificate course: It is a course that makes a student gain hands-on expertise and skills required for holistic development in a specific area/field.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Commission: Means University Grants Commission (UGC), New Delhi.

Continuous Internal Examination: It is an examination conducted towards sessional assessment.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources in the process of study for a degree.

Detention in a course: Student who does not obtain minimum prescribed attendance in a course shall be detained in that particular course.

Dropping from the Semester: A student who doesn't want to register for any semester can apply in writing in prescribed format before commencement of that semester.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

Grade Point: It is a numerical weight allotted to each letter grade on a 10 - point scale.

Institute: Means Institute of Aeronautical Engineering, Hyderabad unless indicated otherwise by the context.

Massive Open Online Course (MOOC): MOOC courses inculcate the habit of self learning. MOOC courses would be additional choices in all the elective group courses.

Pre-requisite: A course, the knowledge of which is required for registration into higher level course.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Means, Bachelor of Technology (B.Tech) degree program / PG degree program: M.Tech/ MBA.

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

Re-Appearing: A student can reappear only in the semester end examination for the theory component of a course, subject to the regulations contained herein.

Registration: Process of enrolling into a set of courses in a semester of a Program.

Regulations: The regulations, common to all B.Tech programs offered by Institute are designated as "IARE Regulations R-16" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd Semester starts usually in July and even semester in December.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

S/he: Means "she" and "he" both.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

University: Means the Jawaharlal Nehru Technological University Hyderabad, Hyderabad.

Withdraw from a Course: Withdrawing from a course means that a student can drop from a course within the first two weeks of the odd or even semester (deadlines are different for summer sessions). However s/he can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

FOREWORD

The autonomy is conferred to Institute of Aeronautical Engineering (IARE), Hyderabad by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like J N T University Hyderabad (JNTUH), Hyderabad and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system** and **monitoring mechanism**, independent of the affiliating University but under its observance.

IARE is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a follow up, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the institute and recommendations of the JNTUH to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the institute to order to produce a quality engineering graduate to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time and with principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The Cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL

ACADEMIC REGULATIONS

B.Tech. Regular Four Year Degree Programme
(for the batches admitted from the academic year 2016 - 17)
&
B.Tech. (Lateral Entry Scheme)
(for the batches admitted from the academic year 2017 - 18)

For pursuing four year undergraduate Bachelor Degree programme of study in Engineering (B.Tech) offered by Institute of Aeronautical Engineering under Autonomous status and herein after referred to as IARE.

1.0. CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching-learning process and enables vertical and horizontal mobility in learning.

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work / comprehensive Examination / seminars / assignments / alternative assessment tools / presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

1. Choose electives from a wide range of elective courses offered by the departments.
2. Undergo additional courses of interest.
3. Adopt an interdisciplinary approach in learning.
4. Make the best use of expertise of the available faculty.

2.0 MEDIUM OF INSTRUCTION

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

3.0 TYPES OF COURSES

Courses in a programme may be of three kinds: **Foundation / Skill, Core and Elective.**

3.1 Foundation / Skill Course:

Foundation courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill subjects are those areas in which one needs to develop a set of skills to learn anything at all. They are fundamental to learning any subject.

3.2 Core Course:

There may be a core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

3.3 Elective Course:

Electives provide breadth of experience in respective branch and applications areas. Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An elective may be discipline centric (Professional Elective) focusing on those courses which add generic proficiency to the students or may be chosen from an unrelated discipline called as "Open Elective".

There are six professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives has to be selected. A student may also opt for more elective courses in his area of interest.

4.0 SEMESTER STRUCTURE

Each academic year is divided into three semesters, TWO being MAIN SEMESTERS (one odd + one even) and ONE being a SUPPLEMENTARY SEMESTER. Main Semesters are for regular class work. Supplementary Semester is primarily for failed students i.e. registration for a course for the first time is generally not permitted in the supplementary semester. However, the following cases are exempted:

4.1 Students admitted under Lateral Entry Scheme in the subjects 'Audit Course', 'Advanced Programming Lab' and 'Value Added Course'.

4.2 Students admitted under Lateral Entry Scheme shall register 'Environmental Studies' course in supplementary semester and pass the subject by the end of VI semester for the award of the degree. This is a non-credit and mandatory course for students admitted under Lateral Entry Scheme.

4.3 Students admitted on transfer from JNTU affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

4.4 Each main semester shall be of 21 weeks (Table 1) duration and this period includes time for registration of courses, course work, examination preparation and conduct of examinations.

4.5 Each main semester shall have a minimum of 90 working days; out of which number of contact days for teaching / practical are 75 and 15 days for conduct of exams and preparation.

4.6 The supplementary semester shall be a fast track semester consisting of eight weeks and this period includes time for registration of courses, course work, examination preparation, conduct of examinations, assessment and declaration of final results.

4.7 All subjects may not be offered in the supplementary semester. The student has to pay a stipulated fee prescribed by the Institute to register for a course in the supplementary semester. The supplementary semester is provided to help the student in not losing an academic year. It is optional for a student to make use of supplementary semester. **Supplementary semester is a special semester and the student cannot demand it as a matter of right** and will be offered based on availability of faculty and other institute resources.

4.8 The institute may use **supplementary semester** to arrange add-on courses for regular students and / or for deputing them for practical training / FSI. A student can register for a maximum number of 15 credits during a supplementary semester.

4.0.1 The registration for the Summer Semester (May – July) provides an opportunity to students to clear their backlogs ('F' grade) or who are prevented from appearing for SEE examinations due to shortage of attendance less than 65% in each course ('SA' Grade) in the earlier semesters or the courses which he / she could not register (Drop/Withdraw) for some reason.

Students will not be permitted to register for more than 15 credits (both I and II Semester) in the Summer Semester. Students are required to register for Summer Semester courses are to pay a nominal fee in within the stipulated time.

It will be optional for a student to get registered in the course(s) of Summer Semester; otherwise, he / she can opt to appear directly in supplementary examination. However, if a student gets registered in a course of Summer Semester, then it will be compulsory for a student to fulfil attendance criteria (≥90%) of Summer Semester and he / she will lose option to appear in immediate supplementary examination.

The students who have earlier taken an SEE Examination and register afresh for the Summer Semester will revoke the CIA marks secured by them in their regular/earlier attempt in the same course. Once revoked, the students shall not seek restoration of the CIA marks.

Summer Semester will be at an accelerated pace and will be at double the rate of normal semester e.g. one credit of course shall require two hours/week so that the total contact hours are maintained same as in normal semester.

Instructions and guidelines for the summer semester course:

- A minimum of 36 to 40 hours will be taught by the faculty for every course.
- The students registered and having sufficient percentage of attendance for the course alone will be permitted to write the examination.
- The assessment procedure in a summer semester course will also be similar to the procedure for a regular semester course.
- Student shall register for the Summer Semester as per the schedule given in academic calendar.
- Once registered, students will not be allowed to withdraw from a summer semester.

4.0.2 The academic calendar shown in Table 1 is declared at the beginning of the academic year.

Table 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Exams			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation, Supplementary Semester and Remedial Exams			8 weeks

5.0 REGISTRATION / DROPPING / WITHDRAWAL

5.1. Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time. The registration will be organized departmentally under the supervision of the Head of the Department.

5.2. IN ABSENTIA registration will not be permitted under any circumstance.

5.3. At the time of registration, students should have cleared all the dues of Institute and Hostel in the previous semesters, paid the prescribed fees for the current semester and not been debarred from institute for a specified period on disciplinary or any other ground.

5.4. The student has to normally register for a minimum of 20 credits and may register up to a maximum of 30 credits, in consultation with HOD/faculty mentor. On an average, a student is expected to register for 25 credits.

5.5. **Dropping of Courses:** Within one week after the last date of first internal assessment test or by the date notified in the academic calendar, the student may in consultation with his / her faculty mentor/adviser, drop one or more courses without prejudice to the minimum number of credits as specified in clause 5.4. The dropped courses are not recorded in the Grade Card. Student must complete the dropped subject by registering in the supplementary semester / forthcoming semester in order to earn the required credits. Student must complete the dropped subject by registering in the supplementary semester / forthcoming semester in order to earn the required credits.

5.6. **Withdrawal from Courses:** A student is permitted to withdraw from a course by the date notified in the academic calendar. Such withdrawals will be permitted without prejudice to the minimum number of credits as specified in clause 5.4. A student cannot withdraw a course more than once and withdrawal of reregistered subjects is not permitted.

5.7. After **Dropping and / or Withdrawal** of courses, minimum credits registered shall be 20.

6.0 UNIQUE COURSE IDENTIFICATION CODE

Every course of the B.Tech program will be placed in one of the nine groups of courses as listed in the Table 2. The various courses and their two-letter codes are given below;

Table 2: Group of Courses

S. No	Branch	Code
1	Aeronautical Engineering	AE
2	Computer Science and Engineering	CS
3	Information Technology	IT
4	Electronics and Communication Engineering	EC
5	Electrical and Electronics Engineering	EE
6	Mechanical Engineering	ME
7	Civil Engineering	CE
8	Humanities and Basic Sciences	HS
9	Miscellaneous	MS

7.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Foundation / Skill Courses, Core Courses, Elective Courses, Laboratory Courses, Audit Courses, Mandatory Courses, Comprehensive Examination, Ideation and Product Development, Internship and Project work. The list of elective courses may include subjects from allied disciplines also.

Contact Periods: Depending on the complexity and volume of the course, the number of contact periods per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours/week as follows:

- **Contact classes (Theory):** 1 credit per lecture hour per week, 1 credit per tutorial hour per week.
- **Laboratory Hours (Practical):** 1 credit for 2 Practical hours, 2 credits for 3 or 4 practical hours per week.
- **Project Work:** 1 credit for 4 hours of project work per week.
- **Ideation and Product Development:** 1 credit for 2 hours per week

7.1 Credit distribution for courses offered is shown in Table 3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core and Foundation)	3 / 4	3 / 4
2	Elective Courses	3	3
3	MOOC Courses	-	2
4	Laboratory Courses	2 / 3	1 / 2
5	Audit Course / Mandatory Course	-	0
6	Comprehensive Examination	-	1
7	Ideation and Product Development	-	1
8	Summer Internship	-	0
9	Full Semester Internship (FSI) Project Work	-	16
10	Project Work	-	10

7.2 Course Structure

Every program of study shall be designed to have 38 - 42 theory courses and 20 - 26 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in the Table 4. In addition, a student has to carry out a Ideation and Product Development, project work and comprehensive Examination.

Table 4: Category Wise Distribution of Credits

S. No	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	10
2	Basic Sciences (BS) including Mathematics, Physics and Chemistry.	BS (15% to 20%)	28
3	Engineering Sciences (ES), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ES (15% to 20%)	28
4	Professional Subjects - Core (PC), relevant to the chosen specialization/branch.	PC (30% to 40%)	96
5	Professional Subjects - Electives (PE), relevant to the chosen specialization/branch.	PE (10% to 15%)	12
6	Open Subjects - Electives (OE), from other technical and/or emerging subject areas.	OE (05% to 10%)	06
7	Project Work or Full Semester Internship, Ideation and Product Development, Comprehensive Examination.	10% to 15%	12 - 18
8	Mandatory Courses / Audit Courses.	MC / AC	Non-Credit
TOTAL			**192**

7.3 Semester wise course break-up

Following are the **TWO** models of course structure out of which any student shall choose or will be allotted with one model based on their academic performance.

i. Full Semester Internship (FSI) Model and

ii. Non Full Semester Internship (NFSI) Model.

7.4 For Four year regular program (FSI Model):

In the FSI Model, out of the selected students - half of students shall undergo Full Semester Internship in VII semester and the remaining students in VIII semester. In the Non FSI Model, all the selected students shall carry out the course work and Project work as specified in the course structure. A student who secures a minimum CGPA of 7.5 up to IV semester with no current arrears and maintains the CGPA of 7.5 till VI Semester shall be eligible to opt for FSI.

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
I Semester	5 Foundation	4	24
II Semester	5 Foundation	4	24
III Semester	5 + Mandatory Course (2 Core + 3 Foundation)	3	25
IV Semester	5 + Audit Course (3 Core + 2 Foundation)	3	25
V Semester	6 (5 Core + 1 Professional Elective)	3	29
VI Semester	6 (3 Core + 1 Professional Elective + 1 Open Elective + 1 Foundation)	3 + Ideation and Product Development	28
VII Semester	**Full Semester Internship (FSI)**		16
VIII Semester	4 (3 Core + 1 Professional Elective)	3 + Comprehensive Examination	21
Total	**36 (16 Foundation + 16 Core + 3 Professional Electives + 1 Open Electives) + Mandatory Course + Audit course**	**22 + Comprehensive Examination +** Ideation and Product Development **+ FSI**	**192**

7.5 For Four year regular program (Non FSI Model):

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
I Semester	5 Foundation	4	24
II Semester	5 Foundation	4	24
III Semester	5 + Mandatory Course (2 Core + 3 Foundation)	3	25
IV Semester	5 + Audit Course (3 Core + 2 Foundation)	3	25
V Semester	6 (4 Core + 1 Skill 1 Professional Elective)	3	25
VI Semester	5 (3 Core + 1 Professional Elective + 1 Open Elective)	3 + Ideation and Product Development	25
VII Semester	5 (3 Core + 1 Professional Elective + 1 Open Elective)	3	24
VIII Semester	3 (2 Core + 1 Professional Elective)	Project Work + Comprehensive Examination	20
Total	**39 (15 Foundation + 01 Skill + 17 Core + 4 Professional Electives + 2 Open Electives) + Mandatory Course + Audit Course**	**23** + Ideation and Product Development + **Comprehensive Examination + Project work**	**192**

7.6 For Three year lateral entry program (FSI Model):

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
III Semester	5 + Mandatory Course (2 Core + 3 Foundation)	3	25
IV Semester	5 + Audit course (3 Core + 2 Foundation)	3	25
V Semester	6 (5 Core + 1 Professional Elective)	3	29
VI Semester	6 (3 Core + 1 Professional Elective + 1 Open Elective + 1 Foundation)	3 + Ideation and Product Development	28
VII Semester	**Full Semester Internship (FSI)**		16
VIII Semester	4 (3 Core + 1 Professional Elective)	3 + Comprehensive Examination	21
Total	**26 (6 Foundation + 16 Core + 3 Professional Electives + 1 Open Electives) + Mandatory Course + Audit Course**	**14 + Comprehensive Examination** + Ideation and Product Development **+ FSI**	**144**

7.7 For Three year lateral entry program (Non FSI Model):

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
III Semester	5 + Mandatory Course (2 Core + 3 Foundation)	3	25
IV Semester	5 + Audit Course (3 Core + 2 Foundation)	3	25
V Semester	6 (4 Core + 1 Skill + 1 Professional Elective)	3	25
VI Semester	5 (3 Core + 1 Professional Elective + 1 Open Elective)	3 + Ideation and Product Development	25
VII Semester	5 (3 Core + 1 Professional Elective + 1 Open Elective)	3	24
VIII Semester	3 (2 Core + 1 Professional Elective)	Project Work + Comprehensive Examination	20
Total	**29 (05 Foundation + 17 Core + 4 Professional Electives + 2 Open Electives + 1 Skill) + Mandatory Course + Audit Course**	**15 +** Ideation and Product Development **+ Comprehensive Examination + Project work**	**144**

7.8 Course wise break-up for the total credits (FSI Model):

Total Theory Courses (36) Core Courses (16) + Foundation Courses (11+ 5) + Professional Electives (03) + Open Elective (01)	16 @ 4 credits + 11 @ 4 credits + 05 @ 3 credits + 03 @ 3 credits + 01 @ 3 credits	134
Total Laboratory Courses (16 + 08)	16 @ 2 credits + 08 @ 1 credit	40
Comprehensive Examination	1 @ 1 credit	01
Ideation and Product Development	1 @ 1 credit	01
Full Semester Internship (FSI)	1 @ 16 credits	16
TOTAL CREDITS		**192**

7.9 For Four year regular program (Non FSI Model):

Total Theory Courses (38) Core Courses (16) + Foundation Courses (11+ 5) + Professional Electives (04) + Open Electives (02) + Skill (01)	14 @ 4 credits + 02 @ 3 credits + 11 @ 4 credits + 05 @ 3 credits + 04 @ 3 credits + 02 @ 3 credits + 01 @ 3 credits	142
Total Laboratory Courses (15 + 08)	15 @ 2 credits + 08 @ 1 credit	38
Comprehensive Examination	1 @ 1 credit	01
Ideation and Product Development	1 @ 1 credit	01
Project work	1 @ 10 credits	10
TOTAL CREDITS		**192**

7.10 For three year lateral entry program (FSI Model):

Total Theory Courses (26) Core Courses (16) + Foundation Courses (5+2) + Professional Electives (03) + Open Electives (01)	14 @ 4 credits + 02 @ 3 credits + 05 @ 4 credits + 02 @ 3 credits + 03 @ 3 credits + 01 @ 3 credits	100
Total Laboratory Courses (11 + 04)	11 @ 2 credits + 04 @ 1 credit	26
Comprehensive Examination	1 @ 1 credit	01
Ideation and Product Development	1 @ 1 credit	01
Full Semester Internship	1 @ 16 credits	16
TOTAL CREDITS		**144**

7.11 For three year lateral entry program (Non FSI Model):

Total Theory Courses (28) Core Courses (16) + Foundation Courses (5+1) + Professional Electives (04) + Open Electives (02) + Skill (01)	14 @ 4 credits + 02 @ 3 credits + 05 @ 4 credits + 01 @ 3 credits + 04 @ 3 credits + 02 @ 3 credits + 01@ 3 credits	106
Total Laboratory Courses (11 + 04)	11 @ 2 credits + 04 @ 1 credit	26
Comprehensive Examination	1 @ 1 credit	01
Ideation and Product Development	1 @ 1 credit	01
Project work	1 @ 10 credits	10
TOTAL CREDITS		**144**

8.0 EVALUATION METHODOLOGY

8.1 Theory Course:

Each theory course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIA during the semester, marks are awarded by taking average of two sessional examinations or the marks scored in the make-up examination conducted.

8.1.1 Semester End Examination (SEE):

The SEE is conducted for 70 marks of 3 hours duration. The syllabus for the theory courses is divided into FIVE units and each unit carries equal weightage in terms of marks distribution. The question paper pattern is as follows.

Two full questions with 'either' 'or' choice will be drawn from each unit. Each question carries 14 marks. There could be a maximum of three sub divisions in a question.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept
30 %	To test the analytical skill of the concept
20 %	To test the application skill of the concept

8.1.2 Continuous Internal Assessment (CIA):

For each theory course the CIA shall be conducted by the faculty/teacher handling the course as given in Table-5. CIA is conducted for a total of 30 marks, with 25 marks for Continuous Internal Examination (CIE) and 05 marks for Quiz / Alternative Assessment Tool (AAT).

Table-5: Assessment pattern for Theory Courses

COMPONENT	THEORY		TOTAL MARKS
Type of Assessment	CIE Exam (Sessional)	Quiz / AAT	
Max. CIA Marks	25	05	30

8.1.2.1 Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8th and 17th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. Marks are awarded by taking average of marks scored in two CIE exams. The valuation and verification of answer scripts of CIE exams shall be completed within a week after the conduct of the Internal Examination.

8.1.2.2 Quiz / Alternative Assessment Tool (AAT)

Two Quiz exams shall be online examination consisting of 20 multiple choice questions and are be answered by choosing the correct answer from a given set of choices (commonly four). Such a question paper shall be useful in the testing of knowledge, skills, application, analysis, evaluation and understanding of the students. Marks shall be awarded considering the average of two quizzes for every course.

In order to encourage innovative methods while delivering a course, the faculty members have been encouraged to use the Alternative Assessment Tool (AAT) in place of two quizzes. This AAT enables faculty to design own assessment patterns during the CIA. However, the usage of AAT is completely optional. The AAT enhances the autonomy (freedom and flexibility) of individual faculty and enables them to create innovative pedagogical practices. If properly applied, the AAT converts the classroom into an effective learning centre. The AAT may include seminars, assignments, term paper, open ended experiments, micro-projects, five minutes video, MOOCs etc.

However, it is mandatory for a faculty to obtain prior permission from the concerned HOD and spell out the teaching/assessment pattern of the AAT prior to commencement of the classes.

8.2 Laboratory Course:

8.2.1 Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment. The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

8.2.2 All the drawing related courses are evaluated in line with laboratory courses. The distribution shall be 30 marks for internal evaluation (20 marks for day–to–day work, and 10 marks for internal tests) and 70 marks for semester end lab examination. There shall be ONE internal test for 10 marks in each semester.

8.3 MOOC Courses:

Meeting with the global requirements, to inculcate the habit of self learning and in compliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives.

8.3.1 The proposed MOOC courses would be additional choices in all the elective groups subject to the availability during the respective semesters and respective departments will declare the list of the courses at the beginning of the semester. Course content for the selected MOOC courses shall be drawn from respective MOOCs links or shall be supplied by the department. Course will be mentored by faculty members and Assessment & Evaluation of the courses shall be done by the department.

8.3.2 There shall be one Mid Continuous Internal Examination (Quiz exam for 30 marks) after 8 weeks of the commencement of the course and semester end examination (Descriptive exam for 70 marks) shall be done along with the other regular courses.

8.3.3 Two credits will be awarded upon successful completion of each MOOC courses. Students need to complete three such MOOC courses to compensate any two elective courses (one open and one professional) having three credits.

8.3.4 Students interested in doing MOOC courses shall register the course title at their department office at the start of the semester against the courses that are announced by the department.

8.4 Audit Courses (AC) / Mandatory Courses (MC):

These courses are among the compulsory courses and do not carry any credits.

a) Gender Sensitivity is a mandatory course in III semester for all the students.

b) The student has to choose one audit course at the beginning of IV semester under self study mode. By the end of VI semester, all the students (regular and lateral entry students) shall complete the audit course.

c) The students will have four chances in total to clear the audit / mandatory course. Further, the student has an option to change the audit course in case if s/he is unable to clear the audit course in the first two chances. However, the audit course should be completed by VI semester and its result will be given in the VI semester grade sheet.

d) Audit / Mandatory courses will not carry any credits; but, a pass in each such course after attaining required CIE and SEE requirements during the programme shall be necessary requirement for the student to qualify for the award of Degree. Its result shall be declared with "Satisfactory" or "Not Satisfactory" performance.

8.5 Value Added Courses:

The value added courses are audit courses in nature offered through joint ventures with various organizations provide ample scope for the students as well as faculty to keep pace with the latest technologies pertaining to their chosen field of studies. A plenty of value added programs will be proposed by the departments one week before the commencement of classwork. The students are given the option to choose the courses according to their desires and inclinations as they choose the desired items in a cafeteria. The expertise gained through the value added programs should enable them to face the formidable challenges of the future and also assist them in exploring new opportunities. Its result shall be declared with "Satisfactory" or "Not Satisfactory" performance.

8.6 Comprehensive Examination

The comprehensive Examination is aimed at assessing the students understanding of various Foundation, Skill and Core courses studied till the end of VII semester and is intended to test the students' grasp of the chosen field of study.

The Comprehensive Examination consists of two parts. Part A is a written examination and part B is the oral examination. The written examination shall be objective type of one hour duration and shall have 50 marks and is to be conducted by the concerned department under the supervision of Dean Academics. Oral examination shall be conducted by the department and carry 50 marks. The examination shall be conducted during the VIII semester.

8.7 Ideation and Product Development

The Ideation and Product Development shall be carried out either during VI semester along with other lab courses by having regular weekly slots. Students will take batch wise and the batches will be divided as per the guidelines issued. The topic of Ideation and Product Development should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of the Ideation and Product Development could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with a specific outcome. Ideation and Product Development Ideation and Product Development report will be evaluated for 100 marks in total. Assessment will be done by the supervisor/guide for 30 marks based on the work and presentation/execution of the Ideation and Product Development Subdivision for the remaining

70 marks is based on report, presentation, execution and viva-voce. Evaluation shall be done by a committee comprising the (IPD) supervisor, Head of the department and an examiner nominated by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the department.

8.8 Project work

In the non-FSI Model, the project work shall be evaluated for 100 marks out of which 30 marks for internal evaluation and 70 marks for semester end evaluation. The project work shall be spread over in VII semester and in VIII semester. The project work shall be somewhat innovative in nature, exploring the research bent of the mind of the student. A project batch shall comprise not more than three students.

At the end of VII semester, students should submit synopsis summarizing the work done in VII semester. The project is expected to be completed by the end of VIII semester. In VII semester, a first mid review is conducted by Project Review Committee (PRC) (on the progress) for 10 marks.

In VIII semester, a second mid review is conducted by PRC (on the progress) for 10 marks. On completion of the project, a third evaluation is conducted for award of internal marks of another 10 marks before the report is submitted, making the total internal marks 30.

The end semester examination shall be based on the report submitted and a viva-voce exam for 70 marks by a committee comprising the Head of the department, project supervisor and an external examiner nominated by the Principal. A minimum of 40% of maximum marks shall be obtained to earn the corresponding credits.

8.9 Full Semester Internship (FSI)

FSI is a full semester internship programme carries 16 credits. During the FSI, student has to spend one full semester in an identified industry / firm / organization and has to carry out the internship as per the stipulated guidelines of that industry / firm / organization and the institute.

Following are the evaluation guidelines:

- Quizzes: 2 times
- Quiz #1 - About the industry profile, weightage: 5%
- Quiz #2 - Technical-project related, weightage: 5%
- Seminars - 2 times (once in six weeks), weightage: 7.5% + 7.5%
- Viva-voce: 2 times (once in six weeks), weightage: 7.5% + 7.5%
- Project Report, weightage: 15%
- Internship Diary, weightage: 5 %
- Final Presentation, weightage: 40%

FSI shall be open to all the branches with a ceiling of maximum 10% distributed in both semesters. The selection procedure is:

- Choice of the students
- CGPA (> 7.5) up to IV semester
- Competency Mapping / Allotment

9.0 MAKE-UP EXAMINATION

The make-up examination facility shall be available to students who may have missed to attend CIE exams in one or more courses in a semester for valid genuine reasons. The make-up examination shall have comprehensive online objective type questions. The syllabus for the make-up examination shall be the whole syllabus covered till the end of the semester under consideration and will be conducted at the end of the semester.

10.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

10.1 It is desirable for a candidate to put on 100% attendance in each course. In every course (theory/laboratory), student has to maintain a minimum of 75% attendance including the days of attendance in sports, games, NCC and NSS activities to be eligible for appearing in Semester End Examination of the course.

10.2 For cases of medical issues, deficiency of attendance in each course to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% to 65% in every course, subjected to submission of medical certificates, medical case file and other needful documents to the concerned departments.

10.3 The basis for the calculation of the attendance shall be the period prescribed by the institute by its calendar of events. For late admission, attendance is reckoned from the date of admission to the program. However, in case of a student having less than 65% attendance in any course, s/he shall be detained in the course and in no case such process will be relaxed.

10.4 A candidate shall put in a minimum required attendance at least three (3) theory courses for getting promoted to next higher class / semester. Otherwise, s/he shall be declared detained and has to repeat semester.

10.5 Students whose shortage of attendance is not condoned in any subject are not eligible to write their semester end examination of that courses and their registration shall stand cancelled.

10.6 A prescribed fee shall be payable towards condonation of shortage of attendance.

10.7 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

10.8 Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

11.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

11.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners.

11.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by Head of the Department one day before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.

11.3 The answer papers of semester end examination should be evaluated by the internal examiner immediately after the completion of exam and the award sheet should be submitted to COE in a sealed cover before the same papers are kept for second evaluation by external examiner.

11.4 In case of difference of more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and marks awarded by this examiner shall be taken as final.

11.5 COE shall invite 3 - 9 external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

11.6 Examinations Control Committee shall consolidate the marks awarded by internal and external examiners and award grades.

12.0 SCHEME FOR THE AWARD OF GRADE

12.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory course, if s/he secures

i. Not less than 35% marks for each theory course in the semester end examination, and

ii. A minimum of 40% marks for each theory course considering both internal and semester end examination.

12.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Lab / Comprehensive Examination / Ideation and Product Development / Project, if s/he secures

i. Not less than 40% marks for each Lab / Comprehensive Examination / Ideation and Product Development / Project course in the semester end examination,

ii. A minimum of 40% marks for each Lab / Comprehensive Examination / Ideation and Product Development / Project course considering both internal and semester end examination.

12.3 If a candidate fails to secure a pass in a particular course, it is mandatory that s/he shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that s/he should continue to register and reappear for the examination till s/he secures a pass.

13.0 LETTER GRADES AND GRADE POINTS

13.1 Performances of students in each course are expressed in terms of marks as well as in Letter Grades based on absolute grading system. The UGC recommends a 10-point grading system with the following letter grades as given in the Table-6.

Table-6: Grade Points Scale (Absolute Grading)

Range of Marks	Grade Point	Letter Grade
100 – 90	10	S (Superior)
89 – 80	9	A+ (Excellent)
79 – 70	8	A (Very Good)
69 – 60	7	B+ (Good)
59 – 50	6	B (Average)
49 – 40	5	C (Pass)
Below 40	0	F (Fail)
Absent	0	AB (Absent)
Authorized Break of Study	0	ABS

13.2 A student is deemed to have passed and acquired to correspondent credits in particular course if s/he obtains any one of the following grades: "S", "A+", "A", "B+", "B", "C".

13.3 A student obtaining Grade F shall be considered Failed and will be required to reappear in the examination.

13.4 For non credit courses, 'Satisfactory' or "Not Satisfactory" is indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

13.5 "SA" denotes shortage of attendance (as per item 10) and hence prevention from writing Semester End Examination.

13.6 "W" denotes **withdrawl** from the exam for the particular course.

13.7 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if s/he has any outstanding dues.

14.0 COMPUTATION OF SGPA AND CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which are important performance indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \sum_{i=1}^{n} (C_i G_i) / \sum_{i=1}^{n} C_i$$

Where, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and n represent the number of courses in which a student is registered in the concerned semester.

$$CGPA = \sum_{j=1}^{m} (C_j S_j) / \sum_{j=1}^{m} C_j$$

Where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits upto the semester and m represent the number of semesters completed in which a student registered upto the semester.

The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

15.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

15.1 Illustration for SGPA

Course Name	Course Credits	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 x 8 = 24
Course 2	4	B+	7	4 x 7 = 28
Course 3	3	B	6	3 x 6 = 18
Course 4	3	S	10	3 x 10 = 30
Course 5	3	C	5	3 x 5 = 15
Course 6	4	B	6	4 x 6 = 24
	20			**139**

$$Thus, SGPA = 139 / 20 = 6.95$$

15.2 Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 20 SGPA: 6.9	Credit: 22 SGPA: 7.8	Credit: 25 SGPA: 5.6	Credit: 26 SGPA: 6.0
Semester 5	**Semester 6**		
Credit: 26 SGPA: 6.3	Credit: 25 SGPA: 8.0		

$$Thus,\ CGPA = \frac{20x6.9 + 22x7.8 + 25x5.6 + 26x6.0 + 26x6.3 + 25x8.0}{144} = 6.73$$

16.0 PHOTOCOPY / REVALUATION

A student, who seeks the re-valuation of the answer script, is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

17.0 PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 10.

17.1 For students admitted into B.Tech (Regular) program

17.1.1 A student will not be promoted from II semester to III semester unless s/he fulfills the academic requirement of securing 24 credits from I and II semesters examinations, whether or not the candidate takes the examinations.

17.1.2 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 37 credits upto III semester **or** 49 credits upto IV semester, from all the examinations, whether or not the candidate takes the examinations.

17.1.3 A student shall be promoted from VI semester to VII semester only if s/he fulfills the academic requirements of securing 62 credits upto V semester **or** 74 credits upto VI semester from all the examinations, whether or not the candidate takes the examinations.

17.1.4 A student shall register for all the 192 credits and earn all the 192 credits. Marks obtained in all the 192 credits shall be considered for the award of the Grade.

17.2 For students admitted into B.Tech (lateral entry students)

17.2.1 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 25 credits upto IV semester, from all the examinations, whether or not the candidate takes the examinations.

17.2.2 A student shall be promoted from VI semester to VII semester only if s/he fulfills the academic requirements of securing 38 credits upto V semester **or** 50 credits upto VI semester from all the examinations, whether or not the candidate takes the examinations.

17.2.3 A student shall register for all the 144 credits and earn all the 144 credits. Marks obtained in all the 144 credits shall be considered for the award of the Grade.

18.0 GRADUATION REQUIREMENTS

The following academic requirements shall be met for the award of the B.Tech degree.

18.1 Student shall register and acquire minimum attendance in all courses and secure 192 credits for regular program and 144 credits for lateral entry program.

18.2 A student of a regular program, who fails to earn 192 credits within eight consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

18.3 A student of a lateral entry program who fails to earn 144 credits within six consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

19.0 BETTERMENT OF MARKS IN THE COURSES ALREADY PASSED

Students who clear all the courses in their first attempt and wish to improve their CGPA shall register and appear for betterment of marks for one course of any theory courses within a period of subsequent two semesters. The improved marks shall be considered for classification / distinction but not for ranking. If there is no improvement, there shall not be any change in the original marks already awarded.

20.0 AWARD OF DEGREE

20.1 Classification of degree will be as follows:

CGPA ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.0 and < 6.5	CGPA ≥ 4.0 and < 5.0	CGPA < 4.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

20.2. In order to extend the benefit to the students with one/two backlogs after either VI semester or VIII semester, GRAFTING option is provided to the students enabling their placements and fulfilling graduation requirements. Following are the guidelines for the Grafting:

a. Grafting will be done among the courses within the semester shall draw a maximum of 7 marks from the any one of the cleared courses in the semester and will be grafted to the failed course in the same semester.

b. Students shall be given a choice of grafting only once in the 4 years program, either after VI semester (Option #1) or after VIII semester (Option #2).

c. Option#1: Applicable to students who have maximum of TWO theory courses in V and / or VI semesters.

Option#2: Applicable to students who have maximum of TWO theory courses in VII and / or VIII semesters.

d. Eligibility for grafting:

i. Prior to the conduct of the supplementary examination after the declaration of VI or VIII semester results.

ii. S/he must appear in all regular or supplementary examinations as per the provisions laid down in regulations for the courses s/he appeals for grafting.

iii. The marks obtained by her/him in latest attempt shall be taken into account for grafting of marks in the failed course(s).

20.3 Student, who clears all the courses upto VII semester, shall have a chance to appear for Quick Supplementary Examination to clear the failed courses of VIII semester.

20.4 By the end of VI semester, all the students (regular and lateral entry students) shall complete one of the audit course and mandatory course with acceptable performance.

20.5 In case, a student takes more than one attempt in clearing a course, the final marks secured shall be indicated by * mark in the grade sheet.

All the candidates who register for the semester end examination will be issued grade sheet by the institute. Apart from the semester wise grade sheet, the institute will issue the provisional certificate and consolidated grade sheet subject to the fulfillment of all the academic requirements.

21.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

21.1 A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the program in a later respective semester, s/he shall apply to the Principal in advance. Such application shall be submitted before the last date for payment of examination fee of the semester in question and forwarded through the Head of the department stating the reasons for such withdrawal together with supporting documents and endorsement of his / her parent / guardian.

21.2 The institute shall examine such an application and if it finds the case to be genuine, it may permit the student to temporarily withdraw from the program. Such permission is accorded only to those who do not have any outstanding dues / demand at the College / University level including tuition fees, any other fees, library materials etc.

21.3 The candidate has to rejoin the program after the break from the commencement of the respective semester as and when it is offered.

21.4 The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 18.0. The maximum period includes the break period.

21.5 If any candidate is detained for any reason, the period of detention shall not be considered as 'Break of Study'.

22.0 TERMINATION FROM THE PROGRAM

The admission of a student to the program may be terminated and the student is asked to leave the institute in the following circumstances:

a. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

b. A student shall not be permitted to study any semester more than three times during the entire Program of study.

c. The student fails to satisfy the norms of discipline specified by the institute from time to time.

23.0 WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the institute / if any case of indiscipline / malpractice is pending against him, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

24.0 GRADUATION DAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

25.0 DISCIPLINE

Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he/she shall be liable for punitive action as prescribed by the Institute from time to time.

26.0 GRIEVANCE REDRESSAL COMMITTEE

The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

27.0 TRANSITORY REGULATIONS

A candidate, who is detained or discontinued in a semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

a) Four Year B.Tech Regular course:

A student who is following Jawaharlal Nehru Technological University (JNTUH) curriculum and detained due to shortage of attendance at the end of the first semester shall join the autonomous batch of first semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUH curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream.

The class will be awarded based on the academic performance of a student in the autonomous pattern.

b) Three Year B.Tech program under Lateral Entry Scheme:

A student who is following JNTUH curriculum and detained due to shortage of attendance at the end of the first semester of second year shall join the autonomous batch of third semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with Lateral Entry regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUH curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

c) Transfer candidates (from non-autonomous college affiliated to JNTUH):

A student who is following JNTUH curriculum, transferred from other college to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUH for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester under JNTUH regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

d) Transfer candidates (from an autonomous college affiliated to JNTUH):

A student who has secured the required credits upto previous semesters as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester as

per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

28.0 REVISION OF REGULATIONS AND CURRICULUM

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

CIVIL ENGINEERING

COURSE STRUCTURE

I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
AHS001	English for Communication	HS	Foundation	3	-	-	3	30	70	100
AHS002	Linear Algebra and Ordinary Differential Equations	BS	Foundation	3	1	-	4	30	70	100
AHS005	Engineering Chemistry	BS	Foundation	3	-	-	3	30	70	100
AHS007	Applied Physics	BS	Foundation	3	1	-	4	30	70	100
AME001	Engineering Drawing	ES	Foundation	2	-	3	4	30	70	100
PRACTICAL										
AHS101	Communication Skills Laboratory	HS	Foundation	-	-	2	1	30	70	100
AHS103	Engineering Chemistry Laboratory	BS	Foundation	-	-	2	1	30	70	100
ACS113	IT Workshop	ES	Foundation	-	-	3	2	30	70	100
AME101	Basic Workshop	ES	Foundation	-	-	3	2	30	70	100
TOTAL				**14**	**02**	**13**	**24**	**270**	**630**	**900**

II SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
AME002	Engineering Mechanics	ES	Foundation	3	1	-	4	30	70	100
AHS003	Computational Mathematics and Integral Calculus	BS	Foundation	3	1	-	4	30	70	100
AHS008	Modern Physics	BS	Foundation	3	1	-	4	30	70	100
AHS009	Environmental Studies	HS	Foundation	3	-	-	3	30	70	100
ACS001	Computer Programming	ES	Foundation	3	-	-	3	30	70	100
PRACTICAL										
AHS102	Computational Mathematics Laboratory	BS	Foundation	-	-	2	1	30	70	100
AHS105	Engineering Physics Laboratory	BS	Foundation	-	-	2	1	30	70	100
ACS101	Computer Programming Laboratory	ES	Foundation	-	-	3	2	30	70	100
AME102	Computer Aided Engineering Drawing Practice	ES	Foundation	-	-	3	2	30	70	100
TOTAL				**15**	**03**	**10**	**24**	**270**	**630**	**900**

III SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	TOTAL
THEORY										
AHS010	Probability and Statistics	BS	Foundation	3	1	-	4	30	70	100
ACE001	Strength of Materials - I	PC	Core	3	1	-	4	30	70	100
ACE002	Surveying	PC	Core	3	1	-	4	30	70	100
ACE003	Engineering Geology	PC	Foundation	3	-	-	3	30	70	100
AEE018	Basic Electrical and Electronics Engineering	ES	Foundation	3	1	-	4	30	70	100
AHS017	Gender Sensitivity	MC	Perspective	-	-	-	-	-	-	-
PRACTICAL										
ACE101	Surveying Laboratory	PC	Core	-	-	3	2	30	70	100
ACE102	Computer Aided Drafting of Buildings	ES	Foundation	-	-	2	2	30	70	100
ACE103	Engineering Geology Laboratory	PC	Core	-	-	3	2	30	70	100
TOTAL				**15**	**04**	**08**	**25**	**240**	**560**	**800**

IV SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	TOTAL
THEORY										
AHS011	Mathematical Transforms Techniques	BS	Foundation	3	1	-	4	30	70	100
ACE004	Strength of Materials - II	PC	Core	3	1	-	4	30	70	100
ACE005	Fluid Mechanics	PC	Core	3	1	-	4	30	70	100
ACE006	Geotechnical Engineering	PC	Core	3	-	-	4	30	70	100
ACE007	Building Materials Construction and Planning	ES	Foundation	3	-	-	3	30	70	100
	Audit Course	MC	Perspective	-	-	-	-	-	-	-
PRACTICAL										
ACE104	Strength of Materials Laboratory	ES	Foundation	-	-	3	2	30	70	100
ACE105	Geotechnical Engineering Laboratory	PC	Core	-	-	3	2	30	70	100
ACE106	Advanced Surveying Laboratory	PC	Core	-	-	3	2	30	70	100
TOTAL				**15**	**03**	**09**	**25**	**240**	**560**	**800**

V SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ACE008	Structural Analysis	PC	Core	3	1	-	4	30	70	100
ACE009	Reinforced Concrete Structures Design and Drawing	PC	Core	3	-	-	3	30	70	100
ACE010	Concrete Technology	PC	Core	3	-	-	3	30	70	100
ACE011	Hydraulics and Hydraulic Machinery	PC	Core	3	1	-	3	30	70	100
AHS015	Business Economics and Financial Analysis	HS	Skill	3	-	-	3	30	70	100
	Professional Elective – I	PE	Elective	3	-	-	3	30	70	100
	Available and Selected MOOC Courses									
PRACTICAL										
ACE107	Fluid Mechanics and Hydraulic Machinery Laboratory	PC	Core	-	-	3	2	30	70	100
ACE108	Concrete Technology Laboratory	PC	Core	-	-	3	2	30	70	100
ACE111	Building Information Modeling Laboratory	ES	Core	-	-	3	2	30	70	100
TOTAL				**18**	**02**	**08**	**25**	**270**	**630**	**900**

VI SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ACE012	Design of Steel Structures and Drawing	PC	Core	3	1	-	4	30	70	100
ACE013	Transportation Engineering	PC	Core	3	1	-	4	30	70	100
ACE014	Water Resources Engineering	PC	Core	3	1	-	4	30	70	100
	Professional Elective - II	PE	Elective	3	-	-	3	30	70	100
	Available and Selected MOOC Courses									
	Open Elective – I	OE	Elective	3	-	-	3	30	70	100
	Available and Selected MOOC Courses									
	Value Added Course - I	AC	Skill	-	-	-	-	-	-	-
AHS108	Technical Writing and Content Development	HS	Skill	-	-	2	2	30	70	100
ACE201	Ideation and Product Development	-	Skill	-	-	2	1	30	70	100
PRACTICAL										
ACE109	Advanced Material Testing Laboratory	PC	Core	-	-	3	2	30	70	100
ACE110	Transportation Materials Laboratory	PC	Core	-	-	3	2	30	70	100
TOTAL				**15**	**03**	**11**	**25**	**270**	**630**	**900**

VII SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ACE015	Environmental Engineering	PC	Core	3	1	-	4	30	70	100
ACE016	Advanced Structural Analysis and Design	PC	Core	3	1	-	4	30	70	100
ACE017	Estimation and Costing	PC	Core	3	1	-	4	30	70	100
	Professional Elective - III	PE	Elective	3	-	-	3	30	70	100
	Available and Selected MOOC Courses									
	Open Elective – II	OE	Elective	3	-	-	3	30	70	100
	Available and Selected MOOC Courses									
	Value Added Course - II	AC	Skill	-	-	-	-	-	-	-
PRACTICAL										
ACE112	Environmental Engineering Laboratory	PC	Core	-	-	3	2	30	70	100
ACE113	Advanced Structural Design Laboratory	PC	Core	-	-	3	2	30	70	100
ACE114	Project Planning and Development Laboratory	PC	Core	-	-	3	2	30	70	100
ACE301	Project Work (Phase - I)	PC	Core	-	-	-	-	-	-	-
TOTAL				**15**	**03**	**09**	**24**	**240**	**560**	**800**

VIII SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
ACE018	Foundation Engineering	PC	Core	3	-	-	3	30	70	100
AHS016	Industrial Management and Psychology	HS	Skill	3	-	-	3	30	70	100
	Professional Elective - IV	PE	Elective	3	-	-	3	30	70	100
	Available and Selected MOOC Courses									
PRACTICAL										
ACE401	Comprehensive Examination	PC	Skill	-	-	-	1	-	100	100
ACE302	Project Work (Phase - II)	PC	Core	-	-	04	10	30	70	100
TOTAL				**09**	**00**	**04**	**20**	**120**	**380**	**500**

PROFESSIONAL ELECTIVES

GROUP- I: STRUCTURAL ENGINEERING

Course Code	Course Title
ACE501	Finite Element Procedures
ACE502	Elements of Earthquake Engineering
ACE503	Design of Prestressed Concrete Structures
ACE504	Advanced Structural Design
ACE505	Rehabilitation and Retrofitting of Structures
ACE506	Design of Bridge Structures

GROUP- II: GEOTECHNICAL ENGINEERING

Course Code	Course Title
ACE507	Advanced Soil Mechanics
ACE508	Rock Mechanics
ACE509	Ground Improvement Techniques
ACE510	Earth and Rock-fill Dams
ACE511	Geotechnical Earthquake Engineering
ACE512	Geo-Environmental Engineering

GROUP- III: FLUID MECHANICS AND WATER RESOURCESENGINEERING

Course Code	Course Title
ACE513	Fluid Dynamics
ACE514	Advanced Water Resources Engineering
ACE515	Water Resources Planning and Management
ACE516	Advanced Ground Water Hydrology
ACE517	Soft Computing in Water Resources
ACE518	Impact of Climate Change in Water Resources Systems

GROUP- IV: TRANSPORTATION ENGINEERING

Course Code	Course Title
ACE519	Principles of Traffic Engineering
ACE520	Pavement Design
ACE521	Urban Transportation and Planning
ACE522	Highway Construction Methods
ACE523	Airways, Railways and Waterways
ACE524	Intelligent Transportation Systems

GROUP- V: ENVIRONMENTAL ENGINEERING

Course Code	Course Title
ACE525	Environmental Impact Assessment and Management
ACE526	Industrial Waste Water Treatment
ACE527	Air Pollution and Control
ACE528	Green Buildings and Energy Conservations
ACE529	Solid Waste Management
ACE530	Renewable Energy Technologies

GROUP- VI: REMOTE SENSING AND GIS

Course Code	Course Title
ACE531	Geographical Information Systems
ACE532	Introduction to Geospatial Technologies
ACE533	Disaster Management and Mitigation
ACE534	Application of Remote Sensing in GIS
ACE535	Introduction to Photogrammetry
ACE536	Land use and Land Cover Mapping

OPEN ELECTIVE-I

Course Code	Course Title
AME551	Elements of Mechanical Engineering
ACE551	Disaster Management*
ACE552	Geospatial Techniques*
ACS551	Principles of Operating System
ACS552	JAVA Programming
AEC551	Embedded System Design
AME552	Introduction to Automobile Engineering
AME553	Introduction to Robotics
AAE551	Aerospace Propulsion and Combustion
Note: * indicates that subject not offered to the students of Civil Engineering department.	

OPEN ELECTIVES- II

Course Code	Course Title
AEC552	Fundamentals of Image Processing
ACS553	Fundamentals of Database Management Systems
AIT551	Basics of Information Security and Cryptography
AHS551	Modeling and Simulation
AHS552	Research Methodologies
AEE551	Energy from Waste
AAE552	Finite Element Analysis
AME554	Basic Refrigeration and Air-Conditioning
AAE553	Launch Vehicles and Controls
Note: * indicates that subject not offered to the students of Civil Engineering department.	

AUDIT COURSES

Course Code	Course Title
AHS601	Intellectual Property Rights
AHS602	Total Quality Management
AHS603	Professional Ethics and Human Values
AHS604	Legal Sciences
AHS605	Clinical Psychology
AHS606	English for Special Purposes
AHS607	Entrepreneurship
AHS608	Any Foreign Language
AHS609	Design History
AHS017	Gender Sensitivity

VALUE ADDED COURSES - I

Course Code	Course Title
ACE801	Watergems
ACE802	STADD.PRO
ACE803	Digital Land Surveying and Mapping
ACE804	Introduction to Remote Sensing

SYLLABUS
(Semesters: I – VIII)

ENGLISH FOR COMMUNICATION

I Semester: CE / AE / ME |II Semester: CSE / ECE / EEE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS001	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Communicate in an intelligible English accent and pronunciation.
II. Effectively use the four language skills i.e., Listening, Speaking, Reading and Writing.
III. Develop the art of writing simple English with correct spelling, grammar and punctuation.

UNIT-I	LISTENING SKILL	Classes: 08

Significance, essentials, barriers and effectiveness of listening; Listening to dialogues, conversation, discussions, monologues; Listening to sounds, silent letters, stressed syllables in English; Listening for the gist of the text, for identifying the topic, general meaning and specific information; Listening for multiple choice questions, positive and negative comments for interpretation

Note: Instructions in theory and practice in the lab

UNIT-II	SPEAKING SKILL	Classes: 10

Significance, essentials, barriers and effectiveness of speaking; Simple oral or casual interaction, dialogue, conversation; Debates: Differences between disagreeing and being disagreeable; Brief presentations; Role plays; Generating talks based on visual or written prompts; Addressing a small group or a large formal gathering; Speaking about present, past experiences and future plans; Arguing outs a topic without verbal fights; Paper presentation.

Note: Instructions in theory and practice in the lab

UNIT-III	READING SKILL	Classes: 09

Techniques of reading: Skimming, scanning, intensive and extensive reading; Reading comprehension: Exercises for multiple choice questions and contextual meaning – Values in Dr. Kalam.

Vocabulary enrichment and grammar exercises based on selective readings: Swami Vivekananda: Chicago Speech, 1893; Passages for intellectual and emotional comments; Reading for the gist of a text, for specific information, for information transfer and interpretation.

UNIT-IV	WRITING SKILL	Classes: 08

Significance, essentials and effectiveness of writing; Writing emails; Writing paragraphs: Comparing, contrasting, presentations with an introduction, body and conclusion; Writing formal and informal letters: Letter of invitation, accepting, declining, requesting, complaint, seeking information; Cover letter enclosing a CV.

UNIT-V	VOCABULARY AND GRAMMAR	Classes: 10

Punctuation, parts of speech, articles, prepositions, tenses, concords, phrasal verbs; Forms of verbs: Regular and irregular, direct and indirect speech, change of voice; prefixes, suffixes, Synonyms, antonyms, one word substitutes, idioms and phrases, technical vocabulary.

Text Books:

1. Meenakshi Raman, Sangeetha Sharma, "Technical Communication Principles Practices", Oxford University Press, New Delhi, 3rd Edition , 2015.

Reference Books:

1. Norman Whitby, "Business Benchmark: Pre-Intermediate to Intermediate – BEC Preliminary", Cambridge University Press, 2nd Edition, 2008.
2. Devaki Reddy, Shreesh Chaudhary, "Technical English", Macmillan, 1st Edition, 2009.
3. Rutherford, Andrea J, "Basic Communication Skills for Technology", Pearson Education, 2nd Edition, 2010
4. Raymond Murphy, "Essential English Grammar with Answers" Cambridge University Press, 2nd Edition.

Web References:

1. http://www.edufind.com
2. http://www.myenglishpages.com
3. http://www.grammar.ccc.comment.edu
4. http://www.owl.english.prudue.edu

E-Text Books:

1. http://www.bookboon.com/en/communication-ebooks-zip
2. http://www.bloomsbury-international.com/images/ezone/ebook/writing-skills-pdf.pdf
3. https://www.americanenglish.state.gov/files/ae/resource_files/developing_writing.pdf
4. http://www.learningenglishvocabularygrammar.com/files/idiomsandphraseswithmeaningsandexamples pdf.pdf
5. http://www.robinwood.com/Democracy/GeneralEssays/CriticalThinking.pdf

Course Home Page:

LINEAR ALGEBRA AND ORDINARY DIFFERENTIAL EQUATIONS

I Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS002	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Analyze and solve linear system of equations by using elementary transformations.
II. Apply differential equations on real time applications
III. Determine the maxima and minima of functions of several variables by using partial differential coefficients.

UNIT-I	THEORY OF MATRICES	Classes: 08

Real matrices: Symmetric, skew-symmetric and orthogonal matrices; Complex matrices: Hermitian, Skew-Hermitian and unitary matrices; Elementary row and column transformations, elementary matrix, finding rank of a matrix by reducing to Echelon form and normal form; Finding the inverse of a matrix using elementary row/column transformations: Gauss-Jordan method; Solving of linear system of equations by LU decomposition method.

UNIT-II	LINEAR TRANSFORMATIONS	Classes: 10

Cayley-Hamilton theorem: Statement, verification, finding inverse and powers of a matrix; Linear dependence and independence of vectors; Linear transformation; Eigen values and Eigen vectors of a matrix; Properties of Eigen values and Eigen vectors of real and complex matrices; Diagonalization of matrix.

UNIT-III	DIFFERENTIAL EQUATIONS OF FIRST ORDER AND THEIR APPLICATIONS	Classes: 08

Solution of first order linear differential equations by exact, non exact, linear equations; Bernoulli equation.

Applications of first order differential equations: Orthogonal trajectories; Newton's law of cooling; Law of natural growth and decay.

UNIT-IV	HIGHER ORDER LINEAR DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS	Classes: 10

Linear differential equations of second and higher order with constant coefficients, non-homogeneous term of the type $f(x)=e^{ax}, \sin ax, \cos ax$ and $f(x)=x^n, e^{ax}v(x), x^n v(x)$; Method of variation of parameters; Applications to electrical circuits and simple harmonic motion.

UNIT-V	FUNCTIONS OF SINGLE AND SEVERAL VARIABLES	Classes: 09

Mean value theorems: Rolle's theorem, Lagrange's theorem, Cauchy's theorem-without proof;
Functions of several variables: Partial differentiation, chain rule, total derivative, Euler's theorem, functional dependence, Jacobian, maxima and minima of functions of two variables without constraints and with constraints; Method of Lagrange multipliers.

Text Books:

1. E. Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.
2. B. S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2013.

Reference Books:

1. R K Jain, S R K Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5th Edition, 2016.
2. Ravish R Singh, Mukul Bhatt, "Engineering Mathematics-1", Tata Mc Graw Hill Education, 1st Edition, 2009.
3. Srimanthapal, Suboth C. Bhunia, "Engineering Mathematics", Oxford Publishers, 3rd Edition, 2015.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://www.mathworld.wolfram.com/

E-Text Books:

1. http://www.e-booksdirectory.com/details.php?ebook=10166
2. http://www.e-booksdirectory.com/details.php?ebook=7400re

Course Home Page:

ENGINEERING CHEMISTRY

I Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS005	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Apply the electrochemical principles in batteries.
II. Understand the fundamentals of corrosion and development of different techniques in corrosion control.
III. Analysis of water for its various parameters and its significance in industrial applications.
IV. Improve the fundamental science and engineering principles relevant to materials.

UNIT-I	ELECTROCHEMISTRY AND BATTERIES	Classes: 10

Electrochemistry: Basic concepts of electrochemistry; Conductance: Specific, equivalent and molar conductance and effect of dilution on conductance; Electrochemical cells: Galvanic cell (daniel cell); Electrode potential; Electrochemical series and its applications; Nernst equation; Types of electrodes: Calomel electrode, quinhydrone electrode; Batteries: Classification of batteries, primary cells (dry cells) and secondary cells (lead-acid battery, Ni-Cd cell), applications of batteries, numerical problems.

UNIT-II	CORROSION AND ITS CONTROL	Classes: 08

Corrosion: Introduction, causes and effects of corrosion; Theories of corrosion: Chemical and electrochemical corrosion with mechanism; Factors affecting the rate of corrosion: Nature of the metal and nature of the environment; Types of corrosion: Waterline and crevice corrosion; Corrosion control methods: Cathodic protection- sacrificial anodic protection and impressed current cathodic protection; Surface coatings: Metallic coatings, methods of application of metallic coatings-hot dipping(galvanizing, tinning), electroplating(copper plating); Organic coatings: Paints, its constituents and their functions.

UNIT-III	WATER TECHNOLOGY	Classes: 09

Water: Sources and impurities of water, hardness of water, expression of hardness-units; Types of hardness: Temporary hardness, permanent hardness and numerical problems; Estimation of temporary and permanent hardness of water by EDTA method; Determination of dissolved oxygen by Winkler's method; Boiler troubles: Priming, foaming, scales, sludges and caustic embrittlement.

Treatment of water: Internal treatment of boiler feed water- carbonate, calgon and phosphate conditioning, softening of water by Zeolite process and Ion exchange process; Potable water-its specifications, steps involved in the treatment of potable water, sterilization of potable water by chlorination and ozonization, purification of water by reverse osmosis process.

UNIT-IV	MATERIALS CHEMISTRY	Classes: 10

Materials chemistry: Polymers-classification with examples, polymerization-addition, condensation and co-polymerization; Plastics: Thermoplastics and thermosetting plastics; Compounding of plastics; Preparation, properties and applications of polyvinyl chloride, Teflon, Bakelite and Nylon-6, 6; Rubbers: Natural rubber its process and vulcanization; Elastomers: Buna-s and Thiokol rubber; Fibers: Characteristics of fibers, preparation properties and applications of Dacron; Characteristics of fiber

reinforced plastics; Cement: Composition of Portland cement, setting and hardening of Portland cement; Lubricants: Classification with examples; Properties: Viscosity, flash, fire, cloud and pour point; Refractories: Characteristics and classification with examples.

UNIT-V	FUELS AND COMBUSTION	Classes: 08

Fuel: Definition, classification of fuels and characteristics of a good fuels; Solid fuels: Coal; Analysis of coal: Proximate and ultimate analysis; Liquid fuels: Petroleum and its refining; Cracking: Fixed bed catalytic cracking; Knocking: Octane and cetane numbers; Gaseous fuels: Composition, characteristics and applications of natural gas, LPG and CNG; Combustion: Calorific value: Gross Calorific Value(GCV) and Net Calorific Value(NCV), calculation of air quantity required for complete combustion of fuel, numerical problems.

Text Books:

1. P. C. Jain, Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company, 15th Edition, 2015.
2. Shasi Chawla, "Text Book of Engineering Chemistry", Dhantpat Rai Publishing Company, New Delhi, 1st Edition, 2011.

Reference Books:

1. B. Siva Shankar, "Engineering Chemistry", Tata Mc Graw Hill Publishing Limited, 3rd Edition, 2015.
2. S. S. Dara, Mukkanti, "Text of Engineering Chemistry", S. Chand & Co., New Delhi, 12th Edition, 2006.
3. C. V. Agarwal, C. P. Murthy, A. Naidu, "Chemistry of Engineering Materials", Wiley India, 5th Edition, 2013.
4. R. P. Mani, K. N. Mishra, "Chemistry of Engineering Materials", Cengage Learning, 3rd Edition, 2015.

Web References:

1. https://www.tndte.com
2. https://www.nptel.ac.in/downloads
3. https://www.scribd.com
4. https://www.cuiet.info
5. https://www.sbtebihar.gov.in
6. https://www.ritchennai.org

E-Text Books:

1. https://www.Corrosion.ksc.nasa.gov/electrochem_cells.htm
2. https://www.science.uwaterloo.ca/~cchieh/cact/applychem/watertreatment.html
3. https://www.acs.org/content/acs/en/careers/college-to-career/areas-of-chemistry/polymer-chemistry.html
4. https://www.darvill.clara.net/altenerg/fossil.htm
5. https://www.Library.njit.edu/research helpdesk/subject guides/chemistry.php

Course Home Page:

APPLIED PHYSICS

I Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS007	Foundation	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes:15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Develop the strong fundamentals of system of forces and friction.
II. Strengthen the knowledge of theoretical and technological aspects of dynamics of rigid bodies.
III. Correlate the principles with applications of the dielectric and magnetic materials.
IV. Enrich the knowledge in acoustics and ultrasonics.

UNIT-I	DIELECTRIC AND MAGNETIC PROPERTIES	Classes: 09

Dielectric Properties: Basic definitions, electronic, ionic and orientation polarizations-qualitative; Internal field in solids; Magnetic properties: Basic definitions, origin of magnetic moment, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, domain theory of ferro magnetism on the basis of hysteresis curve.

UNIT-II	ACOUSTICS AND ULTRASONICS	Classes: 09

Acoustics: Reverberation, reverberation time, Sabine's formula (qualitative), absorption coefficient, measurement of absorption coefficient, factors affecting acoustics of an auditorium and their remedies; Ultrasonics: Introduction; Generation of ultrasonic waves; Magnetostriction method, piezoelectric method, properties, applications.

UNIT-III	EQUILIBRIUM OF SYSTEM OF FORCES	Classes: 09

Introduction, basic concepts, system of forces, coplanar concurrent forces, force systems in plane, parallel forces in plane.

Force systems in space, couples, resultant, Lami's theorem, triangle law of forces, polygon law of forces, condition of equilibrium.

UNIT-IV	FRICTION	Classes: 09

Friction: Types of friction, limiting friction, laws of friction, angle of repose, equilibrium of body laying on rough inclined plane, application of friction, ladder friction, wedge friction, screw friction.

UNIT-V	DYNAMICS OF RIGID BODIES - MOMENT OF INERTIA	Classes: 09

Rotational motion, torque, angular momentum, relation between torque and angular momentum, angular momentum of system of particles, moment of inertia, expression for moment of inertia, radius of gyration, theorems on moment of inertia, moment of inertia of thin rod, rectangular lamina, circular disc.

Text Books:

1. Dr. K. Vijaya Kumar, Dr. S Chandralingam , " Modern Engineering Physics", S.Chand & Co, New Delhi, 1st Edition, 2010.
2. R. C Hibbler, "Engineering mechanics", Prentice Hall, 12th Edition, 2009.

Reference Books:

1. R. K. Gaur, S. L. Gupta, “Engineering Physics”, Dhanpat Rai Publications, 8th Edition, 2001.
2. Timoshenko, D. H. Young, "Engineering mechanics", Tata McGraw Hill, 5th Edition, 2013.
3. Hitendra K Malik, A. K. Singh, “Engineering Physics”, McGraw Hill Education, 1st Edition, 2009.
4. S. S. Bhavikatti, "A text book of Engineering mechanics", New age international, 1st Edition, 2012.

Web References:

1. http://link.springer.com
2. http://www.intechopen.com
3. http://www.iitg.ernet.in/rkbc/me101/Presentation/L01-03.pdf
4. http://www.vssut.ac.in/lecture_notes/lecture1423904717.pdf

E-Text Books:

1. http://www.peaceone.net/basic/Feynman/
2. http://physicsdatabase.com/free-physics-books/
3. http://www.freeengineeringbooks.com/Civil/Engineering-Mechancs-Books.php
4. http://www.textbooksonline.tn.nic.in/books/11/stdxi-voc-ema-em-2.pdf

Course Home Page:

ENGINEERING DRAWING

I Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME001	Foundation	2	-	3	4	30	70	100
Contact Classes: 30	Tutorial Classes: Nil	Practical Classes: 45				Total Classes: 75		

OBJECTIVES:

The course should enable the students to:

I. Understand the basic principles of engineering drawing and construction of curves used in engineering field.
II. Apply the knowledge of interpretation of projection in different quadrants.
III. Understand the projections of solids, when it is inclined to both planes simultaneously.
IV. Convert the pictorial views into orthographic view and vice versa.
V. Create intricate details of components through sections and develop its surfaces.

UNIT-I	FUNDAMENTALS OF ENGINEERING DRAWING, SCALES AND CURVES	Classes: 09

Introduction to engineering drawing: Drawing instruments and accessories, types of line, lettering practice and rules of dimensioning, geometrical constructions, basic geometrical shapes; Scales: Types of scales, units of length and their conversion, construction of scales, plain scale, diagonal scale, vernier scale; Curves used in engineering practice and their constructions; Conic sections, construction of ellipse parabola and hyperbola, special curves, construction of cycloid, epicycloids, hypocycloid and involutes.

UNIT-II	ORTHOGRAPHIC PROJECTION, PROJECTION OF PLANES	Classes: 09

Orthographic projection: Principles of orthographic projections, conventions, first and third angle projections, projection of points, projection of lines, lines inclined to single plane, lines inclined to both the planes, true lengths and traces; Projection of planes: Projection of regular planes, planes inclined to one plane, planes inclined to both planes, projection of planes by auxiliary plane projection method.

UNIT-III	PROJECTION OF SOLIDS	Classes: 09

Projection of solids: Projections of regular solid, prisms, cylinders, pyramids, cones.

Solids inclined to one plane, solids inclined to both planes, projection of solid by auxiliary plane projection method.

UNIT-IV	DEVELOPMENT OF SURFACES, ISOMETRIC PROJECTIONS	Classes: 09

Development of surfaces: Development of lateral surface of right regular solids, prisms, cylinders, pyramids and cones; Isometric projections: Principle of isometric projection, isometric scale, isometric projections and isometric views, isometric projections of planes, prisms, cylinders, pyramids, and cones.

UNIT-V	TRANSFORMATION OF PROJECTIONS	Classes: 09

Transformation of projections: Conversion of isometric views to orthographic views and conversion of orthographic views to isometric views.

Text Books:

1. N.D. Bhatt, "Engineering Drawing", Charotar Publications, 49th Edition, 2012.
2. C. M.Agrawal, Basant Agrawal, "Engineering Drawing'', Tata McGraw Hill, 2nd Edition, 2013.

Reference Books:

1. K. Venugopal, "Engineering Drawing and Graphics",New Age Publications,2nd Edition, 2010.
2. Dhananjay. A. Johle, "Engineering Drawing",Tata McGraw Hill, 1st Edition, 2008.
3. K. C. John, "Engineering Drawing", PHI Learning Private Limited", 2nd Edition, 2009.

Web References:

1. https://nptel.ac.in/courses/112103019/
2. https://nptel.ac.in/courses/112103019/14

E-Text Book:

1. https://books.google.co.in/books/about/Engineering_Drawing.html?id=_hdOU8kRb2AC

Course Home Page:

COMMUNICATION SKILLS LABORATORY

I Semester: CE / AE / ME |II Semester: CSE / ECE / EEE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS101	Foundation	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24				Total Classes: 24		

OBJECTIVES:

The course enables the students to:

I. Improve their ability to listen and comprehend a given text.
II. Upgrade the fluency and acquire a functional knowledge of English Language.
III. Enrich thought process by viewing a problem through multiple angles.

LIST OF EXPERIMENTS

Week-l	**LISTENING SKILL**

a. Listening to conversations and interviews of famous personalities in various fields, listening practice related to the TV talk shows, news.
b. Listening for specific information, listening for summarizing information.

Week-2	**LISTENING SKILL**

a. Listening to films of short duration and monologues for taking notes, listening to answer multiple choice questions.
b. Listening to telephonic conversations; Listening to native Indian, British and American speakers to analyze intercultural differences.

Week-3	**SPEAKING SKILL**

a. Functions of English Language; Introduction to phonetics, exercises on pronunciation, symbols of phonetics.
b. Speaking exercises involving the use of stress and intonation, improving pronunciation through tongue twisters.
c. Tips on how to develop fluency, body language and communication; Introducing oneself: Talking about yourself others, leave taking.

Week-4	**SPEAKING SKILL**

a. Just a minute (JAM) sessions, public speaking, situational conversation/role-play.
b. Greetings for different occasions with feedback preferably through video recording; Speaking about present, past experiences and future plans; Acting as a compere and news reader.

Week-5	**READING SKILL**

a. Reading anecdotes to predict the content, reading for interpretation.
b. Suggested reading: Short stories and poem; Critical reading.

Week-6	**READING SKILL**
a. Reading for information transfer; Reading newspaper and magazine articles, memos, letters, notices and minutes for critical commentary. b. Reading selective autobiographies.	
Week-7	**READING SKILL**
a. Reading brochures, advertisements, pamphlets for improved presentation. b. Reading comprehension exercises with critical and analytical questions based on context.	
Week-8	**WRITING SKILL**
a. Writing messages, leaflets, notice; Writing tasks; Flashcard. b. Filling gaps while listening short stories.	
Week-9	**WRITING SKILL**
a. Write a slogan related to the image. b. Write a short story of 6-10 lines based on the hints given.	
Week-10	**WRITING SKILL**
a. Writing a short story on their own; Writing a review on: Video clippings on inspirational speeches. b. Writing a review on short films, advertisements, recipe and recently watched film.	
Week-11	**THINKING SKILL**
a. Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms, proverbs. b. Argumentative skills; Debates.	
Week-12	**THINKING SKILL**
a. Inculcating interest in English using thinking blocks. b. Making pictures and improvising diagrams to form English words, phrases and proverbs.	
Reference Books:	
1. Meenakshi Raman, Sangeetha Sharma, "Technical Communication Principles Practices", Oxford University Press, New Delhi, 3rd Edition, 2015. 2. Rhirdion, Daniel, "Technical Communication", Cengage Learning, New Delhi, 1st Edition, 2009.	
Web References:	
1. http://learnenglish.britishcouncil.org 2. http://www.esl-lab.com/ 3. http://www.elllo.org/	
Course Home Page:	

ENGINEERING CHEMISTRY LABORATORY

I Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS103	Foundation	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 28				Total Classes: 28		

OBJECTIVES:

The course should enable the students to:

I. Comprehend the experimental results.

II. Analyze, interpret, and draw conclusions from data.

LIST OF EXPERIMENTS

Week-l	**INTRODUCTION TO CHEMISTRY LABORATORY**
Introduction to chemistry laboratory. Do's and Don'ts in chemistry laboratory.	
Week-2	**VOLUMETRIC ANALYSIS**
Batch I: Estimation of hardness of water by EDTA method. Batch II: Estimation of dissolved oxygen in water.	
Week-3	**VOLUMETRIC ANALYSIS**
Batch I: Estimation of dissolved oxygen in water Batch II: Estimation of hardness of water by EDTA method	
Week-4	**VOLUMETRIC ANALYSIS**
Batch I: Estimation of Mno_2 in pyrolusite. Batch II: Determination of copper in brass.	
Week-5	**VOLUMETRIC ANALYSIS**
Batch I: Determination of copper in brass Batch II: Estimation of Mno_2 in pyrolusite	
Week-6	**INSTRUMENTATION**
Batch I: Conductometric titration of strong acid vs strong base. Batch II: Potentiometric titration of strong acid vs strong base.	
Week-7	**INSTRUMENTATION**
Batch I: Potentiometric titration of strong acid vs strong base. Batch II: Conductometric titration of strong acid vs strong base.	
Week-8	**INSTRUMENTATION**
Batch I: Conductometric titration of mixture of acids vs strong base. Batch II: Potentiometric titration of weak acid vs strong base.	
Week-9	**INSTRUMENTATION**
Batch I: Potentiometric titration of weak acid vs strong base. Batch II: Conductometric titration of mixture of acids vs strong base.	
Week-10	**PHYSICAL PROPERTIES**
Batch I: Determination of viscosity of sample oil by Redwood / Oswald's viscometer. Batch II: Determination of surface tension of lubricants.	

Week-11	PHYSICAL PROPERTIES
Batch I: Determination of surface tension of lubricants. Batch II: Determination of viscosity of sample oil by Redwood / Oswald's viscometer.	
Week-12	**PREPARATION OF ORGANIC COMPOUNDS**
Batch I: Preparation of Aspirin. Batch II: Preparation of Thiokol rubber.	
Week-13	**PREPARATION OF ORGANIC COMPOUNDS**
Batch I: Preparation of Thiokol rubber Batch II: Preparation of Aspirin	
Week-14	**REVISION**
Revision.	
Reference Books:	
1.Vogel's, "Quantitative Chemical Analaysis", Prentice Hall, 6th Edition, 2000. 2.Gary D.Christian, "Analytical Chemistry",Wiley India, 6th Edition, 2007.	
Web References:	
http://www.iare.ac.in	
Course Home Page:	

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS:

S. No	Name of the Apparatus	Apparatus Required	Quantity
1	Analytical balance	04	100 gm
2	Beaker	30	100 ml
3	Burette	30	50 ml
4	Burette Stand	30	Metal
5	Clamps with Boss heads	30	Metal
6	Conical Flask	30	250 ml
7	Conductivity cell	10	K=1
8	Calomel electrode	10	Glass
9	Digital Potentiometer	10	EI
10	Digital Conductivity meter	10	EI
11	Digital electronic balance	01	RI
12	Distilled water bottle	30	500 ml
13	Funnel	30	Small
14	Glass rods	30	20 cm length
15	Measuring Cylinders	10	10 ml
16	Oswald Viscometer	30	Glass
17	Pipette	30	20 ml
18	Platinum Electrode	10	PP
19	Porcelain Tiles	30	White
20	Reagent bottle	30	250 ml
21	Standard Flask	30	100 ml
22	Stalagmo meter	30	Glass

IT WORKSHOP

I Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACS113	Foundation	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Provide technical training to the students on productivity tools like word processors, spreadsheets, presentations.

II. Make the students know about the internal parts of a computer.

III. Learn about networking of computers and use internet facility for browsing and searching.

LIST OF EXPERIMENTS

Week-1	**NETWORK CONNECTIONS**
IP configurations, connecting devices in LAN through bridge, hub, switch. Wi-Fi, Li-Fi and bluetooth settings; Crimping: Crossover, strait over.	
Week-2	**TROUBLESHOOTING**
Hardware troubleshooting, software troubleshooting.	
Week-3	**BLOG CREATION**
Creating blogs import the data into blogs, blog templates, and blog design.	
Week-4	**SKYPE INSTALLATION**
Skype installation and usages of Skype.	
Week-5	**CYBER HYGIENE**
Install Antivirus software; Configure their personal firewall and windows update on their computer.	
Week-6	**MS WORD**
Basic text editing, text formatting, paragraph formatting, style formatting, page formatting.	
Week-7	**MS WORD**
Working with graphics and pictures, tables, mail merge, customizing and expanding word.	
Week-8	**MS EXCEL**
Introduction to working with cells, rows, and columns, introduction to formulas and calculations, working with formulas and functions; Formatting: Formatting data, cells, rows and columns; Editing: Cells, rows, columns and worksheets.	

Week-9	MS EXCEL
Maintaining worksheets, the what-if analysis, adding images and graphics, charts and diagrams, creating data lists, managing data, pivot tables and charts.	
Week-10	**MS POWER POINT**
PowerPoint screen, working with slides, add content, work with text, working with tables.	
Week-11	**MS POWER POINT**
Graphics, slide animation, reordering slides, adding sound to a presentation.	
Week-12	**MICROSOFT OUTLOOK**
Introduction to Microsoft Outlook: Navigating outlook, sending and receiving messages, formatting messages, adding tables and other elements to messages, inserting graphics and images into e-mails, working with messages, organizing mail, advanced mail features, address books and contacts, using the calendar, reminders, tasks, notes, social media and outlook, sharing.	

Reference Books:

1. Peter Norton, "Introduction to Computers", Tata Mc Graw Hill Publishers, 6th Edition, 2010.
2. Scott Muller, Que, "Upgrading and Repairing", Pearson Education, PC's 18th Edition, 2009.

Web References:

1. http://www.cl.cam.ac.uk/teaching/1011/CompFunds
2. http://www.bibcol.com
3. http://www.tutorialspoint.com/computer_fundamentals
4. http://www.craftsmanspace.com

Course Home Page:

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE: System Software: Linux / Windows 7.
Application Software's: MS Office and TeXworks 0.6.1on LaTeX 2e (Open Source)

HARDWARE: 30 numbers of Desktop Computer Systems

BASIC WORKSHOP

I Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME101	Foundation	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify and use of tools, types of joints in carpentry, fitting, tin smithy and plumbing operations.
II. Understand of electrical wiring and components.
III. Observation of the function of lathe, shaper, drilling, boring, milling, grinding machines.

LIST OF EXPERIMENTS

Week-1	**CARPENTRY**
Batch I: Preparation of lap joint as per given dimensions. Batch II: Preparation of dove tail joint as per given taper angle.	
Week-2	**CARPENTRY**
Batch I: Preparation of dove tail joint as per given taper angle. Batch II: Preparation of lap joint as per given dimensions.	
Week-3	**FITTING**
Batch I: Make a square fit for given sizes. Batch II: Make a straight fit for given dimensions.	
Week-4	**FITTING**
Batch I: Make a straight fit for given dimensions. Batch II: Make a square fit for given sizes.	
Week-5	**TIN SMITHY**
Batch I: Prepare the development of a surface and make a round tin. Batch II: Prepare the development of a surface and make a rectangular tray.	
Week-6	**TIN SMITHY**
Batch I: Prepare the development of a surface and make a rectangular tray. Batch II: Prepare the development of a surface and make a round tin.	
Week-7	**FOUNDRY**
Batch I: Prepare a wheel flange mould using a given wooden pattern. Batch II: Prepare a bearing housing using a aluminum pattern.	

Week-8	**FOUNDRY**
Batch I: Prepare a bearing housing using a aluminum pattern. Batch II: Prepare a wheel flange mould using a given wooden pattern.	
Week-9	**HOUSE WIRING**
Batch I: Make an electrical connection to demonstrate domestic voltage and current sharing. Batch II: Make an electrical connection to control one bulb with two switches-stair case connection.	
Week-10	**HOUSE WIRING**
Batch I: Make an electrical connection to control one bulb with two switches-stair case connection. Batch II: Make an electrical connection to demonstrate domestic voltage and current sharing.	
Week-11	**BLACK SMITHY**
Batch I: Prepare S-bend for given MS rod using open hearth furnace. Batch II: Prepare J-bendof given MS rod using open hearth furnace	
Week-12	**BLACK SMITHY**
Batch I: Prepare J-bend of given MS rod using open hearth furnace. Batch II: Prepare S-bend for given MS rod using open hearth furnace.	
Week-13	**DEMONSTRATION OF WELDING AND PIPE PLUMBING JOINTS**
Batch I: Demonstration of arc welding and gas welding, Batch II: Preparation of pipe plumbing joints.	
Week-14	**DEMONSTRATION OF MACHINE TOOLS**
Batch I: Familiarization of central lathe and shaping machine and it's working. Batch II: Familiarization of drilling, milling and grinding machines and its working.	
Week-15	**DEMONSTRATION OF MACHINE TOOLS**
Batch I: Familiarization of drilling, milling and grinding machines and its working. Batch II: Familiarization of central lathe and shaping machine and it's working.	
Reference Books:	
1. K. C. John, "Mechanical Workshop Practice", PHI, 2nd Edition, 2010. 2. H.S. Bawa, "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2nd Edition 2009. 3. S. K. Hajra Choudhury, A. K. Hajra Choudhury, "Elements of Workshop Technology", Media Promoters, 1st Edition, 2009.	
Web References:	
http://www.iare.ac.in	
Course Home Page:	

ENGINEERING MECHANICS

II Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME002	Foundation	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Develop the ability to work comfortably with basic engineering mechanics concepts required for analyzing static structures.
II. Identify an appropriate structural system to studying a given problem and isolate it from its environment, model the problem using good free body diagrams and accurate equilibrium equations.
III. Identify and model various types of loading and support conditions that act on structural systems, apply pertinent mathematical, physical and engineering mechanical principles to the system to solve and analyze the problem.
IV. Solve the problem of equilibrium by using the principle of work and energy in mechanical design and structural analysis.

UNIT-I	KINEMATICS OF PARTICLES RECTILINEAR MOTION	Classes: 09

Kinematics of particles rectilinear motion: Motion of a particle**,** rectilinear motion**,** motion curves**,** rectangular components of curvilinear motion, kinematics of rigid body, types of rigid body motion, angular motion, fixed axis rotation**.**

UNIT-II	KINETICS OF PARTICLE	Classes: 09

Kinetics of particle: Introduction, definitions of matter, body, particle, mass, weight, inertia, momentum, Newton's law of motion, relation between force and mass, motion of a particle in rectangular coordinates, D'Alembert's principle, motion of lift, motion of body on an inclined plane, motion of connected bodies.

UNIT-III	IMPULSE AND MOMENTUM, VIRTUAL WORK	Classes: 09

Impulse and momentum: Introduction; Impact, momentum, impulse, impulsive forces, units, law of conservation of momentum, Newton's law of collision of elastic bodies.

Coefficient of restitution, recoil of gun, impulse momentum equation; Virtual work: Introduction, principle of virtual work, applications, beams, lifting machines, simple framed structures.

UNIT-IV	WORK ENERGY METHOD	Classes: 09

Work energy method: Law of conservation of energy, application of work energy, method to particle motion and connected system, work energy applied to connected systems, work energy applied to fixed axis rotation.

UNIT-V	MECHANICAL VIBRATIONS	Classes: 09

Mechanical vibrations: Definitions and concepts**,** simple harmonic motion**,** free vibrations, simple and compound pendulum, torsion pendulum, and free vibrations without damping, general cases.

Text Books:

1. R. C.Hibbler, "Engineering Mechanics", PrenticeHall, 12th Edition, 2009.
2. Timoshenko, D. H.Young, "Engineering Mechanics", Tata Mc Graw hill, 5th Edition, 2013.

Reference Books:

1. S.Bhavikatti, "A Text Book of Engineering Mechanics", New Age International, 1st Edition, 2012.
2. A. K. Tayal, "Engineering Mechanics",Uma Publications, 14th Edition, 2013.
3. R. K. Bansal "Engineering Mechanics", Laxmi Publication, 8th Edition, 2013.
4. BasudebBhattacharya, "EngineeringMechanics", Oxford UniversityPress, 2nd Edition, 2014.
5. K.Vijay Reddy, J. Suresh Kumar, "Singer's Engineering Mechanics Statics and Dynamics", BS Publishers, 1st Edition, 2013.

Web References:

1.https://en.wikipedia.org/wiki/Dynamics_(mechanics)
2.https://www.youtube.com/playlist?list=PLUl4u3cNGP62esZEwffjMAsEMW_YArxYC

E-Text Books:

1. http://www.freeengineeringbooks.com/Civil/Engineering-Mechanics-Books.php
2. http://www.textbooksonline.tn.nic.in/books/11/stdxi-voc-ema-em-2.pdf
3. http://www.faadooengineers.com/threads/17024-Engineering-mechanics-pdf-Free-Download

Course Home Page:

COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS

II Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS003	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes:15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Enrich the knowledge of solving algebraic, transcendental and differential equation by numerical methods.
II. Apply multiple integration to evaluate mass, area and volume of the plane.
III. Analyze gradient, divergence and curl to evaluate the integration over a vector field.
IV. Understand the Bessels equation to solve them under special conditions with the help of series solutions.

UNIT-I	**ROOT FINDING TECHNIQUES AND INTERPOLATION**	**Classes: 09**

Root finding techniques: Solving algebraic and transcendental equations by bisection method, method of false position, Newton-Raphson method; Interpolation: Finite differences, forward differences, backward differences and central differences; Symbolic relations; Newton's forward interpolation, Newton's backward interpolation; Gauss forward central difference formula, Gauss backward central difference formula; Interpolation of unequal intervals: Lagrange's interpolation.

UNIT-II	**CURVE FITTING AND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS**	**Classes: 08**

Fitting a straight line; Second degree curves; Exponential curve, power curve by method of least squares; Taylor's series method; Step by step methods: Euler's method modified Euler's method and Runge-Kutta method for first order differential equations.

UNIT-III	**MULTIPLE INTEGRALS**	**Classes: 10**

Double and triple integrals; Change of order of integration.

Transformation of coordinate system; Finding the area of a region using double integration and volume of a region using triple integration.

UNIT-IV	**VECTOR CALCULUS**	**Classes: 08**

Scalar and vector point functions; Gradient, divergence, curl and their related properties; Solenoidal and irrotational vector point functions; Scalar potential function; Laplacian operator; Line integral, surface integral and volume integral; Vector integral theorems: Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem without proofs.

UNIT-V	**SPECIAL FUNCTIONS**	**Classes: 10**

Gamma function, properties of gamma function; Ordinary point and regular singular point of differential equations; Series solutions to differential equations around zero, Frobenius method about zero; Bessel's differential equation: Bessel functions properties, recurrence relations, orthogonality, generating function, trigonometric expansions involving Bessel functions.

Text Books:

1. Kreyszig, "Advanced Engineering Mathematics", John Wiley &Sons Publishers, 9th Edition, 2014.
2. B. S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.

Reference Books:

1. R K Jain, S R K Iyengar, "Advanced Engineering Mathematics", Narosa Publishers, 5th Edition, 2016.
2. S. S. Sastry, "Introduction Methods of Numerical Analysis", Prentice-Hall of India Private Limited, 5th Edition, 2012.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://www.mathworld.wolfram.com

E-Text Books:

1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks

Course Home Page:

MODERN PHYSICS

II Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS008	Foundation	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Develop strong fundamentals of crystal structures and properties.
II. Meliorate the knowledge of theoretical and technological aspects of lasers and optical fibers.
III. Correlate principles with applications of the x-ray diffraction and defects in crystals.
IV. Enrich knowledge in modern engineering principles of interference and diffraction.

UNIT-I	CRYSTALLOGRAPHY AND CRYSTAL STRUCTURES	Classes: 09

Crystallography and crystal structures: Space lattice, unit cell, lattice parameters, crystal systems, Bravais lattices, directions and planes in crystals, Miller indices, interplanar spacing of orthogonal crystal systems, atomic radius, coordination number and packing factor of SC, BCC, FCC, NaCl and diamond structures.

UNIT-II	X-RAY DIFFRACTION AND DEFECTS IN CRYSTALS.	Classes: 09

X-ray diffraction: Bragg's law, Laue method, powder method and applications; Defects in crystals: Concepts of point defects, vacancies, substitutional, interstitial, frenkel, schottky defects, line defects and Burger's vector.

UNIT-III	LASERS AND SENSORS	Classes: 09

Lasers: Characteristics of lasers, spontaneous and stimulated emission of radiation, metastable state, population inversion, lasing action, ruby laser, semiconductor diode laser and applications of lasers.

Sensors: Introduction, basic principles, sensor materials and applications: principle of pressure, optical, acoustic and thermal sensing.

UNIT-IV	FIBER OPTICS	Classes: 09

Fiber optics: Principle and construction of an optical fiber, acceptance angle, numerical aperture, types of optical fibers (Single mode, multimode, step index, graded index), attenuation in optical fibers, application of optical fibers and optical fiber communication system with block diagram.

UNIT-V	INTERFERENCE AND DIFFRACTION	Classes: 09

Interference: Phase difference, path difference, coherence, conditions for constructive and destructive interference, interference in thin films due to reflected light, Newton rings experiment. Diffraction: Introduction, differences between interference and diffraction, types of diffraction, Fraunhofer diffraction due to single slit, N-slits, diffraction grating experiment.

Text Books:

1. Dr. K. Vijaya Kumar, Dr. S. Chandralingam, "Modern Engineering Physics", S. Chand & Co. New Delhi, 1st Edition, 2010.
2. Rajendran, "Engineering Physics", Tata Mc Graw Hill Book Publishers, 1st Edition, 2010.

Reference Books:

1. P. K. Palanisamy, "Engineering Physics", Scitech Publishers, 4th Edition, 2014.
2. R. K. Gaur, S. L. Gupta, "Engineering Physics", Dhanpat Rai Publications, 8th Edition, 2001.
3. A. J. Dekker, "Solid State Physics", Macmillan India ltd, 1st Edition, 2000.
4. Hitendra K. Malik, A. K. Singh, "Engineering Physics", McGraw Hill Education, 1st Edition, 2009.

Web References:

1. http://link.springer.com/book
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

E-Text Books:

1. http://www.peaceone.net/basic/Feynman/
2. http://physicsdatabase.com/free-physics-books/
3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html

Course Home Page:

ENVIRONMENTAL STUDIES

II Semester: **Common for all Branches**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS009	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Analyze the interrelationship between living organism and environment.
II. Understand the importance of environment by assessing its impact on the human world.
III. Enrich the knowledge on themes of biodiversity, natural resources, pollution control and waste management.

UNIT-I	**ENVIRONMENT AND ECOSYSTEMS**	**Classes: 08**

Environment: Definition, scope and importance of environment, need for public awareness; Ecosystem: Definition, scope and importance of ecosystem, classification, structure and function of an ecosystem, food chains, food web and ecological pyramids, flow of energy; Biogeochemical cycles; Biomagnifications.

UNIT-II	**NATURAL RESOURCES**	**Classes: 08**

Natural resources: Classification of resources, living and nonliving resources; Water resources: Use and over utilization of surface and ground water, floods and droughts, dams, benefits and problems; Mineral resources: Use and exploitation; Land resources; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy source, case studies.

UNIT-III	**BIODIVERSITY AND BIOTIC RESOURCES**	**Classes: 10**

Biodiversity and biotic resources: Introduction, definition, genetic, species and ecosystem diversity; Value of biodiversity: Consumptive use, productive use, social, ethical, aesthetic and optional values; India as a mega diversity nation; Hot spots of biodiversity.

Threats to biodiversity: Habitat loss, poaching of wildlife, human-wildlife conflicts; Conservation of biodiversity: In situ and ex situ conservation; National biodiversity act.

UNIT-IV	**ENVIRONMENTAL POLLUTION, POLLUTION CONTROL TECHNOLOGIES AND GLOBAL ENVIRONMENTAL PROBLEMS**	**Classes: 10**

Environmental pollution: Definition, causes and effects of air pollution, water pollution, soil pollution, noise pollution; Solid waste: Municipal solid waste management, composition and characteristics of e-waste and its management; Pollution control technologies: Waste water treatment methods, primary, secondary and tertiary; Concepts of bioremediation; Global environmental problems and global efforts: Climate change, ozone depletion, ozone depleting substances, deforestation and desertification; International conventions / protocols: Earth summit, Kyoto protocol and Montreal protocol.

UNIT-V	**ENVIRONMENTAL LEGISLATIONS AND SUSTAINABLE DEVELOPMENT**	**Classes: 09**

Environmental legislations: Environmental protection act, air act1981, water act, forest act, wild life act, municipal solid waste management and handling rules, biomedical waste management and handling rules2016, hazardous waste management and handling rules, Environmental impact assessment(EIA); Towards sustainable future: Concept of sustainable development, population and its explosion, crazy consumerism, environmental education, urban sprawl, concept of green building.

Text Books:

1. Benny Joseph, "Environmental Studies", Tata Mc Graw Hill Publishing Co. Ltd, New Delhi, 1st Edition, 2006.
2. Erach Bharucha, "Textbook of Environmental Studies for Under Graduate Courses", Orient Black Swan, 2nd Edition, 2013.
3. Dr. P. D Sharma, "Ecology and Environment", Rastogi Publications, New Delhi, 12th Edition, 2015.

Reference Books:

1. Tyler Miller, Scott Spoolman, "Environmental Science", Cengage Learning, 14th Edition, 2012.
2. Anubha Kaushik, "Perspectives in Environmental Science", New Age International, New Delhi, 4th Edition, 2006.
3. Gilbert M. Masters, Wendell P. Ela, "Introduction to Environmental Engineering and Science, Pearson, 3rd Edition, 2007.

Web References:

1. https://www.elsevier.com
2. https://www. libguides.lib.msu.edu
3. https://www.fao.org
4. https://www nrc.gov
5. https://www istl.org
6. https://www.ser.org
7. https://www.epd.gov.
8. https://www.nptel.ac.in

E-Text Books:

1. http://www.ilocis.org
2. http://www.img.teebweb.org
3. http://www.ec.europa.eu
4. http://www.epa.ie
5. http://www.birdi.ctu.edu.vn

Course Home Page:

COMPUTER PROGRAMMING

II Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACS001	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Learn adequate knowledge by problem solving techniques.
II. Understand programming skills using the fundamentals and basics of C Language.
III. Improve problem solving skills using arrays, strings, and functions.
IV. Understand the dynamics of memory by pointers.
V. Study files creation process with access permissions.

UNIT-I	INTRODUCTION	Classes: 10

Introduction to computers: Computer systems, computing environments, computer languages, creating and running programs, algorithms, flowcharts; Introduction to C language: History of C, basic structure of C programs, process of compiling and running a C program, C tokens, keywords, identifiers, constants, strings, special symbols, variables, data types; Operators and expressions: Operators, arithmetic, relational and logical, assignment operators, increment and decrement operators, bitwise and conditional operators, special operators, operator precedence and associativity, evaluation of expressions, type conversions in expressions, formatted input and output.

UNIT-II	CONTROL STRUCTURES, ARRAYS AND STRINGS	Classes: 10

Control structures: Decision statements; if and switch statement; Loop control statements: while, for and do while loops, jump statements, break, continue, goto statements; Arrays: Concepts, one dimensional arrays, declaration and initialization of one dimensional arrays, two dimensional arrays, initialization and accessing, multi-dimensional arrays; Strings concepts: String handling functions, array of strings.

UNIT-III	FUNCTIONS AND POINTERS	Classes: 09

Functions: Need for user defined functions, function declaration, function prototype, category of functions, inter function communication, function calls, parameter passing mechanisms, recursion, passing arrays to functions, passing strings to functions, storage classes, preprocessor directives.

Pointers: Pointer basics, pointer arithmetic, pointers to pointers, generic pointers, array of pointers, pointers and arrays, pointers as functions arguments, functions returning pointers.

UNIT-IV	STRUCTURES AND UNIONS	Classes: 08

Structures and unions: Structure definition, initialization, accessing structures, nested structures, arrays of structures, structures and functions, passing structures through pointers, self referential structures, unions, bit fields, typedef, enumerations; Dynamic memory allocation: Basic concepts, library functions.

UNIT-V	FILES	Classes: 08

Files: Streams, basic file operations, file types, file opening modes, file input and output functions, file status functions, file positioning functions, command line arguments.

Text Books:

1. Stephen G. Kochan, "Programming in C", Addison-Wesley Professional, 4th Edition, 2014.
2. B. A. Forouzan, R. F. Gillberg, "C Programming and Data Structures", Cengage Learning, India, 3rd Edition, 2014.

Reference Books:

1. W. Kernighan Brian, Dennis M. Ritchie, "The C Programming Language", PHI Learning, 2nd Edition, 1988.
2. Yashavant Kanetkar, "Exploring C", BPB Publishers, 2nd Edition, 2003.
3. E. Balagurusamy, "Programming in ANSI C", Mc Graw Hill Education, 6th Edition, 2012.
4. Schildt Herbert, "C: The Complete Reference", Tata Mc Graw Hill Education, 4th Edition, 2014.
5. R. S. Bichkar, "Programming with C", Universities Press, 2nd Edition, 2012.
6. Dey Pradeep, Manas Ghosh, "Computer Fundamentals and Programming in C", Oxford University Press, 2nd Edition, 2006.

Web References:

1. https://www.bfoit.org/itp/Programming.html
2. https://www.khanacademy.org/computing/computer-programming
3. https://www.edx.org/course/programming-basics-iitbombayx-cs101-1x-0
4. https://www.edx.org/course/introduction-computer-science-harvardx-cs50x

E-Text Books:

1. http://www.freebookcentre.net/Language/Free-C-Programming-Books-Download.htm
2. http://www.imada.sdu.dk/~svalle/courses/dm14-2005/mirror/c/
3. http://www.enggnotebook.weebly.com/uploads/2/2/7/1/22718186/ge6151-notes.pdf

MOOC Course

1. https://www.alison.com/courses/Introduction-to-Programming-in-c
2. http://www.ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-s096-effective-programming-in-c-and-c-january-iap-2014/index.htm

Course Home Page:

COMPUTATIONAL MATHEMATICS LABORATORY

II Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS102	Foundation	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 24				Total Classes: 24		

OBJECTIVES:

The course should enable the students to:

I. Train the students how to approach for solving engineering problems.
II. Understand the concepts of algebra, calculus and numerical solutions using MATLAB software.
III. Enrich the knowledge in MATLAB and can apply for project works.

LIST OF EXPERIMENTS

Week-l	**BASIC FEATURES**

a. Features and uses.
b. Local environment setup.

Week-2	**ALGEBRA**

a. Solving basic algebraic equations.
b. Solving system of equations.
c. Two dimensional plots.

Week-3	**CALCULUS**

a. Calculating limits.
b. Solving differential equations.
c. Finding definite integral.

Week-4	**MATRICES**

a. Addition, subtraction and multiplication of matrices.
b. Transpose of a matrix.
c. Inverse of a matrix.

Week-5	**SYSTEM OF LINEAR EQUATIONS**

a. Rank of a matrix.
b. Gauss Jordan method.
c. LU decomposition method.

Week-6	**LINEAR TRANSFORMATION**

a. Characteristic equation.
b. Eigen values.
c. Eigen vectors.

Week-7	**DIFFERENTIATION AND INTEGRATION**

a. Higher order differential equations.
b. Double integrals.
c. Triple integrals.

Week-8	INTERPOLATION AND CURVE FITTING
a. Lagrange polynomial. b. Straight line fit. c. Polynomial curve fit.	
Week-9	**ROOT FINDING**
a. Bisection method. b. Regula false method. c. Newton Raphson method.	
Week-10	**NUMERICAL DIFFERENTION AND INTEGRATION**
a. Trapezoidal, Simpson's method. b. Euler method. c. Runge Kutta method.	
Week-11	**3D PLOTTING**
a. Line plotting. b. Surface plotting. c. Volume plotting.	
Week-12	**VECTOR CALCULUS**
a. Gradient. b. Divergent. c. Curl.	

Reference Books:

1. Cleve Moler, "Numerical Computing with MATLAB", SIAM, Philadelphia, 2nd Edition, 2008.
2. Dean G. Duffy, "Advanced Engineering Mathematics with MATLAB", CRC Press, Taylor & Francis Group, 6th Edition, 2015.

Web Reference:

http://www.iare.ac.in

Course Home Page:

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE: Microsoft Windows 7 and MATLAB – V 8.5, which is also R2015a

HARDWARE:30 numbers of Desktop Computer Systems

ENGINEERING PHYSICS LABORATORY

II Semester: **CE / ME / AE**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS105	Foundation	-	-	2	1	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 28				Total Classes: 28		

OBJECTIVES:

The course should enable the students to:

I. Enrich the concept of rigidity modulus and frequency.
II. Enlighten the real time application of interference, diffraction and optical fibers.
III. Upgrade practical knowledge in magnetic induction, LED and LASER.

LIST OF EXPERIMENTS

Week- l	**INTRODUCTION TO PHYSICS LABORATORY**

Introduction to physics laboratory. Do's and Don'ts in physics lab.

Week- 2	**MEASURING INSTRUMENTS AND TORSIONAL PENDULUM**

Batch I: Measurement of thickness of a wire and radius of a disc.
Batch II: Determination of rigidity modulus of material of string-Torsional pendulum.

Week-3	**MEASURING INSTRUMENTS AND TORSIONAL PENDULUM**

Batch I: Determination of rigidity modulus of material of string-Torsional pendulum.
Batch II: Measurement of thickness of a wire and radius of a disc.

Week-4	**STEWART AND GEE'S METHOD AND FREQUENCY OF LONGITUDINAL WAVES**

Batch I: Magnetic field along the axis of current carrying coil-Stewart and Gee's method.
Batch II: Determining frequency of longitudinal waves

Week-5	**STEWART AND GEE'S METHOD AND FREQUENCY OF LONGITUDINAL WAVES**

Batch I: Determining frequency of longitudinal waves.
Batch II: Magnetic field along the axis of current carrying coil-Stewart and Gee's method.

Week-6	**FREQUENCY OF TRANSVERSE WAVES AND LASER DIFFRACTION**

Batch I: Calculating frequency of transverse waves.
Batch II: Wavelength of laser source-diffraction grating.

Week-7	**FREQUENCY OF TRANSVERSE WAVES AND LASER DIFFRACTION**

Batch I: Wavelength of laser source-diffraction grating.
Batch II: Calculating frequency of transverse waves.

Week-8	**SPECTROMETER AND DISPERSIVE POWER**

Batch I: Adjustments and minimum deviation in spectrometer.
Batch II: Dispersive power of material of prism.

Week 9	**SPECTROMETER AND DISPERSIVE POWER**

Batch I: Dispersive power of material of prism.
Batch II: Adjustments and minimum deviation in spectrometer.

Week-10	NEWTON'S RINGS AND OPTICAL FIBER
Batch I: Newton's rings-Radius of curvature of plano convex lens. Batch II: Evaluation of numerical aperture of given fiber.	
Week-11	**NEWTON'S RINGS AND OPTICAL FIBER**
Batch I: Evaluation of numerical aperture of given fiber. Batch II: Newton's rings-Radius of curvature of plano convex lens.	
Week-12	**LED CHARACTERISTICS AND LASER CHARACTERISTICS**
Batch I: V-I characteristics of LED. Batch II: Study of L-I characteristics of laser diode.	
Week-13	**LED CHARACTERISTICS AND LASER CHARACTERISTICS**
Batch I: Study of L-I characteristics of laser diode. Batch II: V-I characteristics of LED.	
Week-14	**REVISION**
Revision.	

Reference Books:

1. C. L. Arora, "Practical Physics", S.Chand & Co., New Delhi, 3rd Edition, 2012.
2. Vijay Kumar, Dr. T. Radhakrishna, "Practical Physics for Engineering students", S M enterprises, 2nd Edition, 2014.
3. R. K. Shukla, Anchal Srivatsava, "Practical Physics", New age International, 2nd Edition, 2011.

Web References:

1. http://www.iare.ac.in

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 30 STUDENTS:

S. No	Name of the Component	Quantity	Range
1	Melde's arrangement	10	Tuning fork frequency: 80-90Hz, DC coil 4 – 6 V, 2-3 A
2	Weight box	10	1mg-100g
3	Meter scale	10	1m
4	Stewart and Gees's set	10	Coil 2, 50, 200 turns
5	DC Ammeter	10	Digital Meter DC 0-20V
6	Battery eliminator	10	DC 2 A.
7	Laser source with retort and round stand	10	Semiconductor laser 670 nm
8	Grating	20	15000 LPI
9	Measuring tape	10	1m
10	Torsional Pendulum	10	Brass disc 1000gms wt, 1m steel wire with diameter 0.05 cm
11	Stop watch	20	+/- 1s
12	Screw gauge	10	+/- 0.001cm
13	Vernier calipers	10	+/- 0.01cm
14	Newtons travelling microscope	10	X10
15	Sodium Vapour Lamp	20	700 W
16	Transformer Sodium Vapour Lamp	10	1 KW

17	Numerical aperture kit	10	Optical power meter 660 nm
18	Bending loss tubes	10	Dia – 4 cm, 6 cm, 8 cm, 10 cm
19	Spectrometer	10	LC 1', Ramsden eye piece
20	Glass prisms	20	Crown glass prisms, 30mm x 30mm
21	Mercury lamp	20	Mercury bulb 160 W
22	LED boards	10	I/P 0-10V DC, Resistors 1k Ω-4K Ω
23	Digital ammeter	10	Digital Meter DC 0-20 mA
24	Digital voltmeter	10	Digital Meter DC 0-20V
25	Probes	10	Dia – 4 mm
26	Laser Diode boards	10	I/P 0-10V DC, Resistors 1k Ω-4K Ω

COMPUTER PROGRAMMING LABORATORY

II Semester: CE / AE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACS101	Foundation	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Formulate problems and implement algorithms using C programming language.
II. Develop programs using decision structures, loops and functions.
III. Learn memory allocation techniques using pointers.
IV. Use structured programming approach for solving of computing problems in real world.

LIST OF EXPERIMENTS

Week-1 OPERATORS AND EVALUATION OF EXPRESSIONS

a. Write a C program to check whether a number is even or odd using ternary operator.
b. Write a C program to perform the addition of two numbers without using + operator.
c. Write a C program to evaluate the arithmetic expression ((a + b / c * d - e) * (f - g)). Read the values a, b, c, d, e, f, g from the standard input device.
d. Write a C program to find the sum of individual digits of a 3 digit number.
e. Write a C program to read the values of x and y and print the results of the following expressions in one line:
   i. (x + y) / (x - y)
   ii. (x + y)(x - y)

Week-2 CONTROL STRUCTURES

a. Write a C program to find the sum of individual digits of a positive integer.
b. A Fibonacci sequence is defined as follows: The first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
c. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
d. A character is entered through keyboard. Write a C program to determine whether the character entered is a capital letter, a small case letter, a digit or a special symbol using if-else and switch case. The following table shows the range of ASCII values for various characters.

Characters	ASCII values
A – Z	65 – 90
a – z	97 – 122
0 – 9	48 – 57
Special symbols	0 – 47, 58 – 64, 91 – 96, 123 – 127

e. If cost price and selling price of an item is input through the keyboard, write a program to determine whether the seller has made profit or incurred loss. Write a C program to determine how much profit or loss incurred in percentage.

Week-3	CONTROL STRUCTURES

a. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, *, /, % and use switch statement).
b. Write a C program to calculate the following sum:

sum = $1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$

c. Write a C program to find the roots of a quadratic equation.
d. Write a C program to check whether a given 3 digit number is Armstrong number or not.
e. Write a C program to print the numbers in triangular form

```
1
1  2
1  2  3
1  2  3  4
```

Week-4	ARRAYS

a. Write a C program to find the second largest integer in a list of integers.
b. Write a C program to perform the following:
   i. Addition of two matrices
   ii. Multiplication of two matrices
c. Write a C program to count and display positive, negative, odd and even numbers in an array.
d. Write a C program to merge two sorted arrays into another array in a sorted order.
e. Write a C program to find the frequency of a particular number in a list of integers.

Week-5	STRINGS

a. Write a C program that uses functions to perform the following operations:
   i. To insert a sub string into a given main string from a given position.
   ii. To delete n characters from a given position in a given string.
b. Write a C program to determine if the given string is a palindrome or not.
c. Write a C program to find a string within a sentence and replace it with another string.
d. Write a C program that reads a line of text and counts all occurrence of a particular word.
e. Write a C program that displays the position or index in the string S where the string T begins or 1 if S doesn't contain T.

Week-6	FUNCTIONS

a. Write C programs that use both recursive and non-recursive functions
   i. To find the factorial of a given integer.
   ii. To find the greatest common divisor of two given integers.
b. Write C programs that use both recursive and non-recursive functions
   i. To print Fibonacci series.
   ii. To solve towers of Hanoi problem.
c. Write a C program to print the transpose of a given matrix using function.
d. Write a C program that uses a function to reverse a given string.

Week-7	POINTERS

a. Write a C program to concatenate two strings using pointers.
b. Write a C program to find the length of string using pointers.
c. Write a C program to compare two strings using pointers.
d. Write a C program to copy a string from source to destination using pointers.
e. Write a C program to reverse a string using pointers.

Week-8	STRUCTURES AND UNIONS

a. Write a C program that uses functions to perform the following operations:
   i. Reading a complex number
   ii. Writing a complex number
   iii. Addition and subtraction of two complex numbers
   iv. Multiplication of two complex numbers. Note: represent complex number using a structure.
b. Write a C program to compute the monthly pay of 100 employees using each employee's name, basic pay. The DA is computed as 52% of the basic pay. Gross-salary (basic pay + DA). Print the employees name and gross salary.
c. Create a Book structure containing book_ id, title, author name and price. Write a C program to pass a structure as a function argument and print the book details.
d. Create a union containing 6 strings: name, home_ address, hostel_ address, city, state and zip. Write a C program to display your present address.
e. Write a C program to define a structure named DOB, which contains name, day, month and year. Using the concept of nested structures display your name and date of birth.

Week-9	ADDITIONAL PROGRAMS

a. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: $1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$. For example: if n is 3 and x is 5, then the program computes 1+5+25+125. Print x, n, the sum. Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal? If so, test for them too.
b. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
c. Write a C program to convert a Roman numeral to its decimal equivalent. E.g. Roman number CD is equivalent to 400.

Week-10	PREPROCESSOR DIRECTIVES

a. Define a macro with one parameter to compute the volume of a sphere. Write a C program using this macro to compute the volume for spheres of radius 5, 10 and 15 meters.
b. Define a macro that receives an array and the number of elements in the array as arguments. Write a C program for using this macro to print the elements of the array.
c. Write symbolic constants for the binary arithmetic operators +, -, *, and /. Write a C program to illustrate the use of these symbolic constants.

Week-11	FILES

a. Write a C program to display the contents of a file.
b. Write a C program to copy the contents of one file to another.
c. Write a C program to reverse the first n characters in a file, where n is given by the user.
d. Two files DATA1 and DATA2 contain sorted lists of integers. Write a C program to merge the contents of two files into a third file DATA i.e., the contents of the first file followed by those of the second are put in the third file.
e. Write a C program to count the no. of characters present in the file.

Week-12	COMMAND LINE ARGUMENTS

a. Write a C program to read arguments at the command line and display it.
b. Write a C program to read two numbers at the command line and perform arithmetic operations on it.
c. Write a C program to read a file name at the command line and display its contents.

Reference Books:

1. Yashavant Kanetkar, "Let Us C", BPB Publications, New Delhi, 13th Edition, 2012.
2. Oualline Steve, "Practical C Programming", O'Reilly Media, 3rd Edition, 1997.
3. King K N, "C Programming: A Modern Approach", Atlantic Publishers, 2nd Edition, 2015.
4. Kochan Stephen G, "Programming in C – A Complete Introduction to the C Programming Language", Sam's Publishers, 3rd Edition, 2004.
5. Linden Peter V, "Expert C Programming: Deep C Secrets", Pearson India, 1st Edition, 1994

Web References:

1. http://www.sanfoundry.com/c-programming-examples
2. http://www.geeksforgeeks.org/c
3. http://www.cprogramming.com/tutorial/c
4. http://www.cs.princeton.edu

Course Home Page:

COMPUTER AIDED ENGINEERING DRAWING PRACTICE

II Semester: AE/ CE/ ME

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME102	Foundation	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the basic principles of engineering drawing.
II. Understand the intersection of solids in different quadrants.
III. Convert the pictorial views into orthographic view and vice versa.
IV. Create intricate details of components through sections and develop its surfaces.
V. Understand the perspective projection of solids through vanishing and visual ray method.

UNIT-I	AutoCAD AND DVELOPMENT OF SURFACES WITH SECTIONAL VIEW	Classes: 09

Introduction to AutoCAD: Geometrical construction; Sections and sectional views, sections of right regular solids, prisms, pyramids, cylinders and cones, auxiliary views, development of surfaces, development of surfaces of right regular solids prisms, pyramids, cylinders and cones.

UNIT-II	INTERSECTION OF SOLIDS	Classes: 09

Intersection of solids: Intersection of prism versus prism, cylinder versus prism, cylinder versus cylinder and cylinder versus cone.

UNIT-III	ISOMETRIC PROJECTIONS	Classes: 09

Isometric projections**:** Principles of isometric projections, isometric scale, isometric views, conventions.

Isometric views of lines, planes, simple and compound solids, isometric views of objects having spherical parts.

UNIT-IV	TRANSFORMATION OF PROJECTIONS	Classes: 09

Transformation of projections: Conversion of isometric views to orthographic views, conventions for simple objects; Construction of orthographic projections for given isometric projections.

UNIT-V	PERSPECTIVE PROJECTIONS	Classes: 09

Perspective projections: Perspective view of points, lines, plane figures and simple solids, vanishing point method and visual ray method.

Reference Books:

1. N.D. Bhatt, "Engineering Drawing", Charotar Publications, 49th Edition, 2012.
2. C. M. Agrawal, Basant Agrawal, "Engineering Drawing'', Tata Mc Graw Hill, 2nd Edition, 2013.
3. K. Venugopal, "Engineering Drawing and Graphics", New Age Publications, 2nd Edition, 2010.
4. S. Trymbaka Murthy, "Computer Aided Engineering Drawing", I.K.Publishers, 3rd Edition, 2011.
5. A. K. Sarkar, A. P. Rastogi, "Engineering Graphics with AutoCAD", PHI Learning, 1st Edition, 2010.

Web References:

1. http://nptel.ac.in/courses/112103019/
2. http://freevideolectures.com/Course/3420/Engineering-Drawing

E-Text Book:

1. https://books.google.co.in/books/about/Engineering_Drawing.html?id=_hdOU8kRb2AC

Course Home Page:

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS:

SOFTWARE: System Software: Microsoft Windows 7.
Application Software: AutoCAD R2015.

HARDWARE: 30 numbers of Desktop Computer Systems with 2 GB RAM 2.7GHz Processor.
Dot Matrix Printers: 02

PROBABILITY AND STATISTICS

III Semester: CE/CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS010	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Enrich the knowledge of probability on single random variables and probability distributions.
II. Apply the concept of correlation and regression to find covariance.
III. Analyze the given data for appropriate test of hypothesis.

UNIT-I	**SINGLE RANDOM VARIABLES AND PROBABILITY DISTRIBUTION**	**Classes: 09**

Random variables: Basic definitions, discrete and continuous random variables; Probability distribution: Probability mass function and probability density functions; Mathematical expectation; Binomial distribution, Poisson distribution and normal distribution.

UNIT-II	**MULTIPLE RANDOM VARIABLES**	**Classes: 09**

Joint probability distributions, joint probability mass, density function, marginal probability mass, density functions; Correlation: Coefficient of correlation, the rank correlation; Regression: Regression coefficient, the lines of regression, multiple correlation and regression.

UNIT-III	**SAMPLING DISTRIBUTION AND TESTING OF HYPOTHESIS**	**Classes: 09**

Sampling: Definitions of population, sampling, statistic, parameter; Types of sampling, expected values of sample mean and variance, sampling distribution, standard error, sampling distribution of means and sampling distribution of variance.

Estimation: Point estimation, interval estimations; Testing of hypothesis: Null hypothesis, alternate hypothesis, type I and type II errors, critical region, confidence interval, level of significance. One sided test, two sided test.

UNIT-IV	**LARGE SAMPLE TESTS**	**Classes: 09**

Test of hypothesis for single mean and significance difference between two sample means, Tests of significance difference between sample proportion and population proportion and difference between two sample proportions.

UNIT-V	**SMALL SAMPLE TESTS AND ANOVA**	**Classes: 09**

Small sample tests: Student t-distribution, its properties: Test of significance difference between sample mean and population mean; difference between means of two small samples. Snedecor's F-distribution and its properties; Test of equality of two population variances Chi-square distribution and it's properties; Test of equality of two population variances Chi-square distribution, it's properties, Chi-square test of goodness of fit; ANOVA: Analysis of variance, one way classification, two way classification.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons Publishers, 9th Edition, 2014.
2. B. S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2012.

Reference Books:

1. S. C. Gupta, V. K. Kapoor, "Fundamentals of Mathematical Statistics", S. Chand & Co., 10th Edition, 2000.
2. N. P. Bali, "Engineering Mathematics", Laxmi Publications, 9th Edition, 2016.
3. Richard Arnold Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Prentice Hall, 8thEdition, 2013.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resourcs/#Mathematics
3. http://www.sosmath.com
4. http://www.mathworld.wolfram.com

E-Text Books:

1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks

Course Home Page:

STRENGTH OF MATERIALS - I

III Semester: CE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE001	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Relate mechanical properties of a material with its behavior under various load types.
II. Apply the concepts of mechanics to find the stresses at a point in a material of a structural member.
III. Analyze a loaded structural member for deflections and failure strength.
IV. Evaluate the stresses and strains in materials and deflections in beam members.

UNIT-I	STRESSES AND STRAINS(SIMPLE AND PRINCIPAL)	Classes :09

Concept of stress and strain, elasticity and plasticity, Hooke's law, stress-strain diagram for mild steel, Poisson's ratio, volumetric strain, elastic module and the relationship between them bars of varying section, composite bars, temperature stresses; Strain energy, modulus of resilience, modulus of toughness; stresses on an inclined section of a bar under axial loading; compound stresses; Normal and tangential stresses on an inclined plane for biaxial stresses; Two perpendicular normal stresses accompanied by a state of simple shear; Mohr's circle of stresses; Principal stresses and strains; Analytical and graphical solutions. Theories of Failure: Introduction, various theories of failure, maximum principal stress theory, maximum principal strain theory, strain energy and shear strain energy theory.

UNIT-II	SHEAR FORCE AND BENDING MOMENT	Classes :09

Definition of beam, types of beams, concept of shear force and bending moment, shear force and bending moment diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads, point of contraflexure, relation between Shear force, bending moment and rate of loading at a section of a beam.

UNIT-III	FLEXURAL AND SHEAR STRESSES IN BEAMS	Classes :09

Flexural Stresses: Theory of simple bending, assumptions, derivation of bending equation: M/I = f/y = E/R - neutral axis: Determination of bending stresses; Section modulus of rectangular and circular sections (Solid and Hollow), IT angle and channel sections; Design of simple beam sections.

Shear Stresses: Derivation of formula - shear stress distribution across various beam sections like rectangular, circular, triangular, IT angle sections.

UNIT-IV	TORSION OF CIRCULAR SHAFTS	Classes:09

Theory of pure torsion: derivation of torsion equations: $\frac{T}{J} = \frac{q}{r} = \frac{N\theta}{L}$; Assumptions made in the theory of pure torsion, torsional moment of resistance, polar section modulus, power transmitted by shaft, combined bending and torsion and end thrust, design of shafts according to theories of failure. Introduction to springs, types of springs, deflection of close and open coiled helical springs under axial pull and axial couple, springs in series and parallel.

UNIT-V	COLUMNS AND STRUTS: BUCKLING	Classes:09

Introduction: Types of columns, short, medium and long columns, axially loaded compression members, crushing load, Euler's theorem for long columns, assumptions, derivation of Euler's critical load formulae for various end conditions. Equivalent length of a column, slenderness ratio, Euler's critical stress, limitations of Euler's theory, Rankine's and Gordon formula, long columns subjected to eccentric loading, secant formula, empirical formulae, straight line formula and Prof. Perry's formula. Laterally loaded struts, subjected to uniformly distributed and concentrated loads, maximum bending moment and stress due to transverse and lateral loading.

Text Books:

1. F. Beer, E. R. Johnston, J. DeWolf , "Mechanics of Materials", Tata McGraw-Hill Publishing Company Limited, New Delhi, Indian 1st Edition, 2008.
2. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Mechanics of Materials", Laxmi Publications Private Limited, New Delhi, 4th Edition, 2007.
3. R. K. Rajput, "Strength of Materials: Mechanics of Solids", S. Chand & Co Limited, New Delhi, 3rd Edition, 2007.
4. S. S. Rattan, "Strength of Materials", Tata McGraw-Hill Publishers, 4th Edition, 2011.

Reference Books :

1. J. M. Gere, S.P. Timoshenko, "Mechanics of Materials", CL Engineering, USA, 5th Edition, 2000.
2. E. G. Popov, "Engineering Mechanics of Solids", Pearson Education, India, 2nd Edition, 2015.
3. S. S. Bhavikatti, "Strength of Materials", Vikas Publishing House Pvt. Ltd., New Delhi, 3rd Edition, 2013.
4. R. K. Bansal, "A Textbook of Strength of Materials", Laxmi Publications Private Limited., New Delhi, 4th Edition, 2007.
5. D. S. PrakashRao, "Strength of Materials A Practical Approach Vol.1", University Press India Private Limited, India, 1st Edition, 2007.

Web References:

1. http://www.nptelvideos.in/2012/11/strength-of-materials- prof.html
2. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-2004/lecture-notes/
3. https://www.youtube.com/watch?v=coRgpxG2pyY&list=PLLbvVfERDon3oDfCYxkwRct1Q6YeOzi9g

E-Text Books:

1. http://www.freeengineeringbooks.com/Civil/Strength-of-Material-Books.php
2. http://royalmechanicalbuzz.blogspot.in/2015/04/strength-of-materials-book-by-r-k-bansal.html

Course Home Page:

SURVEYING

III Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE002	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Evaluate the basic principles of surveying and its classification.
II. Identify, formulate and solve the problems in the field of advanced surveying.
III. Determine the contour points and their importance in surveying.
IV. Analyze survey data and design the civil engineering projects.

UNIT-I	INTRODUCTION, LINEAR AND ANGULAR MEASUREMENTS	Classes: 09

Definitions, primary divisions of surveying, objectives, principles and classifications, plan and map, errors due to wrong scale. Linear and angular measurements; Direct and in direct methods, use of chain and tape, errors in chaining, meridians, azimuths and bearings, declination, dip, computation of angle, errors due to local attraction.

UNIT-II	LEVELING AND CONTOURING	Classes: 09

Leveling: Concept and terminology, temporary and permanent adjustments, method of leveling, height of instrument and rise and fall method; Contouring: Characteristics and uses of contours; Methods of conducting contour surveys and their plotting.

UNIT-III	COMPUTATION OF AREAS AND VOLUMES	Classes: 09

Computation of areas directly from field measurements methods, computation of areas along irregular boundaries and regular boundaries.

Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.

UNIT-IV	THEODOLITE AND TRAVERSE SURVEYING	Classes: 09

Theodolite, description of transit theodolite, definitions and terms, temporary and permanent adjustments, measurement of horizontal and vertical angles. Trigonometrical leveling height and distance problems, traverse survey and methods of traversing, closing errors in traversing.

UNIT-V	TACHEOMETRIC AND ADVANCED SURVEYING	Classes: 09

Tachometry: Stadia and tangential methods of tachometry. Distance elevation and depression formulae for staff held in vertical and inclined position. Curves: Definition, types of curves, design and setting out, simple and compound curves. Advanced Surveying: Basic principles of total station, global positioning system and geographic information system.

Text Books:

1. Duggal S. K., "Surveying (Vol-1and 2)", Tata McGraw-Hill Publishers, New Delhi, 10th Edition, 2004.
2. C. Venkatramaiah, "Textbook of Surveying", Universities Press Pvt. Ltd., India, 3rd Edition, 2013.

3. Dr A. M. Chandra, "Surveying Problem Solving with theory and objective type questions", New Age International Pvt. Ltd. Publishers, New Delhi, 2nd Edition, 2005

Reference Books:

1. R. Subramanian, "Surveying and Leveling", Oxford University Press, New Delhi. 2nd Edition, 2012.
2. M. James, Anderson Edward Mikhail, "Surveying Theory and Practice", Tata McGraw Hill, New Delhi, 7th Edition, 2000.
3. Arthur R Benton, Philip J Taety, "Elements of Plane Surveying", McGraw-Hill Education, New Delhi. 8th Edition, 2000.

Web References:

1. https://en.wikipedia.org/wiki/Surveying
2. www.nptel.ac.in/courses/105107122/home.htm
3. www.aboutcivil.org/surveying-levelling%20II.htm

E-Text Books:

1. http://www.freeengineeringbooks.com/Civil/Surveying-Books.php
2. https://www.jntubook.com/surveying-textbook-free-download

Course Home Page:

ENGINEERING GEOLOGY

III Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE003	Foundation	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Discuss the process of formation of rocks, their classifications and properties of minerals.
II. Identify different geological structures encountered in nature.
III. Recognize different hazards such as earthquakes, landslides etc causes and their effects.
IV. Explain the importance of geophysical and geological studies of sites for tunnels, dams and reservoirs.

UNIT-I	WEATHERING OF ROCKS	Classes: 09

Introduction: Importance of geology from civil engineering point of view. Brief study of case histories of failures of some civil engineering constructions due to geological draw backs. Importance of physical geology, petrology and structural geology. Weathering of rocks: Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like granite.

UNIT-II	MINERALOGY AND PETROLOGY	Classes: 09

Mineralogy: Definition of mineral, importance of study of minerals, different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldsper, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chrorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite. Petrology: Definition of rock, geological classification of rocks into igneous, sedimentary and metamorphic. Dykes and Sills, common structures and textures of igneous, sedimentary and metamorphic rocks. Megascopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sand Stone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate. Rock excavation, stone aggregates.

UNIT-III	STRUCTURAL GEOLOGY	Classes: 09

Indian stratigraphy, palaeontology and geological time scale, out crop, strike and dip study of common geological structures associating with the rocks such as fold, faults unconformities, and joint types.

Ground water: Water table, common types of ground water movement, ground water exploration. Earth quakes, their causes and effects, shield hazards, water in landslides their causes and effects, measures to be taken to prevent their occurrence. Importance of study of ground water, earthquake and landslides.

UNIT-IV	GEOLOGY OF DAMS AND RESERVOIRS	Classes: 09

Types of dams and bearing of geology of site in their selection, geological considerations in the selection of a dam site. Factors contributing to the success of a reservoir, geological factors influencing water tightness and life of reservoirs, geo hazards, ground subsidence. Geophysical studies: Importance of geophysical studies principles of geophysical study by gravity methods, magnetic methods, electrical methods, seismic methods, radio metric methods and geothermal method. Special importance of electrical

resistivity methods and seismic refraction methods. Improvement of competence of sites by grouting etc. Fundamental aspects of rock mechanics and environmental geology.

UNIT-V	TUNNELS	Classes: 09

Purpose of tunnelling, effects of tunnelling on the ground, role of geological considerations in tunnelling over break and lining in tunnels, tunnels in rock, subsidence over old mines, mining substances.

Text Books:

1 N. Chennkesavulu, "Engineering Geology", Mc Milan India Private Limited, New Delhi, India, 12th Edition, 2009.
2 Venkat Reddy, "Engineering Geology", Vikas Publications, New Delhi, India, 2nd Edition, 2011.
3 Vasudev Kanithi, "Engineering Geology", University Press, 1st Edition, 2013.
4 Gokhale, "Principles of Engineering Geology", BS Publications, 2009.

Reference Books:

1 F.G. Bell, "Fundamentals of Engineering Geology", Butterworth's Publications, 3rd Edition, New Delhi, 1992.
2 K. V. G. K. Gokhale, "Principles of Engineering Geology", BS Publications, New Delhi, India, 5th Edition, 5th Edition, 2008.

Web References:

1. http://ocw.mit.edu/courses/earth-atmospheric-and-planetary-sciences/12-001-introduction-to-geology-fall-2013/
2. http://nptel.ac.in/courses/105105106/
3. http://www.journals.elsevier.com/engineering-geology
4. http://www.springer.com/earth+sciences+and+geography/engineering+geology/journal/10706
5. http://www.springer.com/earth+sciences+and+geography/engineering+geology/journal/10064
6. http://www.sciencedirect.com/science/journal/00137952

E-Text Books:

1. http://cepdf.blogspot.in/2012/07/geology-for-civil-engineers-pdf-book.html
2. http://nptel.ac.in/courses/105105106/
3. https://www.studynama.com/community/threads/187-Engineering-Geology-Ebook-Lecture-Notes-PDF-download-for-Civil-Engineers
4. http://www.civilenggforall.com/p/engineering-geology-list-of-books.html

Course Home Page:

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

III Semester: AE / ME / CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEE018	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes:15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understand Kirchhoff laws and their application in series and parallel electric circuits.
II. Discuss principle and operation of measuring instruments.
III. Analyze the characteristics of alternating quantities, DC machines and AC machines.
IV. Illustrate the V-I characteristics of various diodes and bi-polar junction transistor.

UNIT-I	ELECTRIC CIRCUITS ,ELECTROMAGNETISM AND INSTRUMENTS	Classes: 10

Electrical Circuits**:** Basic definitions, types of elements, Ohm's Law, resistive networks, inductive networks, capacitive networks, Kirchhoff's laws, series, parallel circuits and star delta and delta star transformations, simple problems. Faradays law of electromagnetic induction. Instruments: Basic principles of indicating instruments, permanent magnet moving coil and moving iron instruments.

UNIT - II	DC MACHINES	Classes: 10

DC Machines: Principle of operation DC Generator, EMF Equation, types, DC motor types, torque equation applications, three point starter.

UNIT - III	ALTERNATING QUANTITIES &AC MACHINES	Classes: 08

Alternating quantities: sinusoidal Ac voltage, average, RMS, form and peak factor, concept of three phases AC. Transformer: Principle of operation of single phase transformers, EMF equation, Losses: Efficiency and regulation.

Induction motor: Principle of operation of induction motor: Slip, torque characteristics, applications; Alternator: Principle of operation of alternator, EMF equation, efficiency, and regulation by synchronous impedance method.

UNIT - IV	SEMICONDUCTOR DIODE AND APPLICATIONS	Classes: 09

Semiconductor diode: P-N junction diode, symbol, V-I characteristics, half wave rectifier, full wave rectifier, bridge rectifier and filters, diode as a switch, zener diode as a voltage regulator.

UNIT - V	BIPOLAR JUNCTION TRANSISTOR AND APPLICATIONS	Classes: 08

Bipolar junction: DC characteristics, CE, CB, CC configurations, biasing, load line, transistor as an amplifier.

Text Books:

1. A. Chakrabarti, “Circuit Theory”, Dhanpat Rai Publications, 6th Edition, 2004.
2. K. S .Suresh Kumar, “Electric Circuit Analysis”, Pearson Education, 1st Edition, 2013.
3. Willianm Hayt, Jack E. Kemmerly S.M.Durbin, “Engineering Circuit Analysis”, Tata McGraw-Hill, 7th Edition, 2010.
4. J. P. J. Millman, C. C. Halkias, Satyabrata Jit, “Millman‟s Electronic Devices and Circuits”, Tata McGraw Hill, 2nd Edition, 1998.

5. 5. R. L. Boylestad, Louis Nashelsky, “Electronic Devices and Circuits”, PEI/PHI, 9th Edition, 2006.
6. R. L. Boylestad, Louis Nashelsky, “Electronic Devices and Circuits”, PEI/PHI, 9th Edition, 2006.
7. V.K.Mehta, Rohit Mehta, “Principles of electrical engineering”, S.CHAND,1st Edition, 2003.

Reference Books:

1. David A.Bell, “Electric Circuits”, Oxford University Press, 9th Edition, 2016.
2. M. Arshad, “Network Analysis and Circuits”, Infinity Science Press, 9th Edition, 2016.
3. A. Bruce Carlson, “Circuits”, Cengage Learning, 1st Edition, 2008.
4. M. Arshad, “Network Analysis and Circuits”, Infinity Science Press, 9th Edition, 2016.
5. A. Bruce Carlson, “Circuits”, Cengage Learning, 1st Edition, 2008

Web References:

1. http://www.kuet.ac.bd/webportal/ppmv2/uploads/1364120248DC%20Machines2.pdftextofvideo.nptel.iitm.ac.in
2. https://eleccompengineering.files.wordpress.com/2014/08/a-textbook-of-electrical-technology-volume-ii-ac-and-dc-machines-b-l-thferaja.pdf
3. http://geosci.uchicago.edu/~moyer/GEOS24705/Readings/Klempner_Ch1.pdf
4. https://www.ibiblio.org/kuphaldt/electricCircuits/DC/DC.pdf
5. https://users.ece.cmu.edu/~dwg/personal/sample.pdf.
6. http://djm.cc/library/Principles_of_Alternating_Current_Machinery_Lawrence_edited.pdf

E-Text Books:

1. http://kisi.deu.edu.tr/aytac.goren/ELK2015/w10.pdfwww.bookboon.com.
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-071j-introduction-to-electronics-signals-and-measurement-spring-2006/lecture-notes/19_bjt_1.pdf.
3. https://www.google.co.in/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=half+and+full+wave+rectifier+pdf.
4. http://www.leka.lt/sites/default/files/vaizdai/concepts-in-electric-circuits.pdf.
5. www.ktustudents.in.

Course Home Page:

SURVEYING LABORATORY

III Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE101	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Gain the practical knowledge on calculation of an area, volume of an irregular and regular land surface using chains and tapes.
II. Operate different types of instruments in surveying. Perform levelling and contouring of ground surfaces.
III. Apply knowledge of mathematics in surveying field to calculate areas and volumes for different projects.
IV. Analyze survey data and design the civil engineering projects.

LIST OF EXPERIMENTS

Week- l	**INTRODUCTION TO SURVEYING LABORATORY -I**
Introduction to surveying laboratory. Do's and Don'ts in surveying lab.	
Week- 2	**SURVEY OF AN AREA BY CHAIN SURVEY (CLOSED TRAVERSE) AND PLOTTING.**
Batch I: Measurement of an area by chain survey Batch II: Measurement of an area by chain survey	
Week-3	**CHAINING ACROSS OBSTACLES.**
Batch I: Chaining across obstacles Batch II: Chaining across obstacles	
Week-4	**DETERMINATION OF DISTANCE BETWEEN TWO INACCESSIBLE POINTS WITH COMPASS.**
Batch I: Calculation of distance between two points with compass survey. Batch II: Calculation of distance between two points with compass survey.	
Week-5	**SURVEYING OF A GIVEN AREA BY PRISMATIC COMPASS (CLOSED TRAVERSE) AND PLOTTING AFTER ADJUSTMENT**
Batch I:Surveying of a given area by prismatic compass Batch II: Surveying of a given area by prismatic compass	
Week-6	**CORRECTION FOR LOCAL ATTRACTION BY PRISMATIC COMPASS.**
Batch I:Corrections for local attraction by prismatic compass Batch II: Corrections for local attraction by prismatic compass	
Week-7	**RADIATION METHOD, INTERSECTION METHODS BY PLANE TABLE SURVEY.**
Batch I: Radiation method and intersection methods by plane table survey. Batch II: Radiation method and intersection methods by plane table survey.	
Week-8	**TWO POINT PROBLEMS IN PLANE TABLE SURVEY.**
Batch I: Two point problems in plane table survey. Batch II: Two point problems in plane table survey.	

Week 9	**THREE POINT PROBLEMS IN PLANE TABLE SURVEY.**
Batch I: Three point problems in plane table survey. Batch II: Three point problems in plane table survey.	
Week-10	**TRAVERSING BY PLANE TABLE SURVEY.**
Batch I: Traversing by plane table survey. Batch II: Traversing by plane table survey.	
Week-11	**FLY LEVELING (DIFFERENTIAL LEVELING).**
Batch I: Fly leveling Batch II: Fly leveling	
Week-12	**AN EXERCISE OF LONGITUDINAL SECTION AND CROSS SECTION AND PLOTTING.**
Batch I : An exercise of longitudinal section and cross section and plotting. Batch II: An exercise of longitudinal section and cross section and plotting.	
Week-13	**TWO EXERCISES ON CONTOURING.**
Batch I : Two exercises on contouring. Batch II: Two exercises on contouring.	
Week-14	**REVISION**
Revision.	

Reference Books:

1. H. S. Moondra, Rajiv Gupta, "Laboratory Manual for Civil Engineering", CBS Publishers Pvt .Ltd., New Delhi, 2nd Edition, 2013.
2. James M. Anderson, Edward M. Mikhail, "Surveying: Theory and Practice", Tata McGraw Hill Education, 2012.
3. S. S. Bhavikatti, "Surveying Theory and Practice", IK Books, New Delhi, 2010.
4. IARE Surveying-I Laboratory Manual.

Web References:

1. http://www.iare.ac.in

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No	Name of equipment	Quantity
1	Measuring chains - 30mtrs length	6
2	Ranging rods (3folds)	40
3	Cross staff with rod	6
4	Plane table set with stand	6
5	Prismatic compass with tripod	12
6	Surveyor Compass with tripod	3
7	Optical square	6
8	Dumpy level with aluminum stand	6
9	Aluminum leveling staffs	8
10	Box sextants	2
11	Plani meter	1
12	Vernier-theodolite	5
13	Digital theodolite	1
14	Auto level	2
15	Arrows	50
16	Plumbing fork	5

COMPUTER AIDED DRAFTING OF BUILDINGS

III Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE102	Foundation	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Understand and study CAD commands for drafting any type of civil engineering drawings.
II. Implement building regulations for designing of buildings.
III. Draft plans of single and multistoried buildings.
IV. Develop the detailing of building components such as roof truss, doors, windows etc.

LIST OF EXPERIMENTS

Week - 1	**INTRODUCTION TO COMPUTER AIDED DRAFTING**
Introduction to computer aided drafting. Do's and Don'ts in CAD lab.	
Week - 2	**AUTO CAD COMMANDS**
Batch I: Explanation of CAD commands. Batch II: Explanation of CAD commands.	
Week - 3	**PRACTISE ON CAD COMMANDS**
Batch I: Practice exercises on CAD commands. Batch II: Practice exercises on CAD commands.	
Week - 4	**PLANS OF BUILDING**
Batch I: Basic drawing of plans of building using software. Batch II: Basic drawing of plans of building using software.	
Week - 5	**PLAN OF SINGLE STOREYED BUILDING**
Batch I: Single storeyed building. Batch II: Single storeyed building.	
Week - 6	**PLAN OF MULTI STOREYED BUILDING**
Batch I: Multi storeyed building. Batch II: Multi storeyed building.	
Week - 7	**DETAILING OF BUILDING COMPONENTS**
Batch I: Detailing of building components like doors, windows, roof trusses etc. using CAD software. Batch II: Detailing of building components like doors, windows, roof trusses etc. using CAD software.	
Week - 8	**DEVELOPMENT OF BUILDING**
Batch I: Exercises on development of working of buildings. Batch II: Exercises on development of working of buildings.	
Week - 9	**REVISION**
Revision	

Reference Books:

1. M. N. Sesha Prakash, Dr. G. S. Servesh, "Computer Aided Design Laboratory", Laxmi Publications, 2012.
2. P.J.Sha, "Engineering Graphics", S. Chand Publishers, 2014.

Web References:

1. https://www.youtube.com/results?search_query=autocad+tutorial+for+civil+engineers
2. http://www.vidyarthiplus.com/vp/thread-22964.html#.V0l5Pvl97IU
3. http://www.annauniverzity.com/civil-engineering/ce6312-computer-aided-building-drawing/

Course Home Page:

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: System Software: Microsoft Windows 7
Application Software: AutoCAD

HARDWARE: 36 numbers of Desktop Computer Systems

ENGINEERING GEOLOGY LABORATORY

III Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE103	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Study the physical properties of minerals and rocks.
II. Identify rocks and mineral by megascopic and microscopic techniques.
III. Interpret and draw profiles and sections of different geological features.
IV. Solve simple structure geology problems.

LIST OF EXPERIMENTS

Week 1	**INTRODUCTION TO ENGINEERING GEOLOGY LABORATORY**
Introduction to geological maps and earthen features. Do's and Don'ts in geology lab.	
Week 2 & 3	**PHYSICAL PROPERTIES AND IDENTIFICATION OF MINERALS**
Study of physical properties and identification of minerals referred under theory.	
Week 3 & 6	**MEGASCOPIC AND MICROSCOPIC STUDY**
Megascopic and microscopic description and identification of rocks referred under theory.	
Week 7 & 8	**MEGASCOPIC AND MICROSCOPIC IDENTIFICATION**
Megascopic and microscopic identification of rocks and minerals.	
Week 9 & 10	**INTERPRETATION AND DRAWING OF GEOLOGICAL MAPS**
Interpretation and drawing of section for geological maps showing titled beds, faults, uniformities etc.	
Week 11 &12	**STRUCTURE GEOLOGY PROBLEMS**
Simple structure geology problems.	

Reference Books:

1. Fred G. Bell, "Engineering Geology and Construction" Spon Press, London, 2004.
2. Robert B. Johnson, Jerome V. Degraff , "Engineering Geology: A Lab Manual", Macmillan Publishing Company, 1st Edition, 1994.

Web References:
1. https://www.youtube.com/results?search_query=engineering+geology+lab 2. http://www.wctmgurgaon.com/pdf/EG%20Lab%20Manual.pdf 3. http://civil.gecgudlavalleru.ac.in/pdf/manuals/EngineeringGeologyLabManual.pdf
Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No	Name of the Component	Quantity
1	Mineral specimens	43
2	Rock specimens	26
3	Streak collection (10 minerals)	1
4	Streak plates	30
5	Plastic specimen trays	100
6	Geological Maps	4
7	Binocular Polarizer and Ore Microscope	1
8	Magnifying glass	3

MATHEMATICAL TRANSFORM TECHNIQUES

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS011	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Express non periodic function to periodic function using Fourier series and Fourier transforms.
II. Apply Laplace transforms and Z-transforms to solve differential equations.
III. Formulate and solve partial differential equations.

UNIT-I	**FOURIER SERIES**	**Classes: 09**

Definition of periodic function, determination of fourier coefficients; Fourier expansion of periodic function in a given interval of length 2π; Fourier series of even and odd functions; Fourier series in an arbitrary interval; Half- range Fourier sine and cosine expansions.

UNIT-II	**FOURIER TRANSFORMS**	**Classes: 09**

Fourier integral theorem, Fourier sine and cosine integrals; Fourier transforms; Fourier sine and cosine transform, properties, inverse transforms, finite fourier transforms.

UNIT-III	**LAPLACE TRANSFORMS**	**Classes: 09**

Definition of laplace transform, linearity property, piecewise continuous function, existence of laplace transform, function of exponential order, first and second shifting theorems, change of scale property, laplace transforms of derivatives and integrals, multiplied by t, divided by t, laplace transform of periodic functions.

Inverse Laplace transform: Definition of Inverse laplace transform, linearity property, first and second shifting theorems, change of scale property, multiplied by s, divided by s; Convolution theorem and applications.

UNIT-IV	**Z –TRANSFORMS**	**Classes: 09**

Z-transforms: Elementary properties, inverse Z-transform, convolution theorem, formation and solution of difference equations.

UNIT-V	**PARTIAL DIFFERENTIAL EQUATIONS AND APPLICATIONS**	**Classes: 09**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equation by lagrange method; Charpit's method; Method of separation of variables; One dimensional heat and wave equations under initial and boundary conditions.

Text Books:

1. Kreyszig,"AdvancedEngineeringMathematics",JohnWiley&SonsPublishers, 10th Edition, 2010.
2. B. S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 42nd Edition, 2013.

Reference Books:

1. S. S. Sastry, "Introduction methods of numerical analysis", Prentice-Hall of India Private Limited, 5th Edition, 2005
2. G. Shanker Rao, "Mathematical Methods", I. K. International Publications, 1st Edition, 2011.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://www.mathworld.wolfram.com/

E-Text Books:

1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook- download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks

Course Home Page:

STRENGTH OF MATERIALS - II

IV Semester: CE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE004	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The Course should enable the students to:

I. Apply the concepts of strain energy and virtual work to calculate deflections in beams.
II. Discuss about springs and their various types of combination connections.
III. Outline of columns and struts with different end conditions and awareness about laterally loaded struts.
IV. Understand direct and bending stresses in concrete structures like retaining wall, chimney and dams

UNIT-I	DEFLECTIONS OF BEAMS	Classes: 09

Bending into a circular arc, slope, deflection and radius of curvature, differential equation for the elastic line of a beam, double integration and Macaulay's methods, determination of slope and deflection for cantilever and simply supported beams subjected to various loads, Mohr's theorems, moment area method, application to simple cases including overhanging beams; Conjugate beam method, concept of conjugate beam method, difference between a real beam and a conjugate beam, deflections of determinate beams with constant and different moments of inertia.

UNIT-II	DEFLECTIONS BY ENERGY METHODS	Classes: 09

Strain Energy: Resilience gradual, sudden, impact and shock loadings simple applications; Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear force; Energy Methods: Work energy method, principal of virtual work, unit load method, Castigliano's theorem; Deflections of simple beams and pin jointed trusses; Concept extended to frames and indeterminate structures; Maxwell's theorem of reciprocal deflections; Betti's Law.

UNIT-III	STRESSES IN CYLINDERS AND SPHERICAL SHELLS	Classes: 09

Thin seamless cylindrical shells, derivation of formula for longitudinal and circumferential stresses, hoop, longitudinal and volumetrical strains, changes in diameter and volume of thin cylinders, thin spherical shells.

Lames theory for thick cylinders, derivation of lames formulae, distribution of hoop and radial stresses across thickness, design of thick cylinders, compound cylinders, necessary difference of radii for shrinkage, thick spherical shells.

UNIT-IV	INDETERMINATE BEAMS: PROPPED CANTILEVER AND FIXED BEAMS	Classes: 09

Analysis of propped cantilever and fixed beams using the method of consistent deformation, including the beams with varying moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads, shear force and bending moment diagrams for propped cantilever and fixed beams, deflection of propped cantilever and fixed beams; Effect of rotation of a support.

UNIT-V	INDETERMINATE BEAMS: CONTINUOUS BEAMS	Classes:09

Continuous beams, Clapeyron's theorem of three moments, analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed, continuous beams with overhang; Effects of sinking of supports.

Text Books:

1. F. Beer, E. R. Johnston, J. DeWolf , "Mechanics of Materials", Tata McGraw-Hill Publishing Company Ltd., New Delhi, India, 1st Edition, 2008.
2. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, "Mechanics of Materials", Laxmi Publications Pvt. Ltd., New Delhi, 12th Edition, 2007.
3. S. S. Bhavikatti, "Strength of Materials", Vikas Publishing House Pvt. Ltd., New Delhi, 5th Edition, 2013.
4. R. K. Bansal, "A Textbook of Strength of Materials", Laxmi Publications (P) Ltd., New Delhi, 2nd Edition, 2007.

Reference Books:

1. D. S. Prakash Rao, "Strength of Materials A Practical Approach Vol.1", Universities Press (India) Pvt. Ltd., India, 3rd Edition, 2007.
2. J. M. Gere, S.P. Timoshenko, "Mechanics of Materials, SI units edition", CL Engineering, USA, 5th Edition, 2000.
3. E. G. Popov, "Engineering Mechanics of Solids", Pearson Education, India, 21st Edition, 2015.
4. N. Krishan Raju and D.R.Gururaje, "Advanced Mechanics of Solids and Structures", Narosa Publishing House, 4th Edition, 2014.

Web References:

1. http://www.nptelvideos.in/2012/11/strength-of-materials-prof.html
2. http://ocw.mit.edu/courses/civil-and-environmental-engineering/1-050-solid-mechanics-fall-
3. 2004/lecture-notes/
   Website:https://www.youtube.com/watch?v=coRgpxG2pyY&list=PLLbvVfERDon3oDfCYxkwRct1Q6YeOzi9g

E-Text Books:

1. http://physics.fe.uni-lj.si/students/literatura/20131029083424925_2.pdf
2. http://staff.fit.ac.cy/eng.sh/lessons/AMEM%20314/AMEM_314_Theory.doc

Course Home Page:

FLUID MECHANICS

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE005	Core	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes:15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understand and study the effect of fluid properties on a flow system.
II. Apply the concept of fluid pressure, its measurements and applications.
III. Explore the static, kinematic and dynamic behavior of fluids.
IV. Assess the fluid flow and flow parameters using measuring devices.

UNIT-I	INTRODUCTION	Classes: 09

Dimensions and units , physical properties of fluids, ideal and real fluids, newtonian and non-newtonian fluids, measurement of surface tension, specific gravity, viscosity, vapor pressure and their influences on fluid motion pressure at a point, Pascal's law, hydrostatic law ,atmospheric, gauge and vacuum pressure, pressure measurement, piezometers and manometers, pressure gauges, manometers: differential and micro manometers. Hydrostatic Forces**:** Hydrostatic forces on submerged plane, horizontal, vertical, inclined and curved surfaces, centre of pressure, derivations and problems.

UNIT-II	FLUID KINEMATICS	Classes: 09

Description of fluid flow, stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows, equation of continuity for one, two , three dimensional flows , velocity field, one & two-dimensional flow analysis, circulation and vorticity, stream function, potential flow, standard flow patterns, combination of flow patterns, flownet, flownet analysis.

UNIT-III	FLUID STATICS AND FLUID DYNAMICS	Classes: 09

Pressure-density-height relationship, manometers, pressure on plane and curved surfaces, center of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to uniform accelerations, measurement of pressure.

Surface and body forces, Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, (Navier, stokes equations (Explanationary)) momentum equation and its application, forces on pipe bend. Pitot tube, venturimeter and orifice meter, classification of orifices, flow over rectangular, triangular and trapezoidal and stepped notches, broad crested weirs.

UNIT-IV	BOUNDARY LAYER THEORY	Classes: 09

Approximate Solutions of Navier stoke's equations , boundary layer , concepts, Prandtl contribution, Characteristics of boundary layer along a thin flat plate, Vonkarmen momentum integral equation, laminar and turbulent boundary layers (no deviation), BL in transition, separation of BL, control of BL, flow around submerged objects-Drag and Lift- Magnus effect.

UNIT-V	CLOSED CONDUIT FLOW	Classes: 09

Reynolds's experiment, Laminar and turbulent flow through pipes and velocity distributions. Elements of Boundary layer theory drag and lift elements of aero-foil theory. Characteristics of laminar & turbulent flows. Flow between parallel plates, flow through long tubes, flow through inclined tubes. Laws of fluid friction, Darcy's equation, branching pipes, pipe networks minor losses, total energy line and hydraulic gradient line. Flow measurements by pitot tube, venturimeter, orifice meter. Flow through orifices, mouthpieces, notches and weirs, pipe network problems, variation of friction factor with Reynolds's number, Moody's Chart.

Text Books:

1. Modi and Seth, "Fluid Mechanics", Standard book house, 2011.
2. S.K.Som & G.Biswas, "Introduction to Fluid Machines", Tata Mc Grawhill publishers Pvt. Ltd, 2010.
3. Potter, "Mechanics of Fluids", Cengage Learning Pvt. Ltd., 2001.
4. V.L. Streeter and E.B. Wylie, "Fluid Mechanics", McGraw Hill Book Co., 1979.

Reference Books:

1. Shiv Kumar, "Fluid Mechanics Basic Concepts & Principles", Ane Books Pvt Ltd., 2010.
2. Frank.M. White, "Fluid Mechanics", Tata Mc Grawhill Pvt. Ltd., 8th Edition, 2015.
3. R.K. Bansal ,"A text of Fluid mechanics and hydraulic machines" - Laxmi Publications (P) ltd., New Delhi, 2011.
4. D. Ramdurgaia, " Fluid Mechanics and Machinery", New Age Publications, 2007.
5. Robert W. Fox, Philip J. Pritchard, Alan T. McDonald, "Introduction to Fluid Mechanics", Student Edition Seventh, Wiley India Edition, 2011.

Web References:

1. http://nptel.ac.in/courses/112105171/1
2. http://nptel.ac.in/courses/105101082/
3. http://nptel.ac.in/courses/112104118/ui/TOC.htm

E-Text Books:

1. http://engineeringstudymaterial.net/tag/fluid-mechanics-books/
2. http://www.allexamresults.net/2015/10/Download-Pdf-Fluid-Mechanics-and-Hydraulic-Machines-by-rk-Bansal.html
3. http://varunkamboj.typepad.com/files/engineering-fluid-mechanics-1.pdf

Course Home Page:

GEOTECHNICAL ENGINEERING

IV Semester: CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE006	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. List the index, engineering properties and standard classifications of soils.
II. Identify the engineering properties of soil and determine the same using laboratory experiments.
III. Discuss soil compaction mechanisms and factors effecting compaction of soils.
IV. Determine the shear strength of soil by Mohr and Coulomb failure theories.

UNIT-I	INTRODUCTION AND INDEX PROPERTIES OF SOILS	Classes:09

Soil formation, clay mineralogy and soil structure, moisture content, weight-volume relationships, relative density. Grain size analysis, sieve analysis, principle of hydrometer method, consistency limits and indices, I.S. classification of soils.

UNIT-II	PERMEABILITY, EFFECTIVE STRESS AND SEEPAGE THROUGH SOILS	Classes:09

Capillary rise, flow of water through soils, Darcy's Law, permeability, factors affecting permeability, laboratory & field tests for determination of coefficient of permeability, permeability of layered soils; Total, neutral and effective stress, upward and downward seepage through soils, quick sand condition, flow nets: characteristics and uses.

UNIT-III	STRESS DISTRIBUTION IN SOILS AND COMPACTION	Classes:09

Boussinesq's and Westergard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along vertical and horizontal plane, Newmark's influence chart for irregular areas.

Mechanism of compaction, factors affecting compaction, effects of compaction on soil properties, field compaction equipment and compaction quality control.

UNIT-IV	CONSOLIDATION	Classes:09

Types of compressibility, immediate settlement, primary consolidation and secondary consolidation, stress history of clay, e-p and e-logp curves, normally consolidated soil , over and under consolidated soil, pre-consolidation pressure and its determination, Terzaghi's 1-D consolidation theory, coefficient of consolidation square root time and logarithm of time fitting methods, computation of total settlement and time rate of settlement.

UNIT-V	SHEAR STRENGTH OF SOILS	Classes:09

Importance of shear strength, mohr and coulomb failure theories, types of laboratory tests for strength parameters, strength tests based on drainage conditions, strength envelops, shear strength of sands, dilatancy, critical void ratio, liquefaction, shear strength of clays.

Text Books:

1. Braja M.Das, "Principles of geotechnical engineering" Cengage learning publishers, 2002.
2. VNS Murthy, "Soil mechanics and foundation engineering", CBS publishers and distributors, 2003.
3. Gopal Ranjan and ASR Rao, "Basic and applied soil mechanics", New age international Pvt. Ltd, New Delhi, 2000.

Reference Books:

1. C. Venkataramiah, "Geotechnical engineering", New Age International Pvt. Ltd, 2002.
2. Manoj dutta and Gulati, "Geotechnical engineering", Tata Mc Grawhill publishers New Delhi, 2005.
3. K.R .Arora, "Soil mechanics and foundation engineering", standard publishers and distributors, New Delhi, 2005.
4. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Soil mechanics and foundation", Laxmi publications Pvt. Ltd, New Delhi, 2005.

Web References:

1. http://nptel.ac.in/courses/105107120/1#
2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-364-advanced-geotechnical-engineering-fall-2003/index.htm
3. http://www.nptel.ac.in/courses/105105105/
4. http://www.nptel.ac.in/courses/105105104/

E-Text Book:

1. https://books.google.co.in/books?id=L_vjBwAAQBAJ&dq=foundation+engineering+lectures&source=gbs_navlinks_s

Course Home Page:

BUILDING MATERIALS CONSTRUCTION AND PLANNING

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE007	Foundation	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Develop knowledge of material science and behavior of various building materials used in construction.
II. Identify the construction materials required for the assigned work.
III. Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc.
IV. List the requirements and different types of stairs.

UNIT-I	STONES, BRICKS AND AGGREGATES:	Classes: 09

Properties of building stones, relation to their structural requirements. Classification of stones, stone quarrying, precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacture of bricks, Comparison between clamp burning and kiln burning; Fine aggregate: Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content, deleterious materials; Coarse aggregate: Natural and manufactured: Importance of size, shape and texture.

UNIT-II	CEMENT AND ADMIXTURES:	Classes: 09

Various types of cement and their properties; Various file and laboratory tests for cement; Various ingredients of cement concrete and their importance, various tests for concrete; Field and tests admixtures, mineral and chemical admixture.

UNIT-III	BUILDING COMPONENTS AND FOUNDATIONS:	Classes: 09

Lintels, arches, different types of floors-concrete, mosaic, terrazzo floors, pitched, flat and curved roofs, lean-to-roof, coupled roofs, trussed roofs, king and queen post.

Trusses; RCC roofs, madras terrace/shell roofs; Foundations: Shallow foundations, spread, combined, strap and mat footings.

UNIT-IV	WOOD, ALUMINUM AND GLASS:	Classes: 09

Structure, properties, seasoning of timber; Classification of various types of woods used in buildings, defects in timber; Alternative materials for wood, galvanized iron, fiber-reinforced plastics, steel, aluminum; Types of masonry, english and flemish bonds, rubble and ashlars masonry, cavity and partition walls.

UNIT-V	STAIRS AND BUILDING PLANNING;	Classes: 09

Stairs**:** Definitions, technical terms and types of stairs, requirements of good stairs; Geometrical design of RCC doglegged and open-well stairs; Principles of building planning, classification building and planning and building by laws.

TEXT BOOKS:

1. Sushil Kumar "Building Materials and construction", Standard Publishers, 20th edition, reprint, 2015.
2. Dr. B.C.Punmia, Ashok kumar Jain, Arun Kumar Jain, "Building Construction, Laxmi Publications (P) ltd., New Delhi.

3. Rangawala S. C. “Engineering Materials”, Charter Publishing House, Anand, India.

REFERENCE BOOKS:

1. S.K.Duggal, “Building Materials”, (Fourth Edition)New Age International (P) Limited, 2016
2. National Building Code(NBC) of India
3. P C Vergese, “Building Materials”, PHI Learning Pvt. Ltd, 2nd Edition, 2015.
4. Building Materials and Components, CBRI, India, 1990.
5. Jagadish.K.S, “Alternative Building Materials Technology”, New Age International, 2007.
6. M. S. Shetty, “Concrete Technology”, S. Chand & Co. New Delhi, 2005.

WEB REFERENCES:

1.http://nptel.ac.in/courses/105102088/
2.http://nptel.ac.in/courses/105101088/2

E-TEXT BOOKS:

1. http://www.freeengineeringbooks.com/civil-books-download/building-materials-construction.php
2. http://www.freeengineeringbooks.com/civil-books-download/building-materials.php

Course Home Page:

STRENGTH OF MATERIALS LABORATORY

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE104	Foundation	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Examine the mechanical properties of different solid engineering materials.
II. Identify the behavior of various material samples under different loads and equilibrium conditions.
III. Experiment with materials subjected to tension, compression, shear, torsion, bending and impact.
IV. Extract and analyze material testing data and its interpretation.

LIST OF EXPERIMENTS

Week - 1 **DIRECT TENSION TEST**

Direct Tension test: To evaluate the tensile strength, the elastic limits and the young's modulus of a mild steel bar in tension using the universal testing machine.

Week - 2 **BENDING TEST ON CANTILEVER BEAM**

(a) To evaluate the deflections of the beam made of wood.
(b) To evaluate the deflections of the beam made of steel.

Week - 3 **BENDING TEST ON SIMPLY SUPPORTED BEAM:**

(a) To evaluate the deflections of the beam made of wood.
(b) To evaluate the deflections of the beam made of steel.

Week - 4 **TORSION TEST**

To conduct torsion test on mild steel or cast iron specimen to determine modulus of rigidity.

Week - 5 **HARDNESS TEST**

To conduct hardness test on mild steel, carbon steel, brass and aluminum specimens using
(a) Brinell's Hardness Test.
(b) Rockwell's Hardness Test.

Week - 6 **SPRING TEST**

To determine the stiffness and modulus of rigidity of a spring wire.

Week - 7 **COMPRESSION TEST**

To perform compression test on UTM for
(a) Wooden block.
(b) Concrete block.

Week - 8 **IMPACT TEST**

To evaluate the impact strength of steel specimen using
(a) Izod test.
(b) Charpy Test.

Week - 9	**SHEAR TEST**
To evaluate the shear strength of the given specimens using universal testing machine.	
Week - 10	**BEAM DEFLECTIONS**
To verify the Maxwell's reciprocal theorem for beam deflections.	
Week - 11	**STRAIN MEASUREMENT**
Use of electrical resistance strain gauges	
Week - 12	**DEFLECTION OF CONTINUOUS BEAM**
To evaluate deflections on a continuous beam.	

Reference Books:

1. Hemant Sood, **"**Laboratory Manual on Testing of Engineering Materials", New Age International Publishers, New Delhi, 2nd Edition, 2007.
2. H.S. Moondra, Rajiv Gupta, "Laboratory Manual for Civil Engineering", CBS Publishers, New Delhi, 4th Edition, 2015.

Web References:

1. https://www.youtube.com/user/MaterialsScience 2000.

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No	Name of the Component	Quantity
1	Universal testing machine for conducting tension test	1
2	Torsion testing machine	1
3	Brinnell's hardness testing machine	1
4	Compression testing machine	1
5	IZOD impact machine	1
6	Maxwell's theorem verification set up	1
7	Continuous beam set up	1
8	Shear testing machine	1
9	Spring testing machine	1

GEOTECHNICAL ENGINEERING LABORATORY

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE105	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Analyze the type of soil by determining the index properties using laboratory methods
II. Identify the engineering properties of the soil which are useful in the design of foundations and other earth retaining structures
III. Estimate the shear strength of various soils by determining their shear strength parameters.
IV. Predict the compressibility of the soil and estimate the consolidation settlement of the clayey soils.

LIST OF EXPERIMENTS

Week- l	**MOISTURE CONTENT**
To determine the natural moisture content of the given soil sample.	
Week- 2	**SPECIFIC GRAVITY**
Determine the specific gravity of soil fraction passing 4.75 mm I.S sieve by density bottle.	
Week- 3	**ATTERBERG'S LIMITS**
To determine liquid limit, plastic limit, shrinkage limit, classify the soil and to find flow index and toughness index	
Week- 4	**RELATIVE DENSITY**
To determine the relative density of given coarse grained material	
Week- 5	**FIELD DENSITY- CORE CUTTER AND SAND REPLACEMENT METHOD**
To determine the mass density of soils by core cutter method and replacement method	
Week- 6	**GRAIN SIZE ANALYSIS**
To classify the coarse grained soils based on sieve analysis	
Week- 7	**PERMEABILITY OF SOIL: CONSTANT AND VARIABLE HEAD TEST**
To determine coefficient of permeability of given soil sample at desired density by a suitable method.	
Week- 8	**COMPACTION TEST**
To determine the optimum moisture content and maximum dry density of a soil by proctor test.	
Week- 9	**CBR TEST**
To determine the California bearing ratio by conducting a load penetration test in the laboratory.	

Week- 10	**CONSOLIDATION TEST**
To determine the settlements due to primary consolidation of soil by conducting one dimensional test.	
Week- 11	**UNCONFINED COMPRESSION TEST**
To determine the unconfined compressive strength of cohesive soil sample and its sensitivity.	
Week- 12	**TRIAXIAL COMPRESSION TEST**
To determine shear strength parameter i.e. angle of shearing resistance and cohesion of a given soil sample.	
Week- 13	**DIRECT SHEAR TEST**
To determine shear strength parameters of the given soil sample at known density and moisture content by direct shear test.	
Week- 14	**VANE SHEAR TEST**
To determine the shear strength of clay specimen.	
Week- 15	**STANDARD PENETRATION TEST**
To measure the resistance to penetration of a sampling spoon in soil under dynamic loading.	

Reference Books:

1. Braja M. Das, "Soil Mechanics Laboratory Manual", Engineering Press at OUP, 2001.
2. Michael E. Kalinski, "Soil Mechanics Lab Manual", John Wiley & Sons, 2006.
3. Head, "Manual of Soil Lab Testing: Effect. Stress Tests", CBS Publishers, 1997.

Web References:

http://home.iitk.ac.in/~madhav/

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No	Name of the Component	Quantity
1	Liquid limits apparatus with grooving tools	2
2	Plastic limit apparatus	2
3	Shrinkage limit apparatus	2
4	Sand replacement apparatus	2
5	Cylinder core and rammer	2
6	Mechanical sieve shaker	1
7	Compaction test apparatus	1
8	CBR test machine	1
9	Consolidation test apparatus	1
10	Unconfined compression test machine	1
11	Vane shear test apparatus	1
12	Triaxial cell, compression test machine	1
13	Direct shear test apparatus	1
14	Permeability apparatus (constant and variable head)	1
15	Pycnometer	4
16	I.S sieves	2 sets
17	Hot air oven	1
18	Measuring jars	4
19	Electronic balance (0.01 gm sensitivity)	2
20	Electronic balance (0.5 gm sensitivity)	2
21	Electronic balance (5 gm sensitivity)	2
22	Porcelain Dishes	6
23	GI trays (60 x 60 cm)	2
24	GI trays (30 x 30 cm)	3
25	Moisture cans	20
26	Sampling tubes	4
27	Sample extractor	1
28	Standard Penetration test equipment	1

ADVANCED SURVEYING LABORATORY

IV Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE106	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45				Total Classes:45		

OBJECTIVES:

The course should enable the students to:

I. Identify principle for theory of errors for correction of measurement.
II. Apply knowledge of astronomy for solving civil engineering problems.
III. Distinguish heights and distances using trigonometric method.
IV. Utilize total station and other modern survey instruments.

LIST OF EXPERIMENTS

Week- l	**INTRODUCTION TO ADVANCED SURVEYING LABORATORY**

Introduction to surveying laboratory. Do's and Don'ts in surveying lab.

Week- 2	**STUDY OF THEODOLITE IN DETAIL-PRACTICE FOR MEASUREMENT OF HORIZONTAL AND VERTICAL ANGLES.**

Batch I: Study of theodolite
Batch II: Study of theodolite

Week-3	**MEASUREMENT OF HORIZONTAL ANGLES BY METHOD OF REPETITION AND REITERATION.**

Batch I: Measurement of horizontal angles
Batch II: Measurement of horizontal angles

Week-4	**TRIGONOMETRIC LEVELING- HEIGHTS AND DISTANCE PROBLEMS**

Batch I: Trigonometric leveling- heights and distance problems
Batch II: Trigonometric leveling- heights and distance problems

Week-5	**CURVE SETTING –DIFFERENT METHODS**

Batch I: Curve setting: different methods.
Batch II: Curve setting: different methods.

Week-6	**SETTING OUT WORKS FOR BUILDINGS AND PIPE LINES**

Batch I: Setting out works for buildings and pipe lines.
Batch II: Setting out works for buildings and pipe lines.

Week-7	**DETERMINATION OF AN AREA USING TOTAL STATION**

Batch I: Determination of an area using total station.
Batch II: Determination of an area using total station.

Week-8	**TRAVERSING USING TOTAL STATION**

Batch I: Determination of an area using total station.
Batch II: Determination of an area using total station.

Week 9	**HEIGHTS AND DISTANCES USING PRINCIPLES OF TACHEOMETRIC SURVEY**
Batch I: Heights and distances using principles of tacheometric survey. Batch II: Heights and distances using principles of tacheometric survey.	
Week-10	**CONTOURING USING TOTAL STATION**
Batch I: Contouring using total station. Batch II: Contouring using total station.	
Week-11	**DETERMINATION OF REMOTE HEIGHT USING TOTAL STATION**
Batch I: Determination of remote height using total station. Batch II: Determination of remote height using total station.	
Week-12	**STATE-OUT USING TOTAL STATION**
Batch I: State-out using total station. Batch II: State-out using total station.	
Week-13	**CALCULATING DISTANCE, GRADIENT AND DIFFERENT HEIGHTS BETWEEN TWO INACCESSIBLE POINTS USING TOTAL STATION.**
Batch I: Calculating distance, gradient and different heights between two inaccessible points using total station. Batch II: Calculating distance, gradient and different heights between two inaccessible points using total station.	
Week-14	**REVISION**
Revision.	

Reference Books:

1. James M. Anderson, Edward M. Mikhail, "Surveying: Theory and Practice", Tata McGraw-Hill Education, 7th Edition, 2012.
2. S. S.Bhavikatti, "Surveying Theory and Practice" IK Books New Delhi, 4th Edition, 2010.
3. H.S. Moondra, Rajiv Gupta "Laboratory Manual for Civil Engineering", CBS Publishers Pvt .Ltd New Delhi, 2nd Edition, 2013.
4. P. Venugopala Rao, Vijayalakshmi Akella, "Textbook on surveying", PHI Learning, New Delhi, 1st Edition, 2015.

Web References:

1. http://www.iare.ac.in

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S.No	Name of the Equipment	Quantity
1	Total Stations	2
2	Measuring Chain (20 m length)	6
3	Measuring Chain (30 m length)	2
4	Measuring Tape (30 m Length)	4

STRUCTURAL ANALYSIS

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE008	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Describe the processes of analysis of various structures such as beams, trusses, arches and frames.
II. Analyze statically indeterminate structures using force and displacement methods.
III. Draw the shear force, bending moment and influence line diagrams for various structures.
IV. Examine the various structures to calculate critical stresses and deformations.

UNIT-I	**ANALYSIS OF PIN-JOINTED FRAMES (TRUSSES)**	**Classes: 08**

Types of frames, perfect, imperfect and redundant. Pin jointed frames (trusses), analysis of determinate pin jointed frames , analysis of determinate pin jointed frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT-II	**ARCHES**	**Classes: 10**

Introduction, types of arches, comparison between three hinged and two hinged arches; Normal thrust and radial shear in an arch; Geometrical properties of parabolic and circular arch; Three hinged circular arch at different levels; Absolute maximum bending moment diagram for a three hinged arch; Two hinged arches: Introduction, classification of two hinged arches, analysis of two hinged parabolic arches, secondary stresses in two hinged arches due to temperature and elastic shortening of rib.

UNIT-III	**FORCE METHOD OF ANALYSIS OF INDETERMINATE BEAMS**	**Classes: 10**

Analysis of propped cantilever and fixed beams using the method of consistent deformation, including the beams with varying moments of inertia, subjected to uniformly distributed load, central point load, eccentric point load, number of point loads, uniformly varying load, couple and combination of loads, shear force and bending moment diagrams for propped cantilever and fixed beams, deflection of propped cantilever and fixed beams; effect of rotation of a support.

Continuous beams, Clapeyron's theorem of three moments, analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed, continuous beams with overhang. Effects of sinking of supports.

UNIT-IV	**DISPLACEMENT METHOD OF ANALYSIS: SLOPE DEFLECTION AND MOMENT DISTRIBUTION**	**Classes: 09**

Derivation of slope, deflection equation, concept of moment distribution method, application of the methods to continuous beams with and without settlement of supports. Shear force and bending moment diagrams, elastic curve, application of the methods to single bay, single storey frames with and without sway.

UNIT-V	**MOVING LOADS AND INFLUENCE LINES**	**Classes: 08**

Introduction, maximum shear force, and bending moment; At a given section and absolute maximum shear force and bending moment due to various load cases, focal length; Definition of influence line for shear force, influence line for bending moment, load position for maximum SF at a section, load position for maximum BM at a section, for various loads.

Text Books:

1. Devadas Menon , “Structural Analysis Vol.1 and Vol. 2”, Narosa Publishers, New Delhi, 2010.
2. S. S. Bhavikatti, “Structural Analysis Vol.1 and Vol. 2”, Vikas Publishing House, New Delhi, 2010.
3. R. C. Hibbler, “Structural Analysis”, Pearson Education, India, 2008.

Reference Books:

1. T. S. Thandavamoorthy, “Structural Analysis”, Oxford Higher Education, India, 2011.
2. C. S. Reddy , “Basic Structural Analysis”, McGraw Hill Education (India), Delhi, 2000.
3. C. K. Wang, “Intermediate Structural Analysis”, McGraw Hill Education (India), Delhi, 2010.

Web References:

1. http://nptel.ac.in/courses/105101085/
2. http://nptel.ac.in/courses/105105109/
3. http://freevideolectures.com/Course/97/Structural,Analysis,II

E-Text Books:

http://weccivilians.weebly.com/uploads/2/4/6/2/24623713/design_of_reinforced_concrete_9th_edition_,_jack_c._mccormac.pdf

Course Home Page:

REINFORCED CONCRETE STRUCTURES DESIGN AND DRAWING

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE009	Core	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Identify, formulate and solve engineering problems of RC elements.
II. Differentiate between working stress design and limit state design.
III. Understand the importance of limit state design in reinforced concrete structures.
IV. Design of different structural members like beam, slab, column, footing and stair case.

UNIT-I	DESIGN CONCEPTS	Classes: 09

Concepts of reinforced concrete design, design Load, limit state method, material Stress, strain curves, safety factors, characteristic values; Stress block parameters, modes of failure - IS – 456: 2000 - working stress method; Beams: Limit state analysis and design of singly reinforced, doubly reinforced, T and L beam sections.

UNIT-II	LIMIT STATE DESIGN	Classes: 09

Shear, torsion and bond: Limit state analysis and design of section for shear and torsion, concept of bond, anchorage and development length, I.S. code provisions; Design examples in simply supported and continuous beams, detailing; Limit state design for serviceability for deflection, cracking and codal provision; General aspects of serviceability, deflection limits in IS: 456–2000, calculation of deflection (theoretical method), cracking in structural concrete members, calculation of deflections and crack width.

UNIT-III	DESIGN OF SLAB	Classes: 09

Design of two-way slabs, one way slab.

Design of continuous slab using I S coefficients, cantilever slab / canopy slab.

UNIT-IV	DESIGN OF COLUMNS	Classes: 09

Short and long columns, axial loads, uniaxial and biaxial bending I S Code provisions.

UNIT-V	DESIGN OF FOOTING AND STAIR CASE	Classes: 09

Design of footing: isolated (square, rectangular) and combined footings. Design of stair case.

Text Books:

1. P. C. Varghese, "Limit state design of reinforced concrete", Prentice Hall of India, New Delhi, 2008.
2. N. Krishna Raju and R. N. Pranesh, "Reinforced Concrete design" , New Age International Publishers, New Delhi, 2007.
3. S. Unnikrishna Pillai and Devdas and Menon, "Reinforced concrete design", Tata Mc.Graw Hill, New Delhi, 2009.
4. Dr. B.C.Punmia,"Limit state design of reinforced concrete", Laxmi Publication , New Delhi, 2007.

Reference Books:

1. M. L. Gambhir, "Fundamentals of reinforced concrete design", Printice Hall of India Pvt. Ltd, New Delhi, 2006.
2. P. Purushotham, "Reinforced concrete structural elements – behavior, Analysis and design", Tata McGraw Hill, 1994.
3. Chen,"Plasticity in Reinforced Concrete", Cengage Learning Pvt. Ltd, 2007.

Web References:

1. http://www.nptel.ac.in/courses/105105105/
2. http://www.nptel.ac.in/courses/105105104/

E-Text Books:

http://weccivilians.weebly.com/uploads/2/4/6/2/24623713/design_of_reinforced_concrete_9th_edition_-_jack_c._mccormac.pdf

Course Home Page:

CONCRETE TECHNOLOGY

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE010	Core	3	-	-	3	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Discuss the physical and chemical properties of cement and admixtures
II. Understand the workability of concrete, manufacturing processes of concrete and the behavior of the hardened concrete.
III. Identify, formulate and solve problems in concrete mix design.
IV. Enrich the practical knowledge on mix design principles, concepts and methods.

UNIT- I	CEMENTS ADMIXTURES& AGGREGATES	Classes: 09

Portland cement: Chemical composition, hydration, setting of cement, structure of hydrate cement, test on physical properties, different grades of cement. Admixtures: Mineral and chemical admixtures, properties, dosage, effects usage; Aggregates: Classification of aggregate, particle shape & texture bond, strength & other mechanical properties of aggregate, specific gravity, bulk density, porosity, adsorption & moisture content of aggregate, bulking of sand, deleterious substance in aggregate, soundness of aggregate, alkali aggregate reaction, thermal properties, sieve analysis, fineness modulus, grading curves, grading of fine & coarse aggregates, gap graded aggregate, maximum aggregate size.

UNIT - II	FRESH CONCRETE	Classes: 09

Workability: Factors affecting workability, measurement of workability by different tests, setting times of concrete, effect of time and temperature on workability, segregation & bleeding, mixing and vibration of concrete, steps in manufacture of concrete, quality of mixing water.

UNIT - III	HARDENED CONCRETE AND ITS TESTING	Classes: 09

Water / Cement ratio: Abram's Law, Gel space ratio, Nature of strength of concrete, maturity concept, strength in tension and compression, factors affecting strength, relation between compression and tensile strength curing.

Testing of hardened concrete: compression tests, tension tests, factors affecting strength, flexure tests, splitting tests, nondestructive testing methods, codal provisions for NDT; Elasticity: Creep & shrinkage, modulus of elasticity, dynamic modulus of elasticity, poisson's ratio, creep of concrete, factors influencing creep, relation between creep & time, nature of creep, effects of creep, shrinkage, types of shrinkage.

UNIT - IV	MIX DESIGN	Classes: 09

Factors in the choice of mix proportions, durability of concrete, quality control of concrete, Statistical methods, acceptance criteria, proportioning of concrete mixes by various methods, BIS method of mix design.

UNIT - V	SPECIAL CONCRETES	Classes: 09

Light weight aggregates, light weight aggregate concrete, cellular concrete , no fines concrete, high density concrete, fiber reinforced concrete, different types of fibers, factors affecting properties of F.R.C, applications, polymer concrete, types of polymer concrete, properties of polymer concrete applications, high performance concrete, self consolidating concrete, SIFCON.

Text Books:

1. Shetty, M.S., "Concrete Technology, Theory & Practice", S.Chand and Co, 2004.
2. Gambhir, M.L., "Concrete Technology", Tata McGraw Hill, 2004.
3. Nevile, "Properties of Concrete", Longman Publishers, 2004.

Reference Books:

Santakumar A.R., "Concrete Technology", Oxford University Press, New Delhi, 2007.

Web References:

1. http://nptel.ac.in/courses/105102012/
2. http://nptel.ac.in/courses/105104030/

E-Text Books:

1. http://www.freeengineeringbooks.com/civilbooksdownload/ConcreteTechnology.php
2. http://www.faadooengineers.com/threads/10428Concretetechnologyebookfreedownload
3. https://books.google.com.au/books/about/Concrete_Technology.html?id...

Course Home Page:

HYDRAULICS AND HYDRAULIC MACHINERY

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE011	Core	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes:15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Strengthen the knowledge of theoretical and technological aspects of hydrodynamic forces on jets.
II. Correlate the principles with applications in hydraulic turbines.
III. Apply the practical applications on Francis and Kaplan turbine.
IV. Analysis the similarities between prototype and model types of hydraulic similitude.

UNIT-I	OPEN CHANNEL FLOW	Classes: 09

Types of flows, types of channels, channel characteristics, velocity distribution, energy and momentum correction factors, Chezy's, Manning's, Basin's formulae for uniform flow, economical sections, critical flow, critical depth, specific energy, channel transitions.

UNIT-II	HYDRAULIC SIMLITUDE	Classes: 09

Dimensional analysis, Rayleigh's method, Buckingham's pi theorem, hydraulic models, similarity laws, geometric, kinematic and dynamic similarities, dimensionless numbers, model and prototype relations.

UNIT-III	HYDRODYNAMIC FORCE ON JETS	Classes: 09

Hydrodynamic force of jets on stationary and moving flat inclined and curved vanes, jet striking centrally and at tip.

Velocity triangles at inlet and outlet, work done, efficiency, angular momentum principle, layout of hydropower plant, heads and efficiencies.

UNIT-IV	HYDRAULIC TURBINES	Classes: 09

Classification of hydraulic machine, Euler's equation of turbo machines, selection of hydraulic machines, design of Pelton turbines, design of Francis turbine, design of Kaplan/ axial flow turbine, draft tube, theory and function efficiency.

UNIT-V	CENTRIFUGAL PUMPS	Classes: 09

Pump installations, classification of pumps, work done, manometric head, minimum starting speed, losses and efficiency, specific speed, multistage pump, pumps in parallel, performance of pumps, design of centrifugal pumps, design of reciprocating pumps, NPSH, cavitation.

Text Books:

1. Subramanya K. "Open Channel Flow", Tata McGraw Hill Publications, New Delhi, 2008.
2. Modi, Seth, "Fluid Mechanics. Hydraulic and Hydraulic Machines", Standard Book House, 2011.
3. Pillai Narayan, Ramakrishna C R, Universities press, 2006.

Reference Books:

1. Ojha CSP, Chandramouli P. N., Berndtsson R., "Fluid Mechanics and Machinery", Oxford University Press, 2010.
2. Chow V.T., "Open Channel Hydraulics", Blackburn Press, 2009.
3. Rajput R.K., "A text book of Fluid Mechanics", S.Chand Publications, 1998.
4. Franck N. White, "Fluid Mechanics", Tata McGrawhill Publications, 8th Edition, 2015.

Web References:

1. http://nptel.ac.in/courses/112104117/
2. http://nptel.ac.in/courses/105103096/
3. http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/machine/ui/TOC.htm

E-Text Books:

1. https://drive.google.com/file/d/0B9_2yANiGJ12aWJrSGJZVjlxbHM/view
2. https://books.google.co.in/books?id=mLpf6YjHM5AC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

BUSINESS ECONOMICS AND FINANCIAL ANALYSIS

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS015	Skill	3	-	-	3	30	70	100
Contact Classes: 30	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the market dynamics namely demand elasticity of demand and pricing in different market structures.
II. Analyze how capital budgeting decisions are carried out for selecting the best investment proposal.
III. Learn how organizations make important investment and financing decisions.
IV. Analyze a company's financial statements and come to a reasoned conclusion about the financial situation of the company.
V. Acquire the basics of how to analyze and interpret the financial statements through ratio analysis.

UNIT-I	INTRODUCTION AND DEMAND ANALYSIS	Classes: 07

Definition, nature and scope of business economics; Demand analysis; Demand determinants, law of demand and its exceptions; Elasticity of demand: Definition, types, measurement and significance of elasticity of demand, demand forecasting, factors governing demand forecasting.

UNIT-II	PRODUCTION AND COST ANALYSIS	Classes: 10

Production function; Isoquants and isocosts, MRTS, least cost combination of inputs, Cobb-Dougles production function, internal and external economies of scale, cost analysis; Cost concepts: Break even analysis (BEA), determination of break-even point (simple problems), managerial significance.

UNIT-III	MARKETS AND NEW ECONOMIC ENVIRONMENT	Classes: 08

Types of competition and markets, features of perfect competition, monopoly and monopolistic competition, price-output determination in case of perfect competition and monopoly business.

Features and evaluation of different forms of business organizations: Sole proprietorship, partnership, joint stock company, public enterprises and their types.

UNIT-IV	CAPITAL BUDGETING	Classes: 10

Capital and its significance, types of capital, estimation of fixed and working capital requirements, methods and sources of raising capital, capital budgeting: features of capital budgeting proposals; Methods of capital budgeting: Payback period, accounting rate of return(ARR), net present value method and internal rate of return method (simple problems).

UNIT-V	INTRODUCTION TO FINANCIAL ACCOUNTING AND FINANCIAL ANALYSIS	Classes : 10

Financial accounting objectives, functions, importance; Accounting concepts and accounting conventions -double-entry book keeping, journal, ledger, trial balance; Final accounts: Trading account, profit and loss account and balance sheet with simple adjustments; Financial analysis: Analysis and interpretation of liquidity ratios, activity ratios, capital structure ratios and profitability ratios (simple problems), Du Pont chart.

Text Books:

1. Aryasri, "Managerial Economics and Financial Analysis", TMH publications, 4th Edition, 2012.
2. M. Kasi Reddy, Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 2nd Edition, 2012.
3. Varshney, Maheswari, "Managerial Economics", Sultan Chand Publications, 11th Edition, 2009.

Reference Books:

1. S. A. Siddiqual, A. S. Siddiqual, "Managerial Economics and Financial Analysis", New Age International Publishers, Hyderabad, Revised 1st Edition, 2013.
2. S. N. Maheswari, S. K. Maheswari, "Financial Accounting", Vikas publications, 3rd Edition, 2012.
3. J. V. Prabhakar Rao, P. V. Rao, "Managerial Economics and Financial Analysis", Maruthi Publishers, Reprinted Edition, 2011.
4. Vijay Kumar, Appa Rao, "Managerial Economics and Financial Analysis", Cengage Publications, 1st Edition, Paperback, 2011.

Web References:

1. https:// www.slideshare.net/glory1988/managerial-economics-and- financial analysis
2. https:// thenthata.web4kurd.net/mypdf/managerial-economics-and- financial analysis
3. https:// bookshallcold.link/pdfread/managerial-economics-and-financial analysis
4. https:// www.gvpce.ac.in/syllabi/Managerial Economics and financial analysis

E-Text Book:

1. https:// books.google.co.in/books/about/Managerial economics and financial analysis
2. http://www. ebooktake.in/pdf/title/managerial-economics-and-financial analysis
3. http://all4ryou.blogspot.in/2012/06/mefa-managerial-economics and financial analysis
4. http://books.google.com/books/about/Managerial economics and financial analysis
5. http://www.scribd.com/doc/37684926

Course Home Page:

FLUID MECHANICS & HYDRAULIC MACHANERY LABORATORY

V Semester: CE

Course Code	Category	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE107	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 28				Total Classes: 28		

OBJECTIVES:

The course should enable the students to:

I. Enrich the concept of fluid mechanics and hydraulic machines.
II. Demonstrate the classical experiments in fluid mechanics and hydraulic machinery.
III. Correlate various flow measuring devices such as venturimeter, orifice meter and notches etc.
IV. Discuss the performance characteristics of turbines and pumps

LIST OF EXPERIMENTS

Week-l	**INTRODUCTION TO FLUID MECHANICS & HYDRAULIC MACHANERY LABORATORY**
Introduction to Fluid Mechanics & Hydraulic Machinery Do's and Don'ts in FM&HM Laboratory	
Week-2	**CALIBRATION OF VENTURIMETER & ORFICEMETER**
Batch I: Calibration of venturimeter Batch II: Oificemeter	
Week-3	**CALIBRATION OF VENTURIMETER & ORFICEMETER**
Batch I: Oificemeter Batch II: Calibration of venturimeter	
Week-4	**DETERMINATION OF COEFFICIENT OF DISCHARGE FOR A SMALL IRIFICE/ MOUTH PIECE BY CONSTANT HEAD METHOD**
Batch I: Determination of coefficient of discharge for a small orifice Batch II: Determination of coefficient of discharge by constant head method	
Week-5	**DETERMINATION OF COEFFICIENT OF DISCHARGE FOR A SMALL IRIFICE/ MOUTH PIECE BY CONSTANT HEAD METHOD**
Batch I: Determination of coefficient of discharge by constant head method Batch II: Determination of coefficient of discharge for a small orifice	
Week-6	**CALIBRATION OF CONTRACTED RECTANGULAR NOTCH / TRIANGULAR NOTCH AND DETERMINATION OF FRICTION FACTOR OF PIPE**
Batch I: Calibration of contracted rectangular notch/ triangular notch Batch II: Determination of friction factor of pipe	
Week-7	**CALIBRATION OF CONTRACTED RECTANGULAR NOTCH / TRIANGULAR NOTCH AND DETERMINATION OF FRICTION FACTOR OF PIPE**
Batch I: Determination of friction factor of pipe Batch II: Calibration of contracted rectangular notch/ triangular notch	
Week-8	**DETERMINATION OF COEFICIENT FOR MINOR LOSSES AND VERIFICATION OF BERNOULLI'S EQUATION**
Batch I: Determination of coefficient for minor losses Batch II: Verification of Bernoulli's equation	

Week-9	**DETERMINATION OF COEFICIENT FOR MINOR LOSSES AND VERIFICATION OF BERNOULLI'S EQUATION**
Batch I: Verification of Bernoulli's equation Batch II: Determination of coefficient for minor losses	
Week-10	**IMPACT OF JET ON VANES AND STUDY OF HYDRAULIC JUMP**
Batch I: Impact of jet on vanes Batch II: Study of hydraulic jump	
Week-11	**IMPACT OF JET ON VANES AND STUDY OF HYDRAULIC JUMP**
Batch I: Study of hydraulic jump Batch II: Impact of jet on vanes	
Week-12	**PERFORMANCE TEST ON PELTON WHEEL TURBINE AND PERFORMANCE TEST ON FRANCIS TURBINE**
Batch I: Performance test on Pelton wheel turbine Batch II: Performance test on Francis wheel turbine	
Week-13	**PERFORMANCE CHARACTERISTICS OF A SINGLE/ MULTI- STAGE CENTRIFUGAL PUMP AND PERFORMANCE CHARACTERSTICS OF A RECIPROCATING PUMP**
Batch I: Performance characteristics of a single/ multi-stage centrifugal pump Batch II: Performance characteristics of a reciprocating pump	
Week-14	**PERFORMANCE CHARACTERISTICS OF A SINGLE/ MULTI- STAGE CENTRIFUGAL PUMP AND PERFORMANCE CHARACTERSTICS OF A RECIPROCATING PUMP**
Batch I: Performance characteristics of a reciprocating pump Batch II: Performance characteristics of a single/ multi-stage centrifugal pump	
Week-15 REVISION	
Revision	

Reference Books:

1. T.S. Desmukh, "Fluid Mechanics and Hydraulic Machines", Laxmi publications, 2001.
2. Gupta / Chandra, "Laboratory Manual of Fluid Mechanics & Machines", Paperback, 2011.
3. Dr.Arora , "Fluid Mechanics Including Hydraulic Machines", Paperback, 9th Edition, 2013.
4. Dr. A.K.Jain, "Fluid Mechanics and Hydraulic Machines", Paperback, 2016.
5. Dr. P.N.Modi & Dr. S.M.Seth, "Fluid Mechanics, Hydraulics and Hydraulic Machines", Paperback, 19th Edition, 2013.

Web References:

http://www.iare.ac.in

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S .No	Name of the Equipment	Quantity
1	Calibration of contracted rectangluar notch	1
2	Bernoullis apparatus	1
3	Reynolds appratus	1
4	Reciprocating pump	1
5	Centrifugal pump	1
6	Pelton wheel turbine	1
7	Kaplan turbine	1
8	Francis turbine	1
9	Impact of jet on vanes	1
10	Digital tachometer	3
11	Venturi meter/orifice meter	1
12	Pipe friction apparatus	1
13	Stop watch	7

CONCRETE TECHNOLOGY LABORATORY

V Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE108	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Achieve the practical knowledge regarding concrete testing equipment and their operation.
II. Demonstrate tests on cement, aggregates and concrete.
III. Observe the behavior of concrete materials and their properties.
IV. Emphasize the knowledge and application of safety regulations.

LIST OF EXPERIMENTS

Week- l	**INTRODUCTION TO SURVEYING LABORATORY -I**
Introduction to concrete technology laboratory. Do's and Don'ts in surveying lab.	
Week- 2	**FINENESS OF CEMENT**
Batch I: Fineness of cement Batch II: Fineness of cement	
Week-3	**NORMAL CONSISTENCY OF CEMENT**
Batch I: Normal consistency of cement Batch II: Normal consistency of cement	
Week-4	**INITIAL AND FINAL SETTING TIMES OF CEMENT**
Batch I: Initial and final setting times of cement Batch II: Initial and final setting times of cement.	
Week-5	**SPECIFIC GRAVITY OF CEMENT**
Batch I:Specific gravity of cement Batch II: Specific gravity of cement	
Week-6	**COMPRESSIVE STRENGTH OF CEMENT**
Batch I:Compressive strength of cement Batch II: Compressive strength of cement	
Week-7	**SOUNDNESS OF CEMENT**
Batch I: Soundness of cement Batch II: Soundness of cement.	
Week-8	**FINENESS MODULUS OF FINE AND COARSE AGGREGATE**

Batch I:Fineness modulus of fine and coarse aggregate Batch II: Fineness modulus of fine and coarse aggregate	
Week 9	**BULKING OF SAND**
Batch I: Bulking of sand Batch II: Bulking of sand.	
Week-10	**WORKABILITY TESTS ON FRESH CONCRETE**
Batch I: Workability tests on fresh concrete Batch II: Workability tests on fresh concrete.	
Week-11	**TEST FOR COMPRESSIVE STRENGTH OF CEMENT CONCRETE**
Batch I: Test for compressive strength of cement concrete Batch II: Test for compressive strength of cement concrete	
Week-12	**REVISION**
Batch I : Revision. Batch II: Revision.	
Week-13	**REVISION**
Batch I : Revision Batch II : Revision.	
Week-14	**REVISION**
Revision.	

Reference Books:

1. Hemanthsood and LN Mittal, "Laboratory Manual on concrete technology", CBS Publishers Pvt. Ltd., New Delhi, 2nd Edition, 2013.
2. Khanna S.K & Justo C.E.G. "Pavement materials and testing", Tata McGraw Hill Education, 2012.

Web References:

1. http://www.iare.ac.in

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No.	Name of the Equipment	Quantity
1	Vicats apparatus (IS 5513)	3
2	Lechatlirers apparatus (IS5514)	3
3	Slump and compaction factor set up	1
4	Specific gravity bottle 50ml	3
5	Los angles abration test machine(IS: 10070)	1
6	Devals Abrasion Test Machine (IS 2346 parti IV)	1
7	Compressive testing machine of 2000KN capacity	1
8	Bulking of fine aggregate	3
9	Aggregate crushing and impact value apparatus	1
10	Workability test on SSC	1
11	Air Entrainment Test	1
12	Marsh cone test	1
13	Permeability of Concrete	1
14	Rebound hammer	1
15	Accelerated Curing Tank	1
16	Compaction factor test	1
17	J-Ring	1
18	Flexural Testing Equipment for concrete	1
19	Rectangular beam mould for Flexure	1

BUILDING INFORMATION MODELING LABORATORY

V Semester: CE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE111	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Provide familiarity with current BIM technologies.
II. Understand the shift from 2D representation to 3D simulation.
III. Synthesize, link and maintain continuity of existing and designed BIM information and other vital information into the model.
IV. Explore new project delivery systems and technologies for 'integrated practice'.

LIST OF EXPERIMENTS

Week- l	**INTRODUCTION TO BIM AND AUTODESK REVIT**
About Autodesk and Autocad, workflow and BIM, Revit terms, overview of the interface, starting projects, viewing commands.	
Week- 2	**BASIC DRAWING AND EDITING TOOLS**
Using general drawing tools, editing elements, working with modify tools.	
Week- 3	**SETTING UP LEVELS AND GRIDS**
Setting up levels and grids, creating structural grids, adding columns, linking and importing CAD files.	
Week- 4	**MODELING WALLS**
Modelling walls, modifying walls, model exterior shell, add interior walls.	
Week- 5	**WORKING WITH DOORS AND WINDOWS**
Inserting doors and windows, loading door and window types from library, creating additional door and window sizes.	
Week- 6	**WORKING WITH CURTAIN WALLS**
Creating curtain walls, adding curtain grids, working with curtain wall panels, attaching mullions to curtain grids.	
Week- 7	**WORKING WITH VIEWS**
Setting the view display, duplicating views, adding callout views, elevations and sections.	
Week 8	**ADDING COMPONENTS**
Adding component, modifying component, working with elements.	

Week- 9	**MODELING FLOORS**
Modelling & modifying floors, joining geometry, creating shaft openings, creating sloped floors	
Week- 10	**MODELING CEILINGS & ROOFS**
Modelling ceilings, adding ceiling fixtures, creating ceiling soffits, modelling roofs	
Week- 11	**MODELING STAIRS AND RAILING**
Creating component stairs, modifying component stairs, working with railings, sketching custom stairs, creating ramps	
Week-12	**REVISION**
Revision.	
Reference Books:	
1. Chuck Eastman, Paul Teicholz, Rafael Sacks, Kathleen Liston "BIM HANDBOOK", Wiley, 2nd Edition, 2011.	
Web References:	
1. http://auvsp.edu.in/datastore/auwebsite/documents/libraryebookspdf/building-information-modeling.pdf	
Course Home Page:	

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: System Software: Microsoft Windows 7.
Application Software: Revit, BIM(Autodesk)

HARDWARE: 36 numbers of Desktop Computer systems

DESIGN OF STEEL STRUCTURES AND DRAWING

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE012	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Discuss the concepts of structural steel design conforming to the IS 800 design code.
II. Identify various types of structural steel and its properties also define concepts of Limit State Design.
III. Analyze structures using plastic method of analysis and evaluate collapse load and plastic moment capacity.
IV. Design compression members, beams, connections and girders.

UNIT-I	INTRODUCTION ON MECHANICAL BEHAVIOUR OF STEEL	Classes : 10

Materials, making of iron and steel, types of structural steel, mechanical properties of steel, concepts of plasticity yield strength, loads and combinations loading wind loads on roof trusses, behavior of steel, local buckling. Concept of limit state design – different limit states as per IS 800:2007. Design strengths deflection limits, serviceability, bolted connections, welded connections, efficiency of joint, prying action types of welded joints, design of tension members, design strength of members.

UNIT-II	COMPRESSION MEMBERS	Classes : 09

Design of compression members, buckling class, slenderness ratio, strength design, laced battened columns, column splice, column base, slab base.

UNIT-III	BEAMS	Classes : 09

Design of beams, plastic moment, and bending and shear strength laterally supported beams.

Design, built up sections, large plates web buckling, crippling and deflection of beams, design of purlin.

UNIT-IV	ECCENTRIC CONNECTIONS	Classes : 08

Design of eccentric connections with brackets, beam end connections, web angle, unstiffened and stiffened seated connections (bolted and welded types), design of truss joints.

UNIT-V	WELDED PLATE GIRDERS	Classes : 09

Design of welded plate girders, optimum depth, design of main section, design of end bearing stiffness and intermediate stiffness. Connection between web and flange and design of flange splice and web splices.

Text Books:

1. N. Subramanian, "Design of steel structures", Oxford University Press, 2016.
2. S. K. Duggal, "Limit state design of steel structures", Tata McGraw-Hill, 2010.

Reference Books:

1. K. S. Sai Ram, “Design of steel structures”, Pearson Education, 2010.
2. Edwin H. Gaylord, Jr. Charles N. Gaylord and James Stallmeyer, “Design of steel structures”, Tata McGraw-Hill Education private Limited, 3rd Edition, 2010.
3. Ramachandra, “Design of steel structures Volumes 1 and 2”, Standard Publications, 2009.
4. S.S. Bhavikatti, “Design of steel structures”, IK International Publication House, New Delhi, 2010.

Web References:

1. http://www.nptel.ac.in/downloads/105106112/
2. http://iitmweb.iitm.ac.in/phase2/courses/105103094/12
3. http://freevideolectures.com/Course/2679/Design-Of-Steel-Structures

E-Text Books:

1. http://www.freeengineeringbooks.com/Civil/Steel-Structure-Design-Books.php
2. https://books.google.co.in/books/about/Comprehensive_Design_of_Steel_Structures.html?id=pXekq3FNMUYC

Course Home Page:

TRANSPORTATION ENGINEERING

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE013	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Enrich knowledge on cross sections and geometric features of highways.
II. Understand the importance of sub-grade soil and pavement construction materials.
III. Design highway pavements and intersection conforming to IRC code provisions.
IV. Identify the problems and remedial measures for construction of safe and durable pavements.

UNIT-I	HIGHWAY DEVELOPMENT AND PLANNING	Classes: 09

Highway development in India, necessity for highway planning, different road development plans; Classification of roads, road network patterns, highway alignment, factors affecting alignment, engineering surveys, drawing and reports, highway project.

UNIT-II	HIGHWAY GEOMETRIC DESIGN	Classes: 09

Importance of geometric design, factors affecting highway geometric design. Design controls and criteria, highway cross section elements, sight distance elements, stopping sight distance, overtaking sight distance and intermediate sight distance, design of horizontal alignment, design of super elevation and extra widening, design of transition curves, design of vertical alignment, gradients, vertical curves.

UNIT-III	TRAFFIC ENGINEERING AND REGULATIONS	Classes: 09

Basic parameters of traffic, volume, speed and density, traffic volume studies, data collection and presentation, speed studies, data collection and presentation, origin and destinations studies.

Parking studies, onstreet and offstreet parking , road accidents , causes and preventive measures, accident data recording, condition diagram and collision diagrams, traffic signs, types and specifications, road markings, need for road markings, types of road markings, design of traffic signals, webster method.

UNIT-IV	INTERSECTION DESIGN	Classes: 09

Types of Intersections, conflicts at intersections, requirements of at, grade intersection, types of at grade intersections, canalization ,traffic islands, types of grade separated intersections, rotary intersection, concept of rotary, design factors of rotary, advantages and limitations of rotary intersections.

UNIT-V	HIGHWAY MATERIAL, CONSTRUCTION ANDMAINTENANCE	Classes: 09

Highway material characterization; subgrade soil, stone aggregate, bitumen materials, construction of gravel roads, construction of water bound macadam roads, construction of bituminous pavements: Surface dressing, bitumen bound macadam, bituminous concrete, construction of cement concrete pavements, construction of joints in cement concrete pavements joint filter and seal pavement failures, maintenance of highways, highway drainage.

Text Books:

1. S.K.Khanna & C.E.G.Justo, "Highway Engineering", Nemchand & Bros., 7th Edition, 2000.
2. Dr.L.R.Kadyali, "Traffic Engineering & Transportation Planning", Khanna publications, 6th Edition,

1997.

Reference Books:

1. Garber & Hoel, "Principles of Traffic and Highway Engineering", Cengage Learning, 2014.
2. Dr.L.R.Kadyali, and Dr.N.B Lal, "Principles of Practices of Highway Engineering", Khanna publications, 2003.
3. S.P.Bindra, ", Dhanpat Rai & Sons., "Highway Engineering, 4th Edition, 1981.

Web References:

1. www.civil.iitm.ac.in/te
2. nptel.ac.in/courses/105101087/
3. www.thecivilengg.com/transportation_engineering.php

E-Text Books:

1. https://www.jntubook.com/transport,engineering,1,textbook,free,download/https://
2. http://www.nptel.ac.in/downloads/105101087/

Course Home Page:

WATER RESOURCES ENGINEERING

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE014	Core	3	1	-	4	30	70	100
Contact Classes:45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Enrich the knowledge of hydrology that deals with the occurrence, distribution and movement of water on the earth.
II. Design unlined and lined irrigation canals; mitigate sediment problems associated with canal.
III. Identifying, formulating and management of water resource related issues.
IV. Discuss the limitations and applications of hydrograph flood analysis.

UNIT-I	INTRODUCTION TO ENGINEERING HYDROLOGY AND ITS APPLICATIONS	Classes: 09

Introduction to engineering hydrology and its applications, hydrologic cycle, types and forms of participation, rainfall measurement, types of rain gauges, computation of average rainfall over a basin, processing of rainfall data, adjustment of record, rainfall double mass curve runoff, factors affecting runoff, runoff over a catchment, empirical and rational formulae. Abstraction from rainfall, evaporation, factors affecting evaporation, measurement of evaporation, evapo-transpiration, penman and Blaney & Criddle methods, infiltration, factors affecting infiltration, measurement of infiltration, infiltration indices.

UNIT-II	DISTRIBUTION OF RUNOFF	Classes: 09

Hydrograph analysis flood hydrograph, effective rainfall, base flow separation, direct runoff hydrograph, unit hydrograph, definition, and limitations applications of unit hydrograph, derivation of unit hydrograph from direct runoff hydrograph and vice versa, hydrograph, synthetic unit hydrograph.

UNIT-III	GROUND WATER OCCURRENCE	Classes: 09

Ground water Occurrence, types of aquifers, aquifer parameters, porosity, specific yield, permeability, transmissivity and storage coefficient.

Darcy's law, radial flow to wells in confined and unconfined aquifers. Types of wells, well construction, well development.

UNIT-IV	NECESSITY AND IMPORTANCE OF IRRIGATION	Classes: 09

Work necessity and importance of irrigation, advantages and ill effects of irrigation, types of irrigation, and methods of application of irrigation water, India agricultural soils, methods of improving soil fertility, crop rotation, and preparation of land for irrigation, standards of quality for irrigation water, soil, water, plant relationship, vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, duty and delta, factors affecting duty, design discharge for a water course. Depth and frequency of irrigation, irrigation efficiencies, water logging.

UNIT-V	CLASSIFICATION OF CANALS	Classes: 09

Mechanical classification of canals, design of irrigation canals by Kennedy's and Lacey's theories, balancing depth of cutting, IS standards for a canal design canal lining. Design discharge over a catchment, computation of design discharge, rational formula, SCS curve number method, flood frequency analysis of stream flow.

Text Books:

1. Jayarami Reddy, "Engineering hydrology", Laxmi publications Pvt. New Delhi, 2005.
2. Punmia & Lal, "Irrigation and Water Power Engineering", Laxmi publications Pvt, Ltd, New Delhi, 1992.

Reference Books:

1. V.P.Singh, "Elementary hydrology", PH1 publications, 1992.
2. Dr.G.Venkata Ramana, "Water Resources Engineering-I", Acadamic Publishing Company.
3. D.K.Majundar, "Irrigation Water Management", Prentice Hall of India, 2002.

Web References:

1. guides.lib.vt.edu/subject,guides/cee/environmental,water,engineering
2. https://en.wikipedia.org/wiki/Water_resources
3. https://www.nae.edu/.../ExpansionofFrontiersofEngineering/Water,ResourceEngineeri...
4. https://books.google.co.in/books?isbn=0470460644
5. https://www.elsevier.com/journals/advances,in,water,resources/0309,1708

E-text Books:

1. https://www.civilenggforall.com/p/water,resources,engineering.html
2. https://books.askvenkat.com/water,resources,engineering,1,textbook,pdf
3. https://www.amazon.in/Water,Resources,Engineering,Larry,Mays/dp/047
4. https://www.respwritunac.hatenablog.com/entry/2016/05/20/044146

Course Home Page:

TECHNICAL WRITING AND CONTENT DEVELOPMENT

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS108	Skill	-	-	2	2	30	70	100

OBJECTIVES:

The course should enable the students to:

I. Gain a practical understanding of the various methodological tools used for social scientific research.
II. Learn the ethical, political, and pragmatic issues involved in the research process.
III. Improve their ability to develop technical writing.
IV. Identify the overall process of designing a research study from its inception to its report.

LATEX FOR DOCUMENTATION

Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check and Track Changes using LaTeX; Mathematical expressions, Subscripts and superscripts, brackets and parentheses, fractions and binomials, aligning equations, operators, spacing in math mode, integrals, sums and limits, display style in math mode, list of Greek letters and math symbols, mathematical fonts; Prepare class timetable and student marks list using LaTex;

RESEARCH FORMULATION AND DESIGN

Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

DATA COLLECTION AND SAMPLING DESIGN

Sources of Date: Primary Dada, Secondary Data; Procedure Questionnaire -Survey and Experiments - Design of survey and Experiments- Sampling Merits and Demirts - Control Observations - Procedures - Sampling Errors.

CONTENT DEVELOPMENT

Document design and layout; Papers; Articles; E-book formats. Forums; Multimedia tutorials; Wikis; Blogs; Websites.

PROOF READING PROCESS AND REPORT WRITING

Definition, purpose, difference between content and copy, editing, competing priorities, elements of structure, style and appearance, evaluation, overall organizing, clarity of expression, grammatical accuracy, correctness of layout; Meaning of Interpretation, technique of Interpretation, precaution in Interpretation; Significance of report writing, different steps in writing report, layout of the research report, types of reports, oral presentation, mechanics of writing a research report, precautions for writing research reports, conclusions.

Text Books:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, "An introduction to Research Methodology", RBSA Publishers. U.K., 2002.
2. Kothari, C.R, "Research Methodology: Methods and Techniques". New Age International. 418p, 1990.

3. Stefan Kottwitz , " LATEX Beginner's Guide", Packt Publishing Limited, 2011.

Reference Book:

1. Meenakshi Raman, Sangeeta Sharma, "Technical Communication", Oxford Publishers, 1st Edition, 2004.
2. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications. 2 volumes.
3. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

Web References:

1. https://www.techwhirl.com/what-is-technical-writing/
2. https://www.mit.edu/me-ugoffice/communication/technical-writing
3. https://www.vocabulary.com/dictionary/technical

E-Text Books:

1. www.ebooksgo.org/
2. www.e-booksdirectory.com

IDEATION AND PRODUCT DEVELOPMENT

VI Semester: Common for all branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE201	Skill	0	0	2	1	30	70	100
Contact Classes:	Tutorial Classes:	Practical Classes: 28				Total Classes: 28		

OBJECTIVES:

The course should enable the students:

I. To develop next generation Entrepreneurs and Creative Leaders to resolve live challenges.
II. To understand about the future needs of industries.
III. To transform innovative ideas into successful businesses.
IV. To use a range of creative thinking tools to develop Out of the Box Ideas.
V. To develop Breakthrough Innovators and Dynamic Thinkers.

Syllabus

- Successful team formation and management
- Introduction to user-centred design
- Ideation and use of personas and POVs
- Need finding
- Embedded Microcontrollers for consumer products
- Human factors in engineering design
- Critical Experience and Critical Function Prototyping
- Dark Horse and 'Funky' prototyping
- Rapid prototyping and manufacturing
- Design for manufacture
- User testing
- Use of video/electronic media for communication
- Start-ups and entrepreneurship
- Intellectual Property

Text Books:

1. Product Design: Techniques in Reverse engineering & New Product development. K Otto & K Wood. Prentice Hall, 2001. ISBN 0-13-0212271-7 TCD Shelf Mark. HL-236-568.
2. Invention by design: how engineers get from thought to thing, Petroski H. Cambridge, Mass., London, Harvard University Press, 1996. ISBN 0674463676. TCD Shelf Mark. HL-201-280.
3. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, Tim Brown, Harper Business, 2009, ISBN 978-0061766084.
4. Creative Confidence: Unleashing the Creative Potential Within Us All, Tom & David Kelley, Crown Business, 2013, ISBN 978-0385349369.

ADVANCED MATERIAL TESTING LABORATORY

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE109	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Examine the mechanical properties of different solid engineering materials.
II. Identify the behavior of various material samples under different loads and equilibrium conditions.
III. Experiment with materials subjected to tension, compression, shear, torsion etc.
IV. Extracting and analyzing material testing data and its interpretation.

LIST OF EXPERIMENTS

Week 1	**TESTS ON CEMENT - CONSISTENCY, SETTING TIMES, SOUNDNESS, COMPRESSIVE STRENGTH**
Tests on cement - Consistency, setting times, soundness, compressive strength	
Week 2	**GRADATION CHARTS OF AGGREGATES**
Batch I: study of gradation charts of aggregates. Batch II: study of gradation charts of aggregates.	
Week 3	**BULKING OF SAND**
Batch I: study of bulking of sand Batch II: study of bulking of sand	
Week 4	**AGGREGATE CRUSHING AND IMPACT VALUE**
Batch I: Measurement of aggregate impact test Batch II: Measurement of aggregate crushing test	
Week 5	**WORKABILITY TESTS ON FRESH SELF-COMPACTING CONCRETE**
Batch I: Measurement of workability tests on fresh self-compacting concrete Batch II: Measurement of workability tests on fresh self-compacting concrete	
Week 6	**AIR ENTRAINMENT TEST ON FRESH CONCRETE**
Batch I: Measurement of air entrainment test on fresh concrete Batch II: Measurement of air entrainment test on fresh concrete	
Week 7	**MARSH CONE TEST**
Batch I: Performing marsh cone test on fresh concrete Batch II: Performing marsh cone test on fresh concrete	

Week 8	**PERMEABILITY OF CONCRETE**
Batch I: Performing permeability of concrete test on fresh concrete Batch II: Performing permeability of concrete test on fresh concrete.	
Week 9	**NON DESTRUCTIVE TESTING OF CONCRETE.**
Batch I: Performing non destructive testing of concrete Batch II: Performing non destructive testing of concrete.	
Week 10	**ACCELERATED CURING OF CONCRETE**
Batch I: Performing accelerated curing test on concrete Batch II: Performing accelerated curing test on concrete.	
Week 11	**INFLUENCE OF W/C RATIO ON STRENGTH AND AGGREGATE / CEMENT RATIO ON WORKABILITY AND STRENGTH**
Batch I : Influence of W/C ratio on strength of concrete Batch II : Influence of aggregate / cement ratio on workability and strength	
Week 12	**INFLUENCE OF DIFFERENT CHEMICAL ADMIXTURES ON CONCRETE**
Batch I: Finding the influence of different chemical admixtures on concrete. Batch II: Finding the influence of different chemical admixtures on concrete.	

Reference Books:

1. Hemant Sood, **"**Laboratory Manual on Testing of Engineering Materials", New Age International Publishers, New Delhi, 2nd Edition, 2007.
2. H.S. Moondra, Rajiv Gupta, "Laboratory Manual for Civil Engineering", CBS Publishers, New Delhi, 4th Edition, 2015.
3. IARE Advanced Materials Testing Lab Manual

Web References:

1. http://www.iare.ac.in
2. https://www.youtube.com/user/MaterialsScience 2000.

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

Sl. No.	Name of the Equipment	Quantity
1	Vicats apparatus (IS 5513)	3
2	Lechatlirers apparatus (IS5514)	3
3	Slump and compaction factor set up	1
4	Specific gravity bottle 50ml	3
5	Los angles abration test machine(IS: 10070)	1
6	Devals Abrasion Test Machine (IS 2346 parti IV)	1
7	Compressive testing machine of 2000KN capacity	1
8	Bulking of fine aggregate	3
9	Aggregate crushing and impact value apparatus	1
10	Workability test on SSC	1
11	Air Entrainment Test	1
12	Marsh cone test	1
13	Permeability of Concrete	1
14	Rebound hammer	1
15	Accelerated Curing Tank	1
16	Compaction factor test	1
17	J-Ring	1
18	Flexural Testing Equipment for concrete	1
19	Rectangular beam mould for Flexure	1

TRANSPORTATION MATERIALS LABORATORY

VI Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE110	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Identify the properties and behaviour of highway material for different loading patterns.
II. Demonstrate tests on transportation materials like aggregate, bitumen, sand etc and check their suitability.
III. Understand the properties of cement by conducting setting time, specific gravity and compressive strength tests.
IV. Measure and calculate flakiness and elongation properties of coarse aggregates.

LIST OF EXPERIMENTS

Week- l	**INTRODUCTION TO TRANSPORTATION MATERIALS LABORATORY – I**

Introduction to transportation material laboratory. Do's and Don'ts in materials lab.

Week- 2	**AGGREGATE CRUSHING STRENGTH TEST**

Batch I: Measurement of aggregate crushing test
Batch II: Measurement of aggregate crushing test

Week-3	**AGGREGATE IMPACT TEST**

Batch I: Measurement of aggregate impact test
Batch II: Measurement of aggregate impact test

Week-4	**SPECIFIC GRAVITY AND WATER ABSORPTION TEST**

Batch I: Calculation of specific gravity and water absorption test
Batch II: Calculation of specific gravity and water absorption Test

Week-5	**ATTRITION TEST OF COARSE AGGREGATES**

Batch I:Perform attrition test of coarse aggregates
Batch II:Perform attrition test of coarse aggregates

Week-6	**ABRASION TEST OF COARSE AGGREGATES**

Batch I:Perform abrasion test on coarse aggregates
Batch II: Perform abrasion test on coarse aggregates

Week-7	**SHAPE TESTS OF COARSE AGGREGATES**

Batch I: Measurement of percentage of flakiness in coarse aggregates.
Batch II: Measurement of percentage of elongation in coarse aggregates.

Week-8	**PENETRATION TEST OF BITUMINOUS MATERIALS**
Batch I: Find the Penetration value of bitumen sample. Batch II: Find the Penetration value of bitumen sample.	
Week 9	**DUCTILITY TEST OF BITUMINOUS MATERIALS**
Batch I: Find the ductility value of bituminous materials. Batch II: Find the ductility value of bituminous materials	
Week-10	**SOFTENING POINT OF BITUMEN MATERIALS**
Batch I: Find the softening point value of bituminous materials. Batch II: Find the softening point value of bituminous materials.	
Week-11	**FLASH AND FIRE POINT TEST OF BITUMEN MATERIALS**
Batch I: Find the flash point value of bitumen sample. Batch II: Find the flash point value of bitumen sample.	
Week-12	**NORMAL CONSISTENCY OF FINENESS OF CEMENT**
Batch I: Perform test and find the normal consistency of fineness of cement. Batch II: Perform test and find the normal consistency of fineness of cement.	
Week-13	**INITIAL SETTING TIME AND FINAL SETTING TIME OF CEMENT**
Batch I: Find the initial setting time of cement. Batch II: Find the final setting time of cement.	
Week-14	**SPECIFIC GRAVITY AND SOUNDNESS OF CEMENT**
Batch I: Find the specific gravity of cement. Batch II: Find the soundness of cement.	
Week-14	**COMPRESSIVE STRENGTH OF CEMENT**
Batch I : Find the compressive strength of cement. Batch II: Find the compressive strength of cement.	
Week-15	**COMPRESSIVE STRENGTH OF CONCRETE**
Batch I: Find the compressive strength of concrete. Batch II: Find the compressive strength of concrete.	
Week-16	**BULKING OF SAND**
Batch I: Find the bulking of sand sample. Batch II: Find the bulking of sand sample.	
Reference Books:	
1. Neville A.M, "Properties of concrete", 3rd Edition. Pitman Publishing Company, 1981. 2. Gambhir .M.L, "Concrete Manual", Dhanpat Rai Sons, Delhi, 1992.	
Web References:	
http://www.iare.ac.in	
Course Home Page:	

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No	Name of Equipment	Quantity
1	Specific gravity bottle 50ml	3
2	Longitudinal compress meter	1
3	Ductility testing machine as per IS:1208	1
4	Los angles abration test machine(IS: 10070)	1
5	Devals Attrition Abrasion Test Machine(IS 2346 Part IV)	1
6	Aggregate crushing test machine(IS 9376-1979)	1
7	Aggregate impact testing machine	1
8	length and elongation gauges (IS 2389)	1
9	Ring and ball apparatus (IS 1205)	1
10	Penkey martins apparatus (IS 1448)	1
11	Electronic balance weight machine(30kgs)	1
12	Hammer(small)	1
13	penetrometer	1
14	Standard seive set	1

ENVIRONMENTAL ENGINEERING

VII Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE015	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Outline the different sources of water and its per capita demand.
II. Describe the basic characteristics of water and study the procedure for determination.
III. Design the water supply lines, water collection and different distribution networks.
IV. Construct and design waste water treatment units such as oxidation ponds, sludge digestion tanks, soak pits etc.

UNIT-I	WATER QUALITY, DEMAND AND SUPPLY	Classes: 09

Protected water supply, population forecasts, design period, water demand, types of demand, factors affecting fluctuations, fire demand, storage capacity, water quality and testing. Drinking water standards. Comparison from quality and quantity and other considerations, intakes, infiltration galleries, confined and unconfined aquifers, distribution systems, requirements, methods and layouts.

UNIT-II	WATER TREATMENT AND DISTRIBUTION	Classes: 09

Layout and general outline of water treatment units, sedimentation, uniform settling velocity, principles, design factors, surface loading, jar test, optimum dosage of coagulant, coagulation, flocculation, clarifier design, coagulants, feeding arrangements. filtration, theory, working of slow and rapid gravity filters ,multimedia filters, design of filters, troubles in operation comparison of filters, disinfection, types of disinfection, theory of chlorination chlorine demand and other disinfection treatment methods. distribution systems, types of layouts of distribution systems, design of distribution systems, Hardy Cross and equivalent pipe methods, service reservoirs, joints, valves such as sluice valves, air valves, scour valves and check valves water meters, laying and testing of pipe lines, pump house.

UNIT-III	SEWAGE TREATMENT AND DISPOSAL	Classes: 09

Conservancy and water carriage systems, sewage and storm water estimation, type of concentration ,storm water over flows combined flow, characteristics of sewage, cycles of decay, decomposition of sewage, examination of sewage, B.O.D. and C.O.D. equations.

Design of sewers, shapes and materials, sewer appurtenances manhole, inverted siphon, catch basins, flushing tanks, ejectors, pumps and pump houses, house drainage, components requirements, sanitary fittings, traps, one pipe and two pipe systems of plumbing, ultimate disposal of sewage, sewage farming ,dilution.

UNIT-IV	WASTEWATER TREATMENT	Classes: 09

Lay out and general outline of various units in a waste water treatment plant, primary treatment design of screens, grit chambers, skimming tanks-sedimentation tanks-principles and design of biological treatment, trickling filters, standard and high rate.

UNIT-V	DESIGN AND WORKING OF TREATMENT UNITS	Classes: 09

Construction and design of oxidation ponds, sludge digestion tanks, factors effecting, design of digestion tank, sludge disposal by drying, septic tanks working principles and design-soak pits. Ultimate disposal of waste water, self purification of rivers, sewage farming.

Text Books:

1. S.K. Garg, "Environmental Engineering", Vol. I: Water Supply Engineering, 20th Edition Khanna Publishers, 2011.
2. Birdie, G.S. and Birdie, "Water Supply and Sanitary Engineering", Dhanpat Rai & Sons, 1992.
3. Duggal, K.N. "Elements of Environmental Engineering", S.Chand & Co, 2002.
4. Punmia B.C, Ashok Jain & Arun Jain, "Water Supply Engineering", Laxmi Publications, Pvt. Ltd., New Delhi, 2004.

Reference Books:

1. Metcalf and Eddy, "Waste Water Engineering, Collection, Treatment and Disposal", Tata McGraw Hill, Inc., New York, 2005
2. H.S. Peavy and D.R.Rowe, "Environmental Engineering", 2nd Edition, Mc.Graw Hill Publishing Company, , 1984

Web References:

1. http://nptel.ac.in/courses/105106119
2. http://envfor.nic.in/
3. www.un.org/en/globalissues/environment/

Course Home Page:

ADVANCED STRUCTURAL ANALYSIS AND DESIGN

VII Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE016	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Enhance knowledge of matrix stiffness and flexibility methods for analyzing continuous beams, portal frames and trusses.
II. Design advanced structures such as retaining walls against lateral earth pressure.
III. Analyze and design the different types of piles and flat slabs as per the recommendations of Indian Standard codes.
IV. Explore and interpret the basic design concepts of water tanks, silos and bunkers.

UNIT-I	MATRIX METHODS OF ANALYSIS	Classes: 09

Static and kinematic indeterminacy, stiffness and flexibility methods; Stiffness method of analysis for continuous beams including settlement of supports; Single storey portal frames including side sway, pin-jointed determinate plane frames; Flexibility method of analysis for continuous beams up to three degree of indeterminacy.

UNIT-II	APPROXIMATE METHODS OF ANALYSIS	Classes: 08

Analysis of multi-storey frames for lateral loads: Portal method and cantilever method; Analysis of multi-storey frames for gravity (vertical) loads; Substitute frame method.

UNIT-III	DESIGN OF RETAINING WALLS AND TANKS	Classes: 10

Design of retaining walls, Design of water tanks.

Design concepts and IS code provisions.

UNIT-IV	DESIGN OF SLABS AND FOUNDATIONS	Classes: 09

Design of flat slabs, Design of raft and pile foundations; Design concepts and IS code provisions.

UNIT-V	DESIGN OF CHIMNEY, BUNKER AND SILOS	Classes: 09

Design of chimneys, Design of bunkers and silos; Design concepts and IS code provisions.

Text Books:

1. G S Pundit, S P Gupta, "Structural Analysis: A Matrix Approach", Mc Graw Hill Education Publishers, 2nd Edition, 2008.
2. S S Bhavikatti, "Structural Analysis- II", Vikas Publishing House Pvt. Ltd., 3rd Edition, 2009.
3. Vargesh,"Advanced reinforced concrete structures", Prenties Hall of India Pvt. Ltd, 2009.
4. Pillai and Menon, "Reinforced Concrete Design", Tata McGraw-Hill Publishing Company, 2009.

Reference Books:

1. Devdas Menon, "Structural Analysis", Narosa Publishing House, 2nd Edition, 2008.
2. Devdas Menon, "Advanced Structural Analysis", Narosa Publishing House, 2nd Edition, 2009.
3. C S Reddy, "Basic Structural Analysis", Tata McGraw-Hill Education, 2001.
4. B C Punmia, Ashok Kumar Jain and Arun Kumar Jain"Reinforced Concrete Structures", Volume 2, Laxmi Publications, 2012.

Web References:

1. www.nptelvideos.in/2012/11/advanced-structural-analysis.html
2. http://nptel.ac.in/syllabus/syllabus.php?subjectId=105107060
3. http://freevideolectures.com/Course/97/Structural-Analysis-II
4.

E-Text Books:

1. https://www.amazon.com/Structural-Analysis-Russell-C-Hibbeler-ebook/dp/B005F70DNM
2. http://www.freeengineeringbooks.com/Civil/Structural-Mechanics-Books.php

Course Home Page:

ESTIMATION AND COSTING

VII Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE017	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Summarize the basic principal and standard methods for working out quantities in estimating.
II. Demonstrate the detailed estimate of buildings and workout rate analysis of the various items of work.
III. Understand the material requirements as per specified norms and standards.
IV. Assess the valuation of buildings and provide practical knowledge of standard specifications of items of building construction.

UNIT-I	GENERAL ITEMS OF WORK IN BUILDING	Classes: 09

General items of work in building – Standard units principles of working out quantities for detailed and abstract estimates – Approximate method of estimating. Detailed estimates of buildings.

UNIT-II	EARTHWORKS	Classes: 09

Earthwork for roads and canals.

UNIT-III	RATE ANALYSIS	Classes: 09

Rate analysis – Working out data for various items of work over head.

Rate analysis- Contingent charges.

UNIT-IV	REINFORCEMENT BAR BENDING	Classes: 09

Reinforcement bar bending and bar requirement schedules. Contracts – Types of contracts – Contract documents – Conditions of contract.

UNIT-V	VALUATION	Classes: 09

Valuation of buildings, standard specifications for different items of building construction.

Text Books:

1. B. N. Dutta, “Estimating and Costing”, UBS publishers, 2000.
2. G. S. Birdie., “Estimating and Costing”, Dhanpat Rai publications, 1988.

Reference Books:

1. Standard schedule of rates and standard data book by public works department, 2015.
2. I.S. 1200 (Parts I to XXV – 1974/method of measurement of building and Civil Engineering works – B.I.S)
3. M. Chakraborthi, “Estimation, costing and specifications”, Laxmi publications, 1982.
4. National building code, 2015.

Web References:
1. https://en.wikipedia.org/wiki/estimating 2. www.nptel.ac.in/courses/105107122/home.htm 3. http://theconstructor.org/practical-guide/quality-control
E-Text Books:
1. http://www.freeengineeringbooks.com/Civil/estiamtionandcosting-Books.php 2. https://www.jntubook.com/estimationandcosting-textbook-free-download/
Course Home Page:

ENVIRONMENTAL ENGINEERING LABORATORY

VII Semester: CE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE112	Core	-	-	3	2	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Investigate the different characteristics of water & wastewater.
II. Outline the procedure for preparations of stock and standard solutions, their handling, storage, etc.
III. Assess the suitability of water for drinking, irrigation purpose and concreting works
IV. Determine the BOD, COD and bacterial density of portable water.

LIST OF EXPERIMENTS

Week- 1	**INTRODUCTION TO ENVIRONMENTAL ENGINEERING LABORATORY DETERMINATION OF PH AND TURBIDITY**

Introduction to environmental engineering. Do's and Don'ts in the lab.
Batch I: To determine the pH of given samples using universal indicator, pH paper and digital pH meter
Batch II: Determination of turbidity of the given sample using nephelometer in NTU.

Week- 2	**DETERMINATION OF PH AND TURBIDITY**

Batch I: Determination of turbidity of the given sample using nephelometer in NTU.
Batch II: To determine the pH of given samples using universal indicator, pH paper and digital pH meter

Week-3	**DETERMINATION OF CONDUCTIVITY AND TOTAL DISSOLVED SOLIDS (ORGANIC AND INORGANIC)**

Batch I: Determining the electrical conductivity of the given water sample.
Batch II: Determination of total dissolved solids of the sample.

Week-4	**DETERMINATION OF CONDUCTIVITY AND TOTAL DISSOLVED SOLIDS (ORGANIC AND INORGANIC)**

Batch I: Determination of total dissolved solids of the sample.
Batch II: Determining the electrical conductivity of the given water sample

Week-5	**DETERMINATION OF ALKALINITY, ACIDITYOF WATER AND CHLORIDE & IRON IN WATER**

Batch I: Determining the amount of alkalinity present in the given samples & determine the acidity of the given sample of water.
Batch II: Determine the quantity of iron present in the given sample of water & determining the amount of chloride present in the given water sample by Mohr's method.

Week-6	**DETERMINATION OF ALKALINITY, ACIDITYOF WATER AND CHLORIDE & IRON IN WATER**

Batch I: Determine the quantity of iron present in the given sample of water & determining the amount of chloride present in the given water sample by Mohr's method.
Batch II: Determining the amount of alkalinity present in the given samples & determine the acidity of the given sample of water.

Week-7	**DETERMINATION OF DISSOLVED OXYGEN AND NITRATES IN WATER**

Batch I: Determine the nitrate nitrogen of the given sample of water.
Batch II: Determine the quantity of dissolved oxygen present in the given sample(s) by using modified Winkler's (Azide modification) method.

Week-8	**DETERMINATION OF DISSOLVED OXYGEN AND NITRATES IN WATER**
Batch I: Determine the quantity of dissolved oxygen present in the given sample(s) by using modified Winkler's (azide modification) method Batch II: Determine the nitrate nitrogen of the given sample of water.	
Week-9	**DETERMINATION OF OPTIMUM DOSE OF COAGULANT AND CHLORINE DEMAND**
Batch I: Determining the optimum coagulant dosage for clarifying the given sample of water by using alum as the coagulant and performing the jar test experiment. Batch II : Determining the chlorine demand	
Week-10	**DETERMINATION OF OPTIMUM DOSE OF COAGULANT AND CHLORINE DEMAND**
Batch I : Determining the chlorine demand Batch II: Determining the optimum coagulant dosage for clarifying the given sample of water by using alum as the coagulant and performing the jar test experiment.	
Week-11	**DETERMINATION OF TOTAL PHOSPHORUS AND B.O.D.**
Batch I: Determining the amount of B.O.D. exerted by the given sample Batch II: Determining the total phosphorus	
Week-12	**DETERMINATION OF TOTAL PHOSPHORUS AND B.O.D.**
Batch I: Determining the total phosphorus Batch II: Determining the amount of B.O.D. exerted by the given sample	
Week-13	**DETERMINATION OF C.O.D IN WATER AND TEST FOR COLIFORMS IN WATER**
Batch I: Determining the most probable number (MPN) of bacterial density by E.Coli test Batch II: Determining the amount of C.O.D. exerted by the given sample	
Week-14	**DETERMINATION OF C.O.D IN WATER AND TEST FOR COLIFORMS IN WATER**
Batch I: Determining the amount of C.O.D. exerted by the given sample Batch II: Determining the most probable number (MPN) of bacterial density by E.Coli test	
Week-15	**REVISION**
Revision of the experiments	

Reference Books:

1. L.G. Rich, "Environmental Systems Engineering", Tata McGraw-Hill, 1973.
2. Fair, Geyer, Okum, "Water and Wastewater Engineering: Water Supply and Wastewater Removal", John Wiley & Sons Canada, Limited, 3rd Edition, 2010.
3. E.D. Schrocder, "Water and Waste Treatment", Tata McGraw-Hill Education, 1977.

Web References:

1. www.mwa.co.th/download/file_upload/SMWW_1000-3000.pdf
2. http://nptel.ac.in/courses/103107084/
3. www.iare.ac.in

Course Home Page:

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

S. No	Name of the Component	Quantity
1	COD digestion apparatus	1
2	BOD digestion apparatus	1
3	Muffle furness	1
4	Hot air oven	1
5	Digital PH meter	1
6	Floculator	1
7	Digital conductivity meter	1
8	Digital turbidity Meter	1
9	D.O meter	1
10	Jar test apparatus	1
11	BOD bottle 300ml	6
12	Burette 50ml	20
13	Beaker 250ml	20
14	Beaker 1 liter	1
15	Conical flask 250ml	20

ADVANCE STRUCTRAL DESIGN LABORTARY

VII Semester: CE

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE113	Core	-	-	3	2	30	70	100
Contact Classes: 0	Tutorial Classes: 0	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Study the basic elements with different loading type and supports with the aid of STAAD Pro software.
II. Analyze and design 2D Frame and multi-storey buildings with different load sets.
III. Synthesize steel structures with truss elements subjected to lateral load.
IV. Modelling and analyze bridge truss and deck slab for moving loads.

LIST OF EXPERIMENTS

Week- l	**INTRODUCTION TO STAAD PRO**
Basic commands used in STAAD Pro.	
Week- 2	**ANALYSIS OF CONTINUOUS BEAM**
Analysis of continuous beam using STAAD Pro.	
Week- 3	**ANALYSIS OF SINGLE STOREY FRAME**
Analysis of single storey frame.	
Week- 4	**ANALYSIS OF MULTI-STOREY FRAME**
Analysis of multi-storey frame.	
Week- 5	**DESIGN OF MULTI-STOREY FRAME**
Design of multi-storey frame design.	
Week- 6	**ANALYSIS OF MULTI-STOREYED BUILDING**
Analysis of multi-storeyed building.	
Week- 7	**DESIGN OF MULTI-STOREYED BUILDING**
Design of multi-storeyed building.	
Week- 8	**WIND LOAD ANALYSIS ON RCC BUILDING**
Wind load analysis on RCC building.	
Week- 9	**ANALYSIS AND DESIGN OF STEEL TRUSS**
Analysis and design of steel truss.	
Week- 10	**ANALYSIS AND DESIGN OF ISOLATED FOOTING**
Analysis and design of isolated footing	
Week- 11	**ANALYSIS AND DESIGN OF COMBINED FOOTING**
Analysis and design of combined footing.	
Week- 12	**ANALYSIS OF BRIDGE DECK**
Analysis of bridge deck slab.	
Week- 13	**REVISION**
Revision.	

Reference Books:

1. T.S.Sarma, "STAAD Pro V8ifor beginners", Notion Press, 1st Edition August 2014.
2. IARE "Advance Analysis and Design Laboratory Manual."

Web References:

1. http://www.iu.hio.no/~pererikt/Konstr/Konstr-design-II/staadpro/manual-staadpro2005.pdf
2. http://www.iare.ac.in

Course Home Page:

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: System Software: Microsoft Windows 7.
Application Software: STAAD Pro V8i

HARDWARE: 36 numbers of Desktop Computer Systems
Dot Matrix Printers: 02

PROJECT PLANNING AND DEVELOPMENT LABORATORY

VII Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE114	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes: 36		

OBJECTIVES:

The course should enable the students to:

I. Enrich the concepts of the construction techniques, equipment, project feasibility and project planning through site visits.
II. Illustrate the work flow of construction activities and cash flow analysis.
III. Generate time and motion study, work measurement and prepare models for various construction techniques, equipment**.**
IV. Apply the process of tendering and bidding for a project and its valuation.

LIST OF EXPERIMENTS

Week- l	**SITE VISIT-I**
Site visit to study the construction techniques and use of major construction equipment associated with the ongoing work. Report on the site visit to be submitted.	
Week- 2	**SITE VISIT-II**
Site visit to study the construction techniques and use of major construction equipment associated with the ongoing work. Report on the site visit to be submitted.	
Week- 3	**NEW ADVANCES IN CONSTRUCTION**
Collection of techno- commercial information on the new construction materials, methods and construction equipment available in the market.	
Week- 4	**WORK FLOW OF CONSTRUCTION ACTIVITIES**
Performing and reporting of time and motion study work measurement of any one construction activity	
Week- 5	**QUANTITY ESTIMATION AND PURCHASE**
Field exercise on estimation of quantities and bulk purchases	
Week- 6	**PRECEDENCE NETWORK**
Preparation, crashing and updating of precedence network for a major construction work.	
Week- 7	**CASH FLOW ANALYSIS**
Exercise on cash flow analysis	
Week- 8	**MODEL PREPARATION**
Preparation of models and charts related to various construction techniques, equipment, organizational structures of existing companies. This is a group activity to generate interest and explore creativity.	
Week- 9	**SITE VISIT-III**
Study of feasibility aspects, tendering procedures, accounting system, fund raising and other financial aspects, billing procedures etc associated with on-going major construction work. Visit report is to be submitted.	

Week- 10	SITE VISIT-IV
Study of feasibility aspects, tendering procedures, accounting system, fund raising and other financial aspects, billing procedures etc associated with on-going major construction work. Visit report is to be submitted.	
Week- 11	**TENDERING**
Collection and study of tender notices, tender documents of contract document associated with civil engineering works.	
Week- 12	**VALUATION**
Valuation of land and building using various methods. A report to be submitted on the same.	

Reference Books:

1. K.S.Menon, "Purchasing and Inventory Control", Wheeler Publication, 1996.
2. Peurifoy, "Construction Planning, Equipment and Method", Tata McGraw-Hill, 2010.
3. Dr. MaheshVarma, "Construction Equipment Planning and Applications", Metropolitan Book Co., 1975.
4. Bohlander and Shnell, "Managing Human Resources", Paperback, 2012.
5. Biswajeet Pattanayak, "Human Resource Management", PHI Learning, 3rd Edition, 2010.

Web References:

1. http://www.iare.ac.in

Course Home Page:

FOUNDATION ENGINEERING

VIII Semester: CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE018	Core	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify the methods of soil exploration, different field tests, planning.
II. Understand earth pressure by Rankine's theory, Coulomb's earth pressure theory and Culmann's graphical method.
III. Implement the Indian standard methods for calculating safe bearing pressure.
IV. Analyze pile foundation, load carrying capacity of piles based on static and dynamic pile formulae.

UNIT-I	SOIL EXPLORATION	Classes: 09

Need and methods of soil exploration, boring and sampling methods, pits and trenches, drifts and shafts, methods of boring, auger borings, wash borings, rotary drilling, percussion drilling, core drilling, types of soil samples, disturbed samples, undisturbed samples, design features affecting the sample disturbance, split spoon samplers, scraper bucket samplers, shell by tubes and thin walled samplers, piston samplers, preservation and handling of samples. penetration tests, monotonic and cyclic, field permeability tests, in-situ tests using pressure meter, observation of ground water table, instrumentation in soil engineering, strain gauges, resistance and inductance type plate load test, pressure meter, geophysical methods, planning of programme and preparation of soil investigation report.

UNIT-II	SLOPE STABILITY	Classes: 09

Infinite and finite earth slopes, types of failures, factor of safety of infinites lopes, stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method, Taylor's Stability number, and stability f slopes of earthdams under different conditions.

UNIT-III	EARTH PRESSURE THEORIES AND RETAINING WALLS	Classes: 09

Rankine's theory of earth pressure, earth pressures in layered soils, Coulomb's earth pressure theory, Culmann's graphical method.

Types of retaining walls, stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill.

UNIT-IV	SHALLOW AND DEEP FOUNDATIONS	Classes: 09

Types, choice of foundation, location of depth, safe bearing capacity, Terzaghi, Meyerhof, Skempton and IS Methods. Safe bearing pressure based on N value, allowable bearing pressure, safe bearing capacity, plate load test, allowable settlements of structures, Analysis of foundation, individual, strip, combined footings and mat foundations conventional, elastic approach, soil structure interaction principles. Types of piles, load carrying capacity of piles based on static pile formulae in dynamic pile formulae, pile load tests, load carrying capacity of pile groups in sands and clays, settlement of pile groups. Introduction to foundations on expansive soils and marine foundations.

UNIT-V	WELL FOUNDATIONS	Classes: 09

Different shapes of wells, components of well, sinking of well, tilts and shifts, principles of analysis and design, seismic influences, IRC guidelines.

Text Books:

1. B. M. Das, "Principles of foundation engineering" Cengage Learning, 2012.
2. Gopal Ranjan &A.S.R. Rao , "Basic and applied soil mechanics" New age international Pvt. Ltd. 2004.
3. V.N.S Murthy ,"Geotechnical Engineering: Principles and practices of soils mechanics and foundation engineering", Taylor & Francis Group, 2002.

Reference Books:

1. Swami Saran, "Analysis and design of substructures, Oxford and IBH publishing company Pvt. Ltd. 1998.
2. Geotechnical Engineering by S. K. Gulhati & Manoj Datta – Tata Mc. Graw Hill publishing company New Delhi. 2005.
3. Foundation Design by Teng, W.C, Prentice Hall, New Jersey. 1962.
4. Foundation analysis and design by Bowles, J.E., 4th Edition, McGraw Hill publishing company, Newyork.1988.

Web References:

1. http://nptel.ac.in/courses/105107120/1#
2. https://ocw.mit.edu/courses/civil,and,environmental,engineering/1,364,advanced,geotechnical,engineering,fall,2003/index.htm

E-Text Book:

https://books.google.co.in/books?id=L_vjBwAAQBAJ&dq=foundation+engineering+lectures&source=gbs_navlinks_s

Course Home Page:

INDUSTRIAL MANAGEMENT AND PSYCHOLOGY

VIII Semester: CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS016	Skill	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Discuss the different Taylor's, Fayol's, Maslow's theories of management.
II. Understanding the line and staff, matrix, functional, virtual, cellular organizational structures of management.
III. Identify the functions of Human resources management and marketing strategies based on product life cycle.
IV. Outline the evolution and fields of social, educational, experimental clinical and personality psychology.

UNIT-I	INTRODUCTION TO MANAGEMENT	Classes: 08

Nature and importance of management, functions of management, theories of management-taylors scientific management theory, fayols principles of management, maslow's theory of human needs, douglas mcgregor's theory x and theory y, two factor theory, leadership styles, social responsibilities of management.

UNIT-II	ORGANIZATIONAL STRUCTURES	Classes:10

Designing organizational structures: Departmentation and decentralization, types of organization structures, line organization, line and staff organization, functional organization, committee organization, matrix organization, virtual organization, cellular organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT-III	HUMAN RESOURCE MANAGEMENT AND MARKETING MANAGEMENT	Classes:09

Human Resources Management (HRM): evolution of HRM, basic functions of hr manager: manpower planning, recruitment, selection, training and development, placement, wage and salary administration, promotion, transfer, separation, performance appraisal, grievance handling and welfare administration, job evaluation and merit rating

Marketing: functions of marketing, marketing mix, marketing strategies based on product life cycle., channels of distribution

UNIT-IV	FUNDAMENTALS OF PSYCHOLOGY	Classes:10

Definition, goals, fields and applications, development of psychology from middle 19th century, psychology in ancient India, the founding of experimental psychology: Contributions of Weber, Fechner, Wundt and Eddinghaus, William James and Galton, development of psychology in India.

UNIT-V	APPLICATIONS AND FIELDS OF PSYCHOLOGY	Classes:08

Applications of psychology to disadvantaged groups, problems of social integration, information technology and mass media, economic development. fields of psychology: social psychology, educational psychology, experimental psychology, clinical psychology, personality psychology.

Text Books:

1. A.R. Aryasri, "Management Science", Tata MC Graw Hill, 2009.
2. Atkinson et al.), "Hilgard's Introduction to Psychology", Harcournt Brace, 13th Edition, 1985.
3. B1ell, P.A., Greene, T. C., Fisher, J.D., and Baum A., "Environmental Psychology", Belmont, CA: Thomson Wadsworth. Ricker Library, 5th Edition, 2001.

Reference Books:

1. Sahakian, William, S. Ed., "History of Psychology", F.E. Peacock Publishers, Inc. Itasca, U.S.A., 1981.
2. Charles G. Morris, Albert Anthony Maisto, Ann Levine, "Psychology: An Introduction", Prentice Hall 2002.

Web References:

1. http://ocw.mit.edu
2. https://www.ivcc.edu

E-Text Books:

1. http://www.blackwellpublishing.com
2. http://college.cengage.com/psychology

Course Home Page:

FINITE ELEMENT PROCEDURE

Group-I:CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE501	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The Course should enable the students to:

I. Understand the concepts of finite element analysis for predicting the behavior of structures to real-world forces, vibration, heat, fluid flow, and other physical effects.
II. Apply finite element method for solving dynamic and stability problems to find an approximate solution by minimizing the associated error function.
III. Understand one, two and three dimensional element properties to obtain stress state and relative displacement of beams.
IV. Analyse and apply various methods of mesh generation techniques for dividing a complex problem into small elements.

UNIT-I	INTRODUCTION	Classes: 09

Introduction; concepts of FEM , steps involved , merits and demerits , energy principles ,discrimination , Raleigh-Ritz method of functional approximation, principles of elasticity; Stress equations, strain displacement relationships in matrix form plane stress, plane strain and axi-symmetric bodies of revolution with axi-symmetric loading.

UNIT-II	ONE DIMENTIONAL & TWO DIMENSIONAL FEM	Classes: 09

One dimensional FEM; stiffness matrix for beam and bar elements , shape functions foe one dimensional elements, two dimensional FEM ; Different types of elements for plane stress and plane strain analysis, displacement models, generalized coordinates, shape functions, convergent and compatibility requirements, geometric invariance, natural coordinate system, area and volume coordinates, generation of element stiffness and nodal load matrices.

UNIT-III	ISOPARAMETRIC FORMULATION & AXI SYMMETRIC ANALYSIS	Classes: 09

Iso-parametric formulation; concept, different iso-parametric elements for 2D analysis, formulation of 4-noded and 8-noded isoparametric quadrilateral elements, Lagrange elements, serendipity elements.

Axi-Symmetric Analysis; bodies of revolution, axi-symmetric modeling, strain displacement relationship formulation of axi-symmetric elements, three dimensional FEM; different 3-D elements, strain, displacement relationship, formulation of hexahedral and isoparametric solid element.

UNIT-IV	FINITE ELEMENT ANALYSIS OF PLATES	Classes: 09

Introduction to basic theory of plate bending, thin plate theory, tress resultants, Mindlin's approximations, formulation of 4-noded isoperimetric quadrilateral plate element – shell element.

UNIT-V	NON – LINEAR ANALYSIS	Classes: 09

Introduction to non – linear analysis, basic methods, application to Special structures.

Text Books:

1. GS Krishna Murthy, "Finite Element Analysis, Theory and Programming", Tata Mcgraw Hill, 7th Edition, 2005.
2. JN Reddy," Introduction to Finite element Method", Tata Mcgraw Hill, 3rd Edition, 2005.

Reference Books:

1. OC Zienkiewicz, "Finite element Methods" Tata Mcgraw Hill, 6th Edition, 2005.
2. Tirupathi Chandra Patila and Belugunudu, "Introduction to Finite element Method", Prentice Hall of India Pvt Ltd – 2007.
3. Robert D.Cook, David S. Malkus and Michael E. Plesha, "Concepts and Applications of Finite Element Analysis", John Wiley & Sons Singapore, 2007.

Web References:

1. http://www.iitg.ernet.in/engfac/rtiwari/resume/usdixit.pdf
2. http://web.mit.edu/16.810/www/16.810_L4_CAE.pdf
3. http://icas.bf.rtu.lv/doc/Book.pdf

E-Text Books:

1. https://books.google.co.in/books/about/The_Finite_Element_Method_in_Engineering.html?id=nBgZqyepUGwC
2. https://books.google.co.in/books/about/Finite_Element_Analysis.html?id=CwOKP1a70Y4C
3. https://books.google.co.in/books/about/Finite_Element_Method_with_Applications.html?id=mtS2TiPACIUC

Course Home Page:

ELEMENTS OF EARTHQUAKE ENGINEERING

Group-I:CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE502	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Summarize the causes of earthquake and understand the theory of vibrations.
II. Comprehend the concepts of seismic resistant design and detailing of reinforced concrete and steel buildings.
III. Understand the seismic design aspects such as base isolation, seismic rehabilitation and retrofitting.
IV. Infer the damage patterns of buildings from case studies of serious earthquakes in various countries in the past.

UNIT-I	ENGINEERING SEISMOLOGY	Classes : 10

Causes of earthquakes, seismic waves**,** magnitudes, intensity and energy release characteristics of strong earthquakes, ground motions, soils effects and liquefaction.

UNIT-II	THEORY OF VIBRATIONS	Classes : 09

Introduction to long and short period structure, single, two and multi-degree of freedom systems, concepts of damped and undamped vibrations, response spectrum, response spectrum analysis.

UNIT-III	SEISMIC DESIGN PHILOSOPHY	Classes : 09

Concept of seismic resistant design, reduction factors, over strength, ductility and redundancy, determination of earthquake forces on structures.

Seismic design and detailing of reinforced concrete and steel buildings.

UNIT-IV	SEISMIC PERFORMANCE OF BUILDINGS	Classes : 08

Case Studies of few serious earthquakes in the country in the past, damages to buildings, damage patterns, performance of non engineered buildings, rural houses during the earthquakes.

UNIT-V	SEISMIC RESISTANT DESIGN	Classes : 09

Basic principles of earthquake resistance. Concepts of earthquake resistant construction in rural areas. Base isolation and energy and dissipation devices. Seismic retrofitting, repair, rehabilitation and retrofitting strategies, Importance of reanalysis. Case Studies.

Text Books:

1. Pankaj Agarwal and Manish Shrikhande, “Earthquake Resistant Design of Structures”, Prentice Hall of India, 2006.
2. S.L. Kramer, “Geotechnical Earthquake Engineering”, Pearson Education, 2004.
3. Mario Paz, “International Handbook of Earthquake Engineering: Codes, Programs, and Examples”, Springer Verlag, 1995.

Reference Books:

1. A.K. Chopra, "Dynamics of Structures, Theory and Applications to Earthquake Engineering", Pearson Education, 2004.
2. D.S. Prakashrao, "Design Principles and Detailing of Concrete Structures", Tata McGraw-Hill Publishing Company, 1995.

Web References:

1. http://nptel.ac.in/downloads/105101004/
2. http://www.ndmindia.nic.in/oneweektrainingarchitects.pdf

E-Text Books:

1. https://drive.google.com/file/d/0B5oarfYUwEDrSlRxZVdDeGdETnc/view
2. http://civilhouse.ir/newsletter/NO2/Earthquake.pdf

Course Home Page:

DESIGN OF PRE STRESSED CONCRETE STRUCTURES

Group-I:CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE503	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Discuss the basic concepts of pre-stressed concrete structures and assess the advantages of pre-stressing over RCC.
II. Design post tensioned and pre tensioned beams and check for strength limit based on IS: 1343 code provisions for safety and durability.
III. Understand short term deflections of uncracked members and predict long term deflections due to creep and shrinkage of members.
IV. Analyze and design composite beams and compute the secondary moments in the beam sections.

UNIT-I	INTRODUCTION -THEORY AND BEHAVIOUR	Classes: 09

Basic concepts, advantages, materials required ,systems and methods of prestressing, analysis of sections, stress concept, strength concept, load balancing concept, effect of loading on the tensile stresses in tendons, effect of tendon profile on deflections, factors influencing deflections, calculation of deflections, short term and long term deflections, losses of prestress, estimation of crack width.

UNIT-II	DESIGN FOR FLEXURE AND SHEAR	Classes: 09

Basic assumptions for calculating flexural stresses, permissible stresses in steel and concrete as per i.s.1343 code, design of sections of type I and type II post-tensioned and pre-tensioned beams, check for strength limit based on IS: 1343 code, layout of cables in post-tensioned beams, location of wires in pre-tensioned beams, design for shear based on IS:1343 code.

UNIT-III	DEFLECTION AND DESIGN OF ANCHORAGE ZONE	Classes: 09

Factors influencing deflections, short term deflections of uncracked members, prediction of long term deflections due to creep and shrinkage, check for serviceability.

Limit state of deflection. Determination of anchorage zone stresses in post-tensioned beams by Magnel‟s method, Guyon’s method and IS1343 code, design of anchorage zone reinforcement, Check for transfer bond length in pre-tensioned beams.

UNIT-IV	COMPOSITE BEAMS AND CONTINUOUS BEAMS	Classes: 09

Analysis and design of composite beams, methods of achieving continuity in continuous beams, analysis for secondary moments, concordant cable and linear transformation, calculation of stresses, principles of design.

UNIT-V	MISCELLANEOUS STRUCTURES	Classes: 09

Design of tension and compression members, tanks, pipes and poles, partial prestressing, definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

Text Books:

1. Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.
3. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012.

Reference Books:

1. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013.
2. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", 3rd Edition, Wiley India Pvt. Ltd., New Delhi, 2013.

Web References:

1. https://www.uncclearn.org/sites/default/files/inventory/unescap20_0.pdf
2. https://www.mdpi.com/2071-1050/7/6/7784/pdf

E-Text Books:

https://ocw.mit.edu/courses/urban-studies-and-planning/

Course Home Page:

ADVACED STRUCTURAL DESIGN

Group-I:CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE504	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the design philosophy in reinforced concrete structures; various types of loads, material characteristics and properties of concrete.
II. Design of various reinforced concrete structures using IS code and ACI code subjected to flexure, shear and torsion.
III. Analyze and design composite beams, columns and shear connectors that provide the means to achieve composite action between the slab and the girders.
IV. Design tension and compression members such are Tanks and pipes subjected to larger longitudinal compressive force of fluids.

UNIT-I	INTRODUCTION	Classes: 08

Design philosophy, modeling of wind loads, wind loads on buildings, material characteristics, properties of concrete.

UNIT-II	REINFORCED CONCRETE	Classes: 09

M-φ relationship: IS code, ACI code, behavior of RC elements under flexure, shear, torsion and combined axial load-bending moment, provision of IS and ACI code, design of RC member in tension.

UNIT-III	PRESTRESSED CONCRETE	Classes: 10

Introduction, prestressing systems, Pre-tensioned and post tensioned members, analysis, losses in prestressed concrete, pressure line, load balancing concept.

Factors influencing deflection, analysis and design of statically determinate pre-stressed concrete structures for flexure and shear, statically indeterminate beams.

UNIT-IV	COMPOSITE STRUCTURES	Classes: 09

Introduction to steel-concrete composite structures, anatomy of a composite building, construction of composite structures, design of composite beam and column, shear connectors, design strength of shear connectors, load resisting systems, connections, Analysis procedures of buildings for gravity and lateral loads.

UNIT-V	MISCELLANEOUS STRUCTURES	Classes: 09

Design of tension and compression members, tanks, pipes and poles partial prestressing; Definition, methods of achieving partial prestressing, merits and demerits of partial prestressing.

Text Books:

1. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, "Reinforced concrete structures", Vol.1, Laxmi Publications, 2004.
2. D. J. Oehlers and M. A. Bradford , "Composite Steel and Concrete Structural Members", Pergamon, Elsevier Science, 1999.

3. S. Unnikrishna Pillai & Menon, “Reinforced concrete design” , Tata McGraw Hill, 2nd Edition, 2003.

Reference Books:

1.Kennath Leet, “Reinforced concrete design”, Tata McGraw-Hill International, 2nd Edition, 1991.
2.IS1343:1980, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012.

Web References:

1. http://www.nicee.org/iaee/E_chapter3.pdf
2. http://www.civ.eng.can.ac.uk/cjb/schools/buildings1/index.xtml

E-Text Books:

1. https://www.highestbrides.com/pdf/wadde11%-20%-20bridge%20engineering.pdf
2. http://books.google.com/books?isbn=1439804818

Course Home Page:

REHABILATION & RETROFITTING OF STRUCTURES

Group-I:CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE505	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Explain different types of deterioration of structures, distress in structures and damage mechanism.
II. Understand the aspects of repair and rehabilitation and facets of maintenance.
III. Apply the various techniques of repair for corrosion protection in structures.
IV. Illustrate different methods for strengthening the existing structures and methods of demolition of structures using engineered and non-engineered techniques.

UNIT-I	INTRODUCTION	Classes: 09

Deterioration of structures; distress in structures; causes and prevention, mechanism of damage; types of damage; damage under accidental and cyclic loads, cracking in structures, evaluation of damage.

UNIT-II	MAINTENANCE AND DIAGNOSIS OF FAILURE	Classes: 09

Maintenance, repair and rehabilitation, facets of maintenance, importance of maintenance, various aspects of inspection; Assessment procedure for evaluating a damaged structure; Diagnosis of construction failures.

UNIT-III	DAMAGES AND THEIR REMEDIES	Classes: 09

Corrosion damage of reinforced concrete, methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, cathodic protection, rust eliminators.

Causes of deterioration of concrete, steel, masonry and timber structures, surface deterioration, efflorescence, causes and preventive measures; coatings for embedded steel and set concrete.

UNIT-IV	MATERIALS AND TECHNIQUES OF REPAIR	Classes: 09

Special concrete and mortar, concrete chemicals, expansive cement, polymer concrete sulphur infiltrated concrete, ferro cement, fiber reinforced concrete, methods of repair in concrete, steel, masonry and timber structures. Gunite and shotcrete, epoxy injection.

UNIT-V	STRENGTHENING AND DEMOLITION ASPECT	Classes: 09

Strengthening of existing structures; repairs to overcome low member strength, deflection, cracking, chemical disruption, weathering, wear, fire, leakage, marine exposure, use of non-destructive testing techniques for evaluation, load testing of structure; demolition of structures using engineered and non-engineered techniques; case studies.

Text Books:

1. Shetty .M.S., "Concrete, Technology", Theory and Practice, S.Chand and Company, New Delhi 2010.
2. Allen .R.T. and Edwards .S.C., "Repair of Concrete Structures" Blakie and Sons, UK 1987.

Reference Books:

1. Raiker .R.N. "Learning from Failures, Deficiencies in Design, Construction and Service", R&D Centre (SDCPL), Raikar Bhavan, Bombay 1987.
2. "Repair & Rehabilitation" "Compilation from The Indian Concrete Journal", - ACC - RCD Publication 2001.
3. Revision compbell, Allen and Itarold Roper, "Concrete Structures Materials Maintenance and Repair" Longman Scientific and Technical UK 1991.

Web References:

1. cpwd.gov.in/Units/handbook.pdf
2. http://www.alljntuworld.in/wp-content/uploads/2016/01/Rehabilitation-and-Retrofitting-of-StructuresNotes.pdf
3. http://iare.ac.in/sites/default/files/PPT/Course%20Resources_12.pdf
4. http://www.tn.gov.in/tsunami/digitallibrary/ebooksweb/04%20REPAIR_RESTORATION_AND_RETROFITTIN.pd

E-Text Books:

1. https://books.google.co.in/books/about/Case_Studies_of_Rehabilitation_Repair_Re.html?id=zraEpIyEpCYC
2. https://books.google.co.in/books/about/Retrofitting_Design_of_Building_Structur.html?id=5XhbZW6JS4YC&redir_esc=y
3. https://books.google.es/books/about/Concrete_Repair_Rehabilitation_and_Retro.html?hl=es&id=nwbNBQAAQBAJ

Course Home Page:

DESIGN OF BRIDGE STRUCTURES

Group-I:CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE506	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify the structural elements of concrete bridges and the different types of bridges.
II. Design short span, long span and pre-stressed concrete bridges for different loading standards as per the specification of IRC.
III. Analyze the dynamic effect due to loading in steel bridges such as plate and box girder bridges.
IV. Assess different types of bearings, piers and abutments of bridges; design bearings, piers and bridge foundation which provide vertical and lateral support for the bridge.

UNIT- I	CONCRETE BRIDGES	Classes: 10

Concrete bridges; introduction, types of bridges, economic span length, types of loading, dead load, live load, impact effect, centrifugal force, wind loads, lateral loads, longitudinal forces, seismic loads, discussion of IRC loadings, frictional resistance of expansion bearings, secondary stresses, temperature effect, erection forces and effects, width of roadway and footway, general design requirements.

UNIT-II	SHORT SPAN AND LONG SPAN REINFORCED CONCRETE BRIDGES	Classes: 09

Types of bridges and loading standards, choice of type, I.R.C. specifications for road bridges, design of RCC solid slab bridges, analysis and design of slab culverts, tee beam and slab bridges, design principles of long span RC bridges; continuous girder bridges, box girder bridges, balanced cantilever bridges arch bridges box culverts.

UNIT-III	PRESTRESSED CONCRETE BRIDGES	Classes: 10

Pre-stressed concrete bridges; basic principles, general design requirements, mild steel reinforcement in pre-stressed concrete member, concrete cover and spacing of pre-stressing steel, slender beams, composite section.

Design of propped composite section; unproped composite section, two-stage pre-stressing, shrinking stresses, general design requirements for road bridges, design of beams and expansion joints.

UNIT-IV	STEEL BRIDGES	Classes: 09

General railway loadings, dynamic effect railway culvert with steel beams, plate girder bridges, box girder bridges, truss bridges, vertical and horizontal stiffeners.

UNIT-V	BEARINGS AND SUBSTRUCTURES	Classes: 07

Different types of bearings, design of bearings, design of piers and abutments of different types, types of bridge foundations design of foundations.

Text Books :

1. Krishna Raju.N. "Design of Bridges", 4th Edition Oxford & IBM Publishing Co, Bombay, 2009.
2. D.Johnson Victor, "Essentials of Bridge Engineering" Oxford and IBH Publishing Co. Pvt. Ltd, 2007.
3. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill Publications, 2008.

Reference Books:

1. Jagadeesh.T.R. and Jayaram.M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd. 2004.
2. Conference Proceedings, "*Advances and Innovations in Bridge Engineering"*, IIT, Madras and Indian Institute of Bridge Engineering Tamil Nadu, Allied Publisher, New Delhi, 1999.

Web References:

1. https://law.resource.org/pub/in/bis/irc/irc.gov.in.sp.013.2004.pdf
2. http://www.iitk.ac.in/nicee/skj/Research_Papers/2002_spectra_Bhuj_Roads%20&%20Bridges.pdf
3. https://law.resource.org/pub/in/bis/irc/irc.gov.in.006.2014.pdf
4. https://law.resource.org/pub/in/bis/irc/irc.gov.in.087.2011.pdf
5. http://www.gian.iitkgp.ac.in/files/brochures/BR1454053769GIAN_Brochure_for_Advanced_Bridge_Design_and_Construction_final_AKSengupta_11_23July2016.pdf
6. http://igs.nigc.ir/STANDS/BOOK/HB-BRIDGE.PDF

E-Text Books:

1. https://books.google.co.in/books/about/Design_of_Bridges.html?id=HUZH0T_1qM0C
2. https://books.google.co.in/books?id=3SLcBQAAQBAJ&printsec=frontcover&dq=bridge+design&hl=en&sa=X&ved=0ahUKEwih27ORyrvQAhVMQY8KHefDDSkQ6AEIKzAD#v=onepage&q=bridge%20design&f=false
3. https://books.google.co.in/books?id=wR37REddB8IC&printsec=frontcover&dq=bridge+design&hl=en&sa=X&ved=0ahUKEwih27ORyrvQAhVMQY8KHefDDSkQ6AEIODAF#v=onepage&q=bridge%20design&f=false

Course Home Page:

ADVANCED SOIL MECHANICS

Group-II :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE507	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the application of the laws of mechanics and hydraulics to engineering problems dealing with sediments and other unconsolidated accumulations of rock particles.
II. Outline the constitutive concepts of mechanical properties: permeability, stiffness, and strength for modeling the stress-strain behavior of soil.
III. Explore the various advanced laboratory and field tests to determine the complete stress-strain behavior of soils.
IV. Analyze the critical state for normally consolidated and over-consolidated soil to determine the soil permeability and maximum settlement under building loads.

UNIT-I	GEOSTATIC STRESSES & STRESS PATHS	Classes: 09

Stresses within a soil mass: Concept of stress for a particulate system, effective stress principle, geostatic stresses, soil water hydraulics: Principal stresses and Mohr's circle of stress, stress paths; at rest earth pressure, stress paths for different practical situations.

UNIT-II	FLOW THROUGH SOILS	Classes:09

Permeability, seepage, mathematical analysis, finite difference formulae for steady state and transient flows, flow nets, computation of seepage, uplift pressure, and critical hydraulic gradient.

UNIT-III	COMPRESSIBILITY AND CONSOLIDATION	Classes:09

One dimensional compression, oedometer test, parameters, coefficient of volume change, constrained modulus, compression index, swell or unloading, maximum past consolidation stress.

Over consolidation ratio, Primary and secondary compression, consolidation: One, two and three dimensional problems, consolidation of partially saturated soils, creep/secondary Compression in soils.

UNIT-IV	STRESS-STRAIN-STRENGTH BEHAVIOUR OF SOILS	Classes:09

Shear strength of soils; failure criteria, drained and un-drained shear strength of soils. Significance of pore pressure parameters; determination of shear strength; drained, consolidated un-drained and undrained tests; interpretation of triaxial test results. Behavior of sands; critical void ratio; dilation in soils.

UNIT-V	CRITICAL STATE SOIL MECHANICS	Classes:09

Critical state parameters; critical state for normally consolidated and over-consolidated soil; significance of Roscoe and Hvorslev state boundary surfaces; yielding, bounding surfaces.

Text Books:

1. Das, B. M., "Advanced Soil Mechanics", Taylor and Francis. 3rd Edition, 2008.
2. Mitchell J.K., "Fundamentals of soil behavior", John Wiley and Sons, Inc., New York, 3rd Edition, 2005.

Reference Books:

1. Atkinson J. H., "An Introduction to the Mechanics of Soils and Foundation - through Critical State Soil Mechanics", McGraw- Hill Co., 1993.
2. Wood, D.M., "Soil Behavior and Critical State Soil Mechanic", Cambridge University Press, 1991.
3. J A Knappett and R F Craig ,"Craig's Soil Mechanic"s, Spon Press Taylor & Francis, 8th Edition, 2012.
4. Lambe, T. W. and Whitman, R. V., "Soil Mechanics", SI version , John Wiley & Sons, 2011.
5. Muniram Budhu, " Soil Mechanics and Foundations", John Wiley & Sons, Inc., 2007.

Web References:

1. https://www.youtube.com/playlist?list=PL_ZYN7hwTiZL-FWFNAXC4F-q3zj20XROb
2. https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/

E-Text Book:

https://ocw.mit.edu/courses/civil-and-environmental-engineering/1-361-advanced-soil-mechanics-fall-2004/download-course-materials/

ROCK MECHANICS

Group-II :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE508	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Categorize the rocks based on the strength and other classification properties.
II. Predict the strength of rocks by different field and laboratory tests such as compressive, triaxial shear test, plate jacking test, etc.
III. Analyze and design rock slopes against various failures and suggest suitable protection measures.
IV. Formulate strategies for safe and controlled blasting operations at underground sites and open spaces.

UNIT-I	ENGINEERING CLASSIFICATION OF ROCKS	Classes: 09

Classification of intact rocks, rock mass classifications, rock quality designation (RQD), rock structure rating (RSR), rock mass rating (RMR), Norwegian geotechnical classification (q-system), strength and modulus from classifications, classification based on strength & modulus and strength and fracture strain, geo-engineering classification.

UNIT-II	LABORATORY AND IN-SITU TESTING OF ROCKS	Classes: 09

Physical properties, compressive strength, tensile strength, direct shear test, triaxial shear test, slake durability test, schmidt rebound hardness test, sound velocity test, in-situ tests: seismic methods, electrical resistivity method, in situ stresses, plate loading test, goodman jack test, plate jacking test, in-situ shear test, field permeability test.

UNIT-III	STRENGTH, MODULUS AND STRESSES-STRAIN RESPONSES OF ROCKS	Classes: 09

Factors influencing rock response, strength criteria for isotropic intact rocks, modulus of intact rocks, effect of confining pressure, uniaxial compressive strength. Strength criteria for intact rocks, strength due to induced anisotropy in rocks.

Stress strain models: Constitutive relationships, elastic, elastoplastic, visco-elastic, elasto-viscoplastic stress-strain models.

UNIT-IV	STABILITY OF ROCK SLOPES AND FOUNDATIONS ON ROCKS	Classes: 09

Rock slopes, modes of failure, rotational failure, plane failure, design charts, wedge method of analysis, buckling failure, toppling failure, improvement of slope stability and protection. Foundations on rock: Introduction, estimation of bearing capacity, stress distribution, sliding stability of dam foundations, strengthening measures, settlements in rocks, bearing cap.

UNIT-V	UNDERGROUND AND OPEN EXCAVATIONS	Classes: 09

Blasting operational planning, explosive products, blast design, underground blast design, controlled blasting techniques, blasting damage and control, safe practice with explosives and shots.

Text Books:

1. Goodman, “Introduction to Rock mechanics”, Willey International, 1980.
2. Ramamurthy, T., “Engineering in Rocks for slopes, foundations and tunnels”, Prentice Hall of India, 2007.

Reference Books:

1. Jaeger, J. C. and Cook, N. G. W. “Fundamentals of Rock Mechanics”, Chapman and Hall, London, 1979.
2. Hoek, E. and Brown, E. T. “Underground Excavation in Rock”, Institution of Mining and Metallurgy, 1982.
3. Brady, B. H. G. and Brown, E. T. “Rock Mechanics for Underground Mining”, Chapman & Hall, 1993.

Web References:

1. http://home.iitk.ac.in/~sarv/New%20Folder/Presentation-1.pdf
2. https://miningandblasting.files.wordpress.com/2009/09/rock-mechanics_for-underground-mining.pdf
3. https://www.rocscience.com/documents/hoek/corner/Practical-Rock-Engineering-Full-Text.pdf
4. http://ceae.colorado.edu/~amadei/CVEN5768/Lecturenotes.htm

E-Text Book:

1. https://books.google.co.in/books/about/Engineering_Rock_Mechanics.html?id=GNoTr0T84NYC
2. https://miningandblasting.files.wordpress.com/2009/09/rock-mechanics_for-underground-mining.pdf

Course Home Page:

GROUND IMPROVEMENT TECHNIQUES

Group-II :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE509	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify the types of soils and categorize the problematic soils by in-situ laboratory tests.
II. Design dewatering systems to prevent significant groundwater seepage into the excavation and to ensure stability of excavation side slopes.
III. Modify the ground by different procedures such as admixtures, shotcrete, grouting and ground freezing.
IV. Apply different methods of soil reinforcement like soil anchors, rock bolts and soil nails in cohesive and granular soils.

UNIT-I	INTRODUCTION TO GROUND MODIFICATION	Classes: 09

Need and objectives, identification of soil types, in situ and laboratory tests to characterize problematic soils; mechanical, hydraulic, physical, chemical, electrical, thermal methods and their applications.

UNIT-II	MECHANICAL MODIFICATION	Classes: 09

Deep compaction techniques- blasting vibro compaction, dynamic tamping and compaction piles.

UNIT-III	HYDRAULIC MODIFICATION	Classes: 09

Objective and techniques, traditional dewatering methods and their choice, design of dewatering system, electro-osmosis, electro kinetic dewatering.

Filtration, drainage and seepage control with geosynthetics, preloading the vertical drains.

UNIT-IV	PHYSICAL AND CHEMICAL MODIFICATION	Classes: 09

Modification by admixtures, shotcreting and guniting technology, modification at depth by grouting, crack grouting and compaction grouting. Jet grouting, thermal modification, ground freezing.

UNIT-V	MODIFICATION BY INCLUSIONS AND CONFINEMENT	Classes: 09

Soil reinforcement, reinforcement with strip, and grid reinforced soil. In-situ ground reinforcement, and ground anchors, rock bolting and soil nailing.

Text Books:

1. Hausmann, M.R "Engineering principles of Ground Modifications", Tata McGraw-Hill publications, 1990.

Reference Books:

1. Koener, R.M, "Designing with Geosynthetics", Prentice Hall, New Jersey, 1994.
2. Jones C.J.P, "Earth Reinforcement and soil structures", Butterworths, London, 1985.

Web References:

1. http://nptel.ac.in/courses/105104034/
2. http://www.myopencourses.com/subject/ground-improvement-techniques-1

E-Text Book:

1. http://www.sciencedirect.com/science/book/9780124080768

Course Home Page:

EARTH AND ROCKFILL DAMS

Group-II : CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE510	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Measure and asses the pore pressure, settlements and stresses in earth and rockfill dams.
II. Discuss different failure mechanisms and damages in earthen dams and rockfill dams.
III. Analyze natural slopes using various standard methods to design non-rigid structure that under stress behaves semi-plastically.
IV. Design different slopes for stability and effective drainage using Bishop's and Spencer's methods of slope analysis.

UNIT-I	EARTH AND ROCKFILL DAMS	Classes: 09

General features, selection of site; merits and demerits of the earth and rock fill dams, classification of earth dams, materials of construction and requirements, causes of failure, safe design criteria. Instrumentation in earth dams: Pore pressure measurements, settlement gauges, inclinometers, stress measurements, seismic measurements.

UNIT-II	FAILURES, DAMAGES AND PROTECTION OF EARTH DAMS	Classes: 09

Nature and importance of failure, piping through embankment and foundations, methods of seepage control through embankments and foundations, design criteria for filters, treatment of upstream and downstream of slopes, drainage control, filter design.

UNIT-III	SLOPE STABILITY ANALYSIS	Classes: 09

Types of Failure: Failure surfaces, planar surfaces, circular surfaces, non-circular surfaces, limit equilibrium methods.

Total stress analysis versus effective stress analysis, use of bishop's pore pressure parameters, short term and long term stability in slopes.

UNIT-IV	METHODS OF SLOPE STABILITY	Classes: 09

Taylor Charts, method of slices, effect of tension cracks, vertical cuts. Bishop's analysis, Bishop and Morgenstern analysis, non-circular failure surfaces: Morgenstern and price analysis, janbu analysis, spencer analysis, sliding block analysis, seismic stability, stabilization of slopes: drainage measures, soil reinforcement (geosynthetics/soil nailing/micro piles etc), soil treatment (cement/lime/thermal treatment), surface protection (vegetation/erosion control mats/shotcrete).

UNIT-V	ROCKFILL DAMS	Classes: 09

Requirements of compacted rockfill, shear strength of rockfill, rockfill mixtures, rockfill embankments, earth-core rockfill dams, stability, upstream and downstream slopes.

Text Books:

1. Sherard, Woodward, Gizienski and Clevenger, "Earth and Earth-Rock Dams", John Wiley &. Sons. , 1963.

Reference Books:

1. Bharat Singh and Sharma, H. D. "Earth and Rockfill Dams", Sarita Prakashan, 1975.
2. Sowers, G. F. and Salley, H. I. "Earth and Rockfill Dams", Willams, R.C., and Willace, T.S., 1965.
3. Abramson, L. W., Lee, T. S. and Sharma, S. "Slope Stability and Stabilization methods", John Wiley & sons., 2002.
4. Bromhead, E. N." The Stability of Slopes", Blackie Academic and Professional, London, 1992.
5. Christian," Earth & Rockfill Dams .Principles of Design and Construction", Kutzner Published Oxford and IBH, 1997.
6. Ortiago, J. A. R. and Sayao, A. S. F. J. "Handbook of Slope Stabilization", 2004.

Web References:

1. https://www.youtube.com/watch?v=fqceTkveWTo
2. https://www.youtube.com/watch?v=2MkylO8HC1E

E-Text Book:

1. Advanced Dam Engineering for Design, Construction, and Rehabilitation By R.B. Jansen
2. http://build-crimea.com/21119-christian-kutzner-downloadable-audio-books.html
3. http://www.worldcat.org/title/earth-and-rockfill-dam-engineering/oclc/597077278

Course Home Page:

GEOTECHNICAL EARTHQUAKE ENGINEERING

Group-II :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE511	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Discuss the concept of seismology and theory of continental drift due to plate tectonic.
II. Identify the parameters controlling the dynamic response of soil under earthquake load.
III. Summarize stiffness, damping and plasticity parameters of soil and their determination by laboratory testing, intrusive and non intrusive in-situ testing.
IV. Describe deterministic seismic hazard analysis and probabilistic seismic hazard analysis.

UNIT-I	INTRODUCTION TO GEOTECHNICAL EARTHQUAKE ENGINEERING	Classes: 09

Scope and objective; nature and types of earthquake loading; importance of geotechnical earthquake engineering, basic seismology, earthquake, list of major earthquakes, causes of earthquakes, sources of earthquake data, elastic rebound theory, faults, plate tectonics, seismograph and seismogram, prediction of earthquakes, protection against earthquake damage, origin of universe, layers of earth, theory of continental drift, hazards due to earthquakes.

UNIT-II	BASICS OF VIBRATION THEORY	Classes: 09

Concept of dynamic load, earthquake load, single degree of freedom system, multiple degree of freedom system, free and forced vibrations, damped and undamped systems, equation of motion, response spectra.

UNIT-III	STRONG GROUND MOTION	Classes: 09

Size of earthquake: magnitude and intensity of earthquake modified Mercalli intensity scale, measuring of earthquake, earthquake magnitude, local (Richter) magnitude, surface wave magnitude, moment magnitude, seismic energy, correlations.

Spectral parameters: Peak acceleration, peak velocity, peak displacement, frequency content and duration, spatial variability of ground motion, attenuation relationships, fourier amplitude spectra, arias intensity.

UNIT-IV	DYNAMIC SOIL PROPERTIES	Classes: 09

Stiffness, damping and plasticity parameters of soil and their determination (laboratory testing, intrusive and non intrusive in-situ testing); correlations of different soil parameters; liquefaction (basics, evaluation and effects), liquefaction hazard map, lateral spreading.

UNIT-V	SEISMIC HAZARD ANALYSIS	Classes: 09

Magnitude indicators, segmentation, deterministic seismic hazard analysis (DSHA), probabilistic seismic hazard analysis (psha), earthquake source characterization, Gutenberg-Richter recurrence law, predictive relationships, temporal uncertainty, probability computations, seismic hazard curve, logic tree methods.

Text Books:

1. Shamsher Prakash, “Soil Dynamics”, McGraw-Hill Book Company, 1981.
2. Steven L.Kramer, “Geotechnical Earthquake Engineering”, Prentice Hall Inc., 1996.
3. Kenji Ishihara, “Soil Behaviour in Earthquake Geotechnics”, Oxford University Press, USA. , 1996.

Reference Books:

1. IS 1893: “Indian Standard Criteria for earthquake resistant Design of Structures”, 2002.
2. Robert W. Day, “Geotechnical Earthquake Engineering Handbook”, McGraw Hill, New York, 1999.
3. Ikuo Towhata, “Geotechnical Earthquake Engineering”, Springer-Verlag Heidelberg, 2008.
4. Milutin Srbulov, “Geotechnical Earthquake Engineering: Simplified Analyses with Case Studies and Examples”, Springer-Verlag, 2008.
5. D. D.Barkan, “Dynamics of Bases and Foundations”, McGraw-Hill Book Company, 1962.

Web References:

1. https://www.youtube.com/watch?v=LG-4bIgYYhQ

E-Text Book:

1. https://www.nuquake.eu/AnalyzaSeizmickehoOhrozenia/ucebne%20texty/Geotechnical%20Earthquake%20Engineering%20(Kramer%201996).pdf

Course Home Page:

GEO-ENVIRONMENTAL ENGINEERING

Group-II :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE512	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify, prevent and solve the problems that may adversely affect the environment.
II. Examine the basics of geo-environmental problems, contaminant transport in subsurface environments.
III. Develop the awareness to various geo-environmental problems, their multi-disciplinary nature, site contamination scenarios and control.
IV. Design resistant landfill liner systems to prevent contamination between the waste and the surrounding environment, especially groundwater.

UNIT-I	SOURCES AND SITE CHARECTERIZATION	Classes: 09

Sources and site characterization: Scope of geo-environmental engineering, various sources of contaminations, need for contaminated site characterization; and characterization methods.

UNIT-II	SOLID AND HAZARDOUS WASTE MANAGEMENT	Classes: 09

Solid and hazardous waste management: Characterization solid wastes, environmental concerns with waste, waste management strategies.

UNIT-III	SOIL-WATER-CONTAMINANT INTERACTION	Classes: 09

Soil mineralogy characterization and its significance in determining soil behaviour, soil-water interaction and concepts of double layer, forces of interaction between soil particles. Concepts of unsaturated soil.

Importance of unsaturated soil in geo-environmental problems, measurement of soil suction, water retention curves, water flow in saturated and unsaturated zone. Soil-water-contaminant interactions and its implications, factors effecting retention and transport of contaminant.

UNIT-IV	REMEDIATION TECHNIQUES	Classes:09

Objectives of site remediation, various active and passive methods, Bioremediation, Phyto remediation of NAPL sites.

UNIT-V	LANDFILLS	Classes: 09

Landfills: Types of landfills, Site Selection, Waste Containment Liners, Leachate collection system, Cover system, Gas collection system.

Text Books:

1. Phillip B. Bedient, Refai, H.S and Newell C. J., " Ground water Contamination", Prentice Hall Publications, 4th Edition, 2008.
2. Sharma, H. D. and Reddy, K. R., "Geoenvironmental Engineering", John Wiley and Sons, 2004.

Reference Books:

1 Rowe, R. K, "Geotechnical and Geoenvironmental Engineering Handbook", Kluwer Academic, 2001.
2 Reddi, L. N. and Inyang, H.I, "Geoenvironmental Engineering Principles and Application", Marcel. Dekker, Inc., New York, 2000.
3 La Grega, M.D., Buckingham, P.L. and Evans, J. C., "Hazardous Waste Management", New York: McGraw-Hill, 2001.

Web References:

1. http://nptel.ac.in/courses/105103025/
2. http://hydro.geo.ua.edu/geo406_506/Lecture20.pdf
3. https://yosemite.epa.gov/r9/sfund/r9sfdocw.nsf/92ac13b3285177088825742600 73faee/bec6e421fe5eb64f88257a63006cbf8c/$FILE/Section%206.pdf
4. http://www.lmnoeng.com/Groundwater/transportStep.php
5. http://www.engr.colostate.edu/ce/academicprograms/geoenv.shtml

E-Text Books:

1. https://books.google.co.in/books/about/Geoenvironmental_Engineering.html?id=r3JsZO1VcoC&redir_esc=y
2. https://www.crcpress.com/Geoenvironmental-Engineering-Principles-and-Applications/Reddi-Inyang/p/book/9780824700454
3. https://www.studynama.com/community/threads/187-Engineering-Geology-Ebook-Lecture-Notes-PDF-download-for-Civil-Engineers
4. http://ascelibrary.org/journal/jggefk
5. http://ascelibrary.org/?gclid=cjwkeaia6rrbbrdsrlgm4utpkwasjadnwzq4g5ta4labyjpdpxmh0tqkotqthjamafxmh1kgqu7xdroc8shw_wcb.

Course Home Page:

FLUID DYNAMICS

Group-III :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE513	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Discuss the basic concepts of mass conservation and continuity in fluid flow and their analyses under different flow types.
II. Illustrate advanced concepts of fluid vorticity and the laminar boundary layer solutions formulated by Blasius and Karman-Pohlhausen.
III. Use of Fourier series for solving one-dimensional wave, sound waves, plane, cylindrical and spherical sound waves problems.
IV. Solve the analytical and numerical methods to model the HD/MHD systems.

UNIT- I	INTRODUCTION	Classes: 09

Fluids; Mass conservation and continuity equation, Navier-Stokes equations & forces, steady and transient flows, vorticity and rotation, laminar flows, flow through pipe, boundary layers, characteristics, momentum thickness, flow with circular shape, couette flow, spherical polar co-ords.

UNIT-II	CONTINUUM FLUIDS	Classes: 09

Flow past a sphere, reynolds number, vorticity equation and the role of irrotational flow, burgers vortex, vortex lines, the blasius solution, the von karman-pohlhausen method simple applications, classification of PDEs.

UNIT-III	WAVE EQUATION	Classes: 09

Waves on strings, D'Alembert solution, standing and propagating waves, normal modes, use of fourier series for solving one-dimensional wave problems, sound waves, plane, cylindrical and spherical sound waves.

Water waves, wave dispersion, group velocity, traffic waves introducing the method of characteristics, magnetized fluid as a plasma.

UNIT-IV	MAGNETO HYDRODYNAMICS	Classes: 09

Debye length and plasma oscillations, magneto hydrodynamic equations, magneto hydrostatics, induction equation, magnetic reynolds number, plasma beta, transport coefficients in presence of magnetic field.

UNIT-V	ANALYTICAL METHODS	Classes: 09

Magnetic reconnection, MHD waves, shock waves, instabilities, characteristics in MHD, introduction to essential analytical and numerical methods to model the HD/MHD systems.

Text Books :

1. M.D. Raisinghania, "Fluid Dynamics with Hydrodynamics" , S Chand & Co Ltd, 5th Edition, 2003.
2. Peter S. Benard, "Fluid Dynamics", Cambridge University Press, 2015.

Reference Books:

1. D.J. Acheson, "Elementary Fluid Dynamics", Clarendon Press, 1990.
2. Atul Sharma, "Introduction to Computational Fluid Dynamics: Development, Application and Analysis", John Wiley and Sons Ltd, 1st Edition, 2016.

Web References:

1. https://courses.soe.ucsc.edu/courses/ams217
2. https://www.researchgate.net/journal/0169-5983_Fluid_Dynamics_Research
3. http://www.thphys.nuim.ie/Notes/MP353/nash_notes_on_fluids.pdf

E-Text Books:

1. https://books.google.co.in/books?isbn=0521429692
2. https://books.google.co.in/books?isbn=0521663962

Course Home Page:

ADVANCE WATER RESOURCES ENGINEERING

Group-III :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE514	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand precipitation measurement using rain gauges and mass rainfall curves methods.
II. Discuss the occurrence of the ground water and necessary methods for improving ground water storage.
III. Illustrate various types of floods, flood routing through reservoirs and channels.
IV. Describe the impact assessment of water resource development and managerial measures.

UNIT- I	INTRODUCTION	Classes: 10

Hydrology; hydrological cycle, precipitation and its measurement, recording and non-recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves.

UNIT-II	ADVANCED HYDROLOGY	Classes: 09

Infiltration and infiltration indices, evaporation stream gauging, runoff and its estimation, hydrograph analysis, unit hydrograph derivation from isolated and complex storms, S-curve hydrography, synthetic unit hydrography.

UNIT-III	GROUND WATER	Classes: 10

Ground water; occurrence, confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries, ground water recharge; necessity and methods of improving ground water storage.

Water logging and salt efflorescence; water logging causes, effects and prevention, salt efflorescence; causes and effects, reclaimation of water logged and salt affected lands.

UNIT-IV	FLOODS	Classes: 09

Floods; types of floods, estimation by various methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

UNIT-V	WATER RESOURCE PLANNING AND MANAGEMENT	Classes: 07

Planning of water resources projects, data requirements, economic analysis of water resources projects, appraisal of multiple projects, optimal operation of projects, introduction to linear programming and its application to water resources projects, role of water in the environment, rain water harvesting, impact assessment of water resources development and managerial measures.

Text Books :

1. K. Subramanya, “Engineering Hydrology”, Tata McGraw-Hill, 1994.
2. Santosh Kumar Garg, “Hydrology and Flood Control”, Khanna Publishers, 2015.

Reference Books:

1. J.Nemec, “Engineering Hydrology”, McGraw-Hill, 1972.
2. H.M. Rahunath, “Hydrology: Principles, Analysis and Design”, New Age International, 2006.

Web References:

1. https://www.elsevier.com/journals/advances-in-water-resources/0309-1708?generatepdf=true
2. http://www.journals.elsevier.com/advances-in-water-resources
3. http://nptel.ac.in/courses/105103026/

E-Text Books:

1. https://books.google.co.in/books/about/Hydrology.html?id=-N1G5VSoRngC&redir_esc=y
2. https://books.google.co.in/books?id=qFRezTsaxo8C&printsec=frontcover&dq=engineering+hydrology&hl=en&sa=X&ved=0ahUKEwjssb7t5bvQAhULNI8KHUpdDAoQ6AEIIjAB#v=onepage&q=engineering%20hydrology&f=false
3. https://books.google.co.in/books?id=KIJSAgAAQBAJ&printsec=frontcover&dq=engineering+hydrology&hl=en&sa=X&ved=0ahUKEwjssb7t5bvQAhULNI8KHUpdDAoQ6AEIKDAC#v=onepage&q=engineering%20hydrology&f=false

Course Home Page:

WATER RESOURCES PLANNING AND MANAGEMENT

Group-III :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE515	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Assess the potential of groundwater and surface water resources using different mathematical techniques about sustainable yields of the water resources.
II. Outline the levels/stages of water resources planning and water master planning for acquiring the required data pertaining population, water demand, coverage area, etc.
III. Deal with water supply/demand issues including water demand management, reservoir storage and other structural and non-structural methods.
IV. Implement Integrated Water Resource Management in different regions by adopting LP, DP and TSM for water resources management and planning.

UNIT- I	ASSESSMENT OF GROUND WATER AND SURFACE WATER RESOURCES	Classes: 10

Hydrologic cycle, groundwater resources, types of aquifers, groundwater flow, groundwater as a storage medium, surface water resources, water balance, available renewable water resources, water scarcity, a rainbow of water, the water balance as a result of human interference, brief about water resources in India.

UNIT-II	WATER RESOURCES PLANNING	Classes: 09

Planning concepts and definitions, aim of water resources planning, levels of water resources planning, measurement of objectives (utility trade-off analysis), function and role of water resources, risk and uncertainty, phases of water resources planning, water master planning, data requirements for water resources planning, determination of sustainable yield, methods of forecasting population, storage reservoirs.

UNIT-III	WATER RESOURCES MANAGEMENT	Classes: 10

Functions of water resources management, water scarcity and its impacts, water shortages vs. WRM.

Water resources management in palestine and evaluation of water resources management options in India.

UNIT-IV	WATER DEMAND MANAGEMENT	Classes: 09

Concept, potential stresses on water demand, the demand management approach, water demand and water quality management.

UNIT-V	INTEGRATED WATER RESOURCES MANAGEMENT	Classes: 07

Definition of IWRM, IWRM principles, how to implement IWRM, legislative and organizational framework, types and forms of private sector involvement.

Text Books :

1. Loucks D.P, Stedinger J.R and Haith D.A, 'Water Resources Systems Planning and Analysis', Prentice Hall, USA, 1981.
2. Mays L.W and Tung Y-K, 'Hydrosystems Engineering and Management', McGraw Hill, USA, 1992.
3. Vedula S. and Mujumdar P.P., 'Water Resources Systems: Modelling Techniques and Analysis', Tata McGraw-Hill, 2005.

Reference Books:

1. Jain S.K. and Singh V.P., 'Water Resources Systems Planning and Management', Elsevier, The Netherlands, 2003.
2. Loucks D.P. and van Beek E., 'Water Resources Systems Planning and Management', UNESCO Publishing, The Netherlands, 2005.

Web References:

1. http://www.myopencourses.com/subject/water-resources-systems-planning-and-management
2. http://nptel.ac.in/courses/105108081/

E-Text Books:

1. https://ecommons.cornell.edu/bitstream/handle/1813/2804/00_intro.pdf?sequence=21
2. http://www.springer.com/gp/book/978331944232

Course Home Page:

ADVANCED GROUND WATER HYDROLOGY

Group-III :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE516	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify ground water source by geophysical studies and estimate the quantity of water by pumping tests.
II. Understand the need of pumping tests and the transient methods for determining aquifer parameters.
III. Evaluate the need of artificial recharge and monitor its effect on ground water recharge.
IV. Model groundwater structure by adopting the various finite-difference and finite-element modeling techniques.

UNIT-I	FUNDAMENTALS OF GROUNDWATER	Classes:09

Concept of effective porosity, storage coefficient, specific yield, fillable porosity and safe yield, primary and secondary porosity, homogeneity and isotropy, Darcy's law and its validity, streamlines and equipotential lines, overview of aquifer hydraulics. Steady/ unsteady, uniform/ radial flow to a well in a confined/ unconfined /leaky aquifer, well flow near aquifer boundaries/ for special conditions, partially penetrating/horizontal wells & multiple well systems, well completion/ development/ protection/ rehabilitation/ testing for yield.

UNIT-II	WELL AND AQUIFER EVALUATION FROM PUMPING TESTS	Classes:09

Need of pumping tests, types, design and test procedure, merits and demerits of pumping test, steady and transient methods for determining aquifer parameters, recovery test, slug tests. Geo-physical exploration studies, different types and procedures for analysis of geophysical studies.

UNIT-III	GROUND WATER QUALITY AND CONTAMINATION	Classes:09

Definitions, water-quality parameters and characteristics, monitoring of groundwater quality, water-quality criteria and standards, collection of water samples, vadose zone monitoring, mass transport of solutes.

Groundwater contamination, sources and causes, attenuation of groundwater contamination, groundwater restoration, case history, capture zone analysis.

UNIT-IV	GROUND WATER MODELING	Classes:09

Definitions and terms, model types, brief history of groundwater modeling techniques, application of models, data requirements for numerical modeling, modeling protocol, finite-difference models, finite element models, introduction to inverse modeling, salient groundwater flow and transport software packages, case studies, overview of multiphase flow, density-dependent flow and fractured media.

UNIT-V	ARTIFICIAL RECHARGE OF GROUNDWATER	Classes:09

Definition, objectives, significance, environmental impacts, sources of recharge water, methods, hydraulics and monitoring of artificial recharge, concept of SAT system, ASR technique, conjunctive use of surface water and groundwater, design, construction, operation and maintenance of injection wells and spreading basins, modeling of artificial recharge, salient case studies.

Text Books:

1. Karamouz, M, Ahmadi, A, and Akhbari, M, "Groundwater Hydrology: Engineering, Planning and Management", CRC Press, 2011.
2. D.K. Todd and L. F. Mays, "Groundwater Hydrology", John Wiley and sons, 2005.
3. K. R. Karanth,"Hydrogeology", Tata McGraw Hill Publishing Company, 1989.

Reference Books:

1. Chow, V.T., D.R. Maidment, and L.W. Mays, "Applied Hydrology", McGraw-Hill Book Company, 1988.
2. Freeze, Alan R., and John A. Cherry. "*Groundwater".* Englewood Cliffs, NJ: Prentice Hall, 1979. ISBN: 0133653129.
3. Davis, S.N., and De Weist, R.J.M., Hydrogeology, John Wiley & Sons, New York, 1966.
4. Domenico, Concepts and Models in Groundwater Hydrology, McGraw Hill Inc. New York, 1972.

Web References:

1. http://nptel.ac.in/courses/105105042/1

E-Text Book:

1. https://books.google.co.in/books?id=chwdkxjpkokC&q= Groundwater Hydrology TODD and MOYS.pdf
2. http://homepages.vub.ac.be/~fdesmedt/groundwater%20hydrology%20part%201.pdf

Course Home Page:

SOFT COMPUTING IN WATER RESOURCES

Group-III :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE517	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the concept of soft computing techniques and its application in water resource engineering.
II. Evaluate various hydrology and water resource engineering solutions using Artificial Neural Networks.
III. Assess the applications of feed forward neural networks in hydrology, water resources and environmental Engineering.
IV. Apply fuzzy logic and fuzzy reasoning for decision making and solving real-time water resource engineering problems.

UNIT-I	INTRODUCTION	Classes: 09

Introduction, need for soft computing techniques, components of soft computing artificial neural networks (ANN), types of ANN and learning algorithms, tasks performed by ANN.

UNIT-II	INTRODUCTION TO NEURAL NETWORKS AND ITS APPLICATION IN HYDROLOGY	Classes: 09

Basic concepts of feed forward neural networks, perceptron learning rule, back propagation learning algorithm, application of feed forward ANN for function approximation and prediction, limitations of feed forward neural networks, applications of feed forward neural networks in hydrology, water resources and environmental Engineering.

UNIT-III	NEURAL NETWORK MODELS	Classes: 09

Hebbian learning and hopfield networks, pattern association, radial basis function networks, Kohonen networks and self-organization maps, applications of ANN in pattern classification.

Information and uncertainty, chance versus ambiguity, classical sets and fuzzy sets, logic and reasoning, fuzzy set operations and fuzzy relations, membership functions, fuzzy numbers and fuzzy arithmetic.

UNIT-IV	FUZZY SET THEORY	Classes: 09

Fuzzy systems, fuzzy relations, fuzzy inference systems, decision making with fuzzy information, fuzzy classification and pattern recognition, neuro-fuzzy systems.

UNIT-V	BASIC CONCEPTS OF OTHER SOFT COMPUTING	Classes: 09

Basic concepts of other soft computing algorithms: Genetic algorithms, evolutionary algorithms, simulated annealing, honeybee mating algorithms, hybrid soft computing techniques, applications to water resources engineering problems.

Text Books:

1. Haykin, "Neural Networks: A Comprehensive Foundation", Prentice Hall India, New Delhi, 2008.
2. Rajasekaran, S., and Vijayalakshmi Pai, G.A., "Neural Networks, Fuzzy Logic and Genetic Algorithms – Synthesis and Applications", Prentice-Hall India, New Delhi, 2003.
3. Tayfur, G. "Soft Computing in Water Resources Engineering", Southampton-WIT Press, 2012.

Reference Books:

1. Jang, J.R, Sun Chuen-tsai, and Mizutani Eiji, Neuro, "Fuzzy and Soft Computing: A Computational Approach to Learning and Machine", Intelligence, PHI Learning, 2009.
2. Kosko, B., "Neural Networks and Fuzzy Systems", Prentice Hall of India Pvt. Ltd., New Delhi, 1997.
3. Zimmermann, H.-J. "Fuzzy Set Theory and its Applications", Kluwer Academic, Boston, 1985.

Web References:

1. http://www.myreaders.info/html/soft_computing.html

E-Text Book:

1. https://books.google.co.in/books/about/Soft_Computing_in_Water_Resources_Engine.html?id=OzYrBQAAQBAJ&redir_esc=y
2. https://books.google.co.in/books?id=OzYrBQAAQBAJ&pg=PP17&lpg=PP17&dq=soft+computing+in+water+resources+engineering+books&source=bl&ots=LUTGZaH27F&sig=qaX9lmm814aEkkAT5Pgw-5norPY&hl=en&sa=X&ved=0ahUKEwj1iKSArbrQAhUKo48KHV6MDZwQ6AEIRzAJ#v=onepage&q=soft%20computing%20in%20water%20resources%20engineering%20books&f=false

Course Home Page:

IMPACT OF CLIMATE CHANGE IN WATER RESOURCES SYSTEMS

Group-III :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE518	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the characteristics of climate system and drivers of climate change in order to predict the control measures.
II. Relate the impact of climate change on water resources in the global and Indian scenarios.
III. Apply various quantitative and economic models for the vulnerability assessment of climate change.
IV. Outline the mitigation measures essential for sustainable development based on the assessment of case studies.

UNIT-I	THE CLIMATE SYSTEM	Classes: 09

Definitions: Climate, Climate system, climate change; Drivers of climate change; Characteristics of climate system components; Green house effect; Carbon cycle; Wind systems; Trade winds and the hadley cell; Ozone hole in the stratosphere; El Nino, la nina; ENSO, teleconnections.

UNIT-II	IMPACTS OF CLIMATE CHANGE –OBSERVED AND PROJECTED	Classes: 09

Global Scenario; Indian scenario; Observed changes and projected changes of IPCC: Impacts on water resources, NATCOM Report, Impacts on sectoral vulnerabilities, SRES, Different scenarios.

UNIT-III	TOOLS FOR VULNERABILITY ASSESMENT	Classes: 09

Need for vulnerability assessment, Steps for assessment; Approaches for assessment; Models; Quantitative models, Economic model.

Impact matrix approach: Box models, Zero-dimensional models, Radioactive convective models, Higher dimension models, EMICs (Earth-system models of intermediate complexity), GCMs (global climate models or general circulation models) , Sectoral models.

UNIT-IV	ADAPTATION AND MITIGATION	Classes: 09

Water-related adaptation to climate change in the fields of ecosystems and biodiversity, Agriculture and food security, land use and forestry, human health, water supply and sanitation, infrastructure and economy (insurance, tourism, industry and transportation), Adaptation, vulnerability and sustainable development sector, specific mitigation, Carbon dioxide capture and storage (CCS), Bioenergy crops, Biomass electricity, hydropower, geothermal energy, energy use in buildings, landuse change and management, cropland management, afforestation and reforestation, Potential water resource conflicts between adaptation and mitigation, Implications for policy and sustainable development.

UNIT-V	CASESTUDIES	Classes: 09

Water resources assessment case studies , Ganga damodar project, himalayan glacier studies, ganga valley project, Adaptation strategies in assessment of water resources, Hydrological design practices and dam safety; Operation policies for water resources projects; Flood management strategies: Drought management strategies; Temporal & spatial assessment of water for Irrigation; Land use & cropping pattern; Coastal zone management strategies.

Text Books:

1. P R Shukla, Subobh K Sarma, NH Ravindranath, Amit Garg and Sumana Bhattacharya, "Climate Change and India: Vulnerability assessment and adaptation", University Press (India) Pvt Ltd, Hyderabad, 2003.

Reference Books:

1. IPCC Report Technical Paper VI – "Climate change and water", 2008.
2. UNFCC "Technologies for Adaptation to climate change", 2006.
3. Preliminary consolidated Report on Effect of climate change on Water Resources, GOI, CWC, MOWR, 2008.

Web References:

1. http://www.grida.no/climate/ipcc_tar/wg2/pdf/wg2TARchap4.pdf
2. https://www.ipcc.ch/pdf/technical-papers/ccw/chapter3.pdf

E-Text Book:

1. https://cfpub.epa.gov/watertrain/pdf/modules/Climate_Change_Module.pdf
2. https://books.google.co.in/books?id=ttkBj ps96EC&pg=PP5&lpg=PP5&dq=impact+of+climate+change+on+water+resources+e-books&source=bl&ots=EIvBRNCVXY&sig=Yo_q8oRqk_WXtzNdKNUH93dDsok&hl=en&sa=X&ved=0ahUKEwj41Mb8gLzQAhUEOI8KHW0oCl8Q6AEINjAF#v=onepage&q=impact%20of%20climate%20change%20on%20water%20resources%20e-books&f=false

Course Home Page:

PRINCIPLES OF TRAFFIC ENGINEERING

Group-IV :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE519	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Outline the basics principles of traffic engineering and their classifications.
II. Identify the traffic flow and traffic stream models with technical approach.
III. Conduct surveys and know the importance of queuing theory that applicability to real world scenario.
IV. Analyze the behavior of pedestrian delays, gaps and simulation of traffic.

UNIT-I	TRAFFIC FLOW DESCRIPTION	Classes: 09

Traffic stream characteristics and description using distributions: measurement, microscopic and macroscopic study of traffic stream characteristics flow, speed and concentration; use of counting, interval and translated distributions for describing vehicle arrivals, headways, speeds, gaps and lags; fitting of distributions, goodness of fit tests.

UNIT-II	TRAFFIC STREAM MODELS	Classes: 09

Fundamental equation of traffic flow, speed flow concentration relationships, normalized relationship, fluid flow analogy approach, shock wave theory, flow density diagram use in shockwave analysis; use of time-space diagram for shockwave description; bottleneck situations and shockwaves; traffic signal and shockwave theory; numerical examples for application of shockwave theory; car-following theory.

UNIT-III	QUEUING ANALYSIS	Classes: 09

Fundamentals of queuing theory, demand service characteristics, deterministic queuing models, stochastic queuing models, multiple service channels, analysis of m/m/1 system; assumptions and derivation of system state equations; application of m/m/1 analysis for parking garages and toll plazas, numerical examples;

Analysis of D/D/1 system for delay characteristics; traffic signal analysis as d/d/1 system; computation of delays and queue dissipation time, numerical examples.

UNIT-IV	PEDESTRIAN DELAYS AND GAPS	Classes: 09

Pedestrian gap acceptance and delays; concept of blocks, anti- blocks, gaps and non-gaps; underwood's analysis for pedestrian delays; warrants for pedestrian crossing facilities, minimum vehicular volume warrant, minimum pedestrian volume warrant, maximum pedestrian volume warrant.

UNIT-V	SIMULATION OF TRAFFIC	Classes: 09

Introduction, advantages of simulation techniques, steps in simulation, scanning techniques, example of simulation.

Text Books:

1 A.D.May, "Traffic Flow Fundamentals", Prentice Hall India Publication, 1990.
2 McShane & Rogers, "Fundamentals of Traffic Engineering", 1977.

Reference Books:

1. Gerlough & Huber, A Monograph, "Traffic Flow Theory", TRB Special Report 165, 1975.
2. C.S.Papacostas, "Fundamentals of Transportation Engineering", Prentice Hall India Publication, 1987.
3. F.L.Mannering & W.P.Kilareski, "Principles of Highway Engineering and Traffic Analysis", John Wiley Publishers, 3rd Edition , 2007.

Web References:

1. https://en.wikipedia.org/wiki/Traffic_engineering_(transportation)
2. nptel.ac.in/downloads/105101008/
3. https://www.sciencedaily.com/terms/traffic_engineering_(transportation).html

E-Text Books:

1. www.fdot.gov/traffic/TrafficServices/Studies/TEM/tem.shtml
2. https://www.jntubook.com/traffic-engineering-textbook-free-download/

Course Home Page:

PAVEMENT DESIGN

Group-IV :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE520	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Discuss the types of pavements and the factors affecting the rigid and flexible pavements.
II. Understand the Visco- elastic theory and the stress solutions for layered systems.
III. Design flexible and rigid pavements for roadways using common procedures and computational tools.
IV. Assess the deformation parameters and properties of pavement materials; design pavements for low volume and rural roads as per the codes of practices.

UNIT-I	FACTOR AFFECTING PAVEMENT DESIGN AND STRESS IN PAVEMENTS	Classes: 09

Variables considered in pavement design, types of pavements, functions of individual layers, classification of axle types of rigid chassis and articulated commercial vehicles, legal axle and gross weights on single and multiple units, tire pressure, contact pressure, EAL and ESWL concepts, traffic analysis: ADT, AADT, truck factor, growth factor, lane distribution factor & vehicle damage factor, effects of transient & moving loads. Vehicle: pavement interaction: transient, random & damping vibrations, steady state of vibration, experiments on vibration, stress inducing factors in flexible and rigid pavements.

UNIT-II	STRESS IN FLEXIBLE PAVEMENTS AND RIGID PAVEMENTS	Classes: 09

Visco-elastic theory and assumptions, layered systems concepts, stress solutions for one, two and three layered systems, fundamental design concepts. Westergaard's theory and assumptions, stresses due to curling, stresses and deflections due to loading, frictional stresses, stresses in dowel bars & tie bars.

UNIT-III	MATERIAL CHARACTERISTICS	Classes: 09

CBR and modulus of sub grade reaction of soil, mineral aggregates – blending of aggregates, binder, polymer and rubber modified bitumen, resilient, diametral resilient and complex (dynamic) moduli of bituminous mixes.

Permanent deformation parameters and other properties, effects and methods of stabilization and use of geo synthetics.

UNIT-IV	DESIGN OF FLEXIBLE PAVEMENTS ANDRIGID PAVEMENTS	Classes: 09

Flexible pavements design concepts, asphalt institute's method with HMA and other base combinations, AASHTO, IRC method, calibrated mechanistic design process, PCA, AASHTO & IRC specifications, introduction to prestressed and continuously reinforced cement concrete pavement design.

UNIT-V	DESIGN OF PAVEMENTS	Classes: 09

Pavement design for low volume roads, rural road designs- Codes of practices.

Text Books:

1. Nai C. Yang , "Design of Functional pavement", Tata McGraw-Hill Publications, 1972.
2. AF Stock, "Concrete pavements", Taylor & Francis, 1988.

Reference Books:

1 Youder.J. & Witzorac Mathew, "Principles of pavement Design", W.Jhon Wiley & Sons INC, 1975.
2 Yang H. Huang , "Pavement Analysis & Design", Prentice Hall Inc, 2008.
3 Micheal Sargious, "Pavement and Surfacing for Highway & Airports", Applied Science Publications Limited, 1989.
4 IRC Codes for Flexible and Rigid Pavements Design, 1982.

Web References:

1. https://en.wikipedia.org/wiki/Highway_engineering
2. nptel.ac.in/courses/105101087/downloads/Lec-19.pdf
3. nptel.ac.in/courses/105101087/downloads/Lec-20.pdf
4. nptel.ac.in/courses/105101087/downloads/Lec-27.pdf
5. nptel.ac.in/courses/105101087/downloads/Lec-28.pdf

E-Text Books:

1. nptel.ac.in/courses/105101087/downloads/Lec-29.pdf
2. https://hidot.hawaii.gov/highways/files/.../hwy_l-HWY-Pavmenent-Design-Manual.pdf

Course Home Page:

URBAN TRANSPORTATION AND PLANNING

Group-IV :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE521	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understand the role of transportation in the economic development, principles of planning, financing and implementation of urban transportation systems.
II. Establish inventories of data collected regarding income, population, employment, vehicle owner ship, etc.
III. Analyze various types of travel demand issues such as demand function, independent variables and travel attributes for planning sustainable urban mobility.
IV. Apply data management tools in decision making, demand analysis and urban transport activity analysis to integrate land use and transport planning.

UNIT-I	INTRODUCTION	Classes: 09

Introduction: Role of transportation in the economic development of nations, overview of transport modes, growth trends, National Transport Policy of India : Case studies, transportation planning in the developing world; and comparative international transportation policies; fundamentals of transportation, Principles of planning, evaluation, selection, adoption, financing, and implementation of alternative urban transportation systems; formulation of community goals and objectives, inventory of existing conditions; transportation modeling trip generation, distribution, modal choice, assignment.

UNIT-II	DATA COLLECTION AND INVENTORIES	Classes: 08

Data collection and inventories: collection of data, organization of surveys and analysis, study area, zoning, types and sources of data, road side interviews, home interview surveys, commercial vehicle surveys, sampling techniques, expansion factors, accuracy checks, use of secondary sources, economic data, income, population ,employment, vehicle owner ship.

UNIT-III	TRAVEL DEMAND ISSUES	Classes: 09

Travel demand issues: Trends, overall planning process, long term Vs short term planning, demand function, independent variables.

Travel attributes, assumptions in demand estimation, detailed approach on 4 step travel demand estimation; sequential, and simultaneous approaches, aggregate and disaggregate techniques.

UNIT-IV	DEMAND AND SUPPLY PLANNING	Classes: 10

Demand and supply planning : Planning for sustainable urban mobility, positive and negative externalities in urban transport, congestion pricing, parking policy, demand management, urban travel and transportation system characteristics - a systems perspective, data management and use in decision making, demand analysis, urban activity analysis, supply analysis; plan preparation and evaluation: Travel forecasts to evaluate alternative improvements, impacts of new development on transportation facilities. Master plans, selection of corridor, corridor identification, corridor deficiency analysis.

UNIT-V	METROPOLITAN CITIES	Classes: 09

Metropolitan cities: Design issues in urban mobility, integrating land use and transport planning; overview of urbanization process, city structure and urban activity and infrastructure systems, economic and social significance of urban infrastructure systems; transport's role in tackling social inclusion, economic impacts of transport policy.

Text Books:

1. M.J.Bruton, "Introduction to Transportation Planning", Hutchinson of London Ltd., 1975.
2. B.G.Hutchinson, "Introduction to Urban System Planning", McGraw-Hill, 1974.
3. Kadiyali L.R ., "Traffic Engineering and Transport Planning", Khanna Publishers, 1987.

Reference Books:

1. Lecture notes on UTP - Prof. S. Raghavachari, R.E.C.Warangal, 2014.
2. John W. Dickey, "Metropolitan transportation planning" , Tata McGraw Hill, New Delhi, 1975.

Web References:

1. www.uncclearn.org/sites/default/files/inventory/unescap20_0.pdf
2. www.mdpi.com/2071-1050/7/6/7784/pdf

E-Text Books:

1.https://ocw.mit.edu/courses/urban-studies-and-planning/

Course Home Page:

HIGHWAY CONSTRUCTION METHODS

Group-IV :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE522	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Discuss the components of road and pavement structure, drainage requirements for roads and its components.
II. Distinguish between different types of excavators, graders and soil compactors.
III. Analyze the various types of granular base courses such as WMM, CRM, WBM and their construction methods.
IV. Apply the flexural strength, modulus of elasticity and fatigue properties on cement concrete mix.

UNIT-I	COMPONENTS OF ROAD AND PAVEMENT STRUCTURE	Classes: 08

Components of road and pavement structure including sub-grade, drainage system, functions, requirements and sequence of construction operations plants and equipment for production of materials - crushers, mixers, bituminous mixing plants, cement concrete mixers, various types, advantages and choice. Drainage: Assessment of drainage requirements for the road and design of various components, drainage materials, construction of surface and subsurface drainage system and design of filter materials for roads. Drainage of urban roads, problems.

UNIT-II	ROAD CONSTRUCTION EQUIPMENT	Classes: 09

Road construction equipment : Different types of excavators, graders, soil compactors / rollers, pavers and other equipment for construction of different pavement layers, their uses and choice Problem on equipment usage charges. Pre-construction surveys and marking on ground: Specifications and steps for the 10 Hours 11 construction of road formation in embankment and cut, construction steps for sub-grade (preparation of sub-grade) in cutting, filling and at grade. Construction of sub-grade in marshy areas and weak / expansive soils and water- logged areas. Construction steps for granular sub-base, quality control tests.

UNIT-III	DIFFERENT TYPES OF GRANULAR BASE COURSE	Classes: 07

Different types of granular base course; WMM, CRM, WBM, specifications, construction method and quality control tests. Different types of bituminous layers for binder and surface courses, their specifications (as per IRC and MORTH),

Construction method and quality control tests. Special structural courses like stone matrix asphalt and mastic asphalt and construction of porous asphalt.

UNIT-IV	DIFFERENT TYPES OF SUB-BASE AND BASE COURSE FOR CEMENT CONCRETE	Classes: 12
Different types of sub-base and base course for cement concrete (CC) pavement and construction method. Construction of cement concrete (PQC) pavements and joints, quality control during construction. Construction of special Cement concrete pavements like interlocking concrete block pavements (ICBP), continuously reinforced cement concrete pavements (CRCP), fiber reinforced cement concrete pavements (FRCP), white topping, ultra thin white topping etc. General Aspects: Quality assurance, statistical approach, quality system for road construction. Safety aspects during road construction and maintenance works. Installation of various traffic safety devices and information system Principle of construction planning, application of CPM and PERT(Problems not included)		
UNIT-V	**ROAD MAINTENANCE WORKS**	**Classes: 09**
Road maintenance works, day to day and periodic maintenance works of various components of road works and road furniture. Preventive maintenance of road drainage system, pavements and other components of road. Preparation of existing pavement, patching, profile correction, special measures to deal with reflection cracks in pavement layers, slipperiness of surface, etc. Requirements for rehabilitation, recycling and re-construction. Special problems in construction & maintenance of hill roads, land slide, causes, investigation, and preventive and remedial measures, protection of embankment and cut slopes.		

Text Books:

1. Peurifoy, R.L., and Clifford,JS "Construction Planning Equipment and Method"- McGraw-Hill Book Co. Inc., 2010.
2. Sharma S.C., "Construction Equipment and its Management"- Khanna Publishers, 2006.
3. National Asphalt Pavement Association "Hot Mix Asphalt Paving Hand book"- 5100 Forbes Boulevard, Lanhm, Mary Land, USA,

Reference Books:

1. MoRTH "Specifications for Roads and Bridge Works", fourth revision, Indian Roads Congress, 2001.
2. MoRTH "Manual for Construction and Supervision of Bituminous Works", Indian Roads Congress, 2001
3. MoRTH "Manual for Maintenance of Roads", Indian Roads Congress, 1989.
4. IRC: 42-1994, IRC:15-2002, IRC SP :11-1988, , 55-2001, 57-2001,58-2001, IRC 19-1977, 27-1967, 29- 1988, 34- 1970, 36-1970,48-1972,61-1976, 63-1976, 68-1976, 81-1997,82-1982, 84-1983,93-1985, 94- 1986, 95-1987, 98-1997, 105-1988.
5. "Hand Book on Cement Concrete Roads"- Cement Manufacturers Association, New Delhi, 2010

Web References:

1. www.dss.nitc.ac.in/.../Highway%20Construction%20&%20Maintenance-%20I.pdf
2. www.eurovia.com/en/solutions/works/road-construction-and-maintenance

E-Text Books:

1. https://www.nzta.govt.nz/resources/sh-construction-maintenance-noise/

Course Home Page:

AIRWAYS RAILWAYS AND WATERWAYS

Group-IV :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE523	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the different transportation systems and their importance.
II. Interpret the functioning of various components of a permanent railway track comprising rails, sleepers, tracks, geometric curves, etc.
III. Generate the wind rose diagram for analysis of runway and design various components of runway.
IV. Discuss the importance and requirements of ports, harbors and inland water transport.

UNIT-I	AIRPORT ENGINEERING	Classes: 08

Airport site selection, factors affecting selection of site for airport, runway orientation, basic runway length, corrections for elevation, temperature, airport classification, aircraft characteristics.

UNIT-II	RUNWAY GEOMETRIC DESIGN	Classes: 09

Runway geometric design, factors controlling taxiway layout, terminal area, apron, hanger, blast considerations, typical airport layouts, wind rose diagram, runway lighting system and marking correction for runway length, orientation of runway.

UNIT-III	RAILWAY ENGINEERING	Classes: 09

Permanent way components, cross section of permanent way-functions of various components like rails, sleepers and ballast, gauge, creep of rails, theories related to creep, sleeper density.

Layout of railway stations and yards, signals, interlocking, track circuiting, track maintenance.

UNIT-IV	GEOMETRIC DESIGN OF RAILWAY TRACK	Classes: 09

Gradients ,grade compensation, cant and negative super elevation, cant deficiency, degree of curve ,points and crossings, rail joints and welding of joints, railway stations and yards, signaling and interlocking.

UNIT-V	WATER WAYS-PORT AND HARBOUR ENGINEERING	Classes: 10

Requirements of port and harbor, classification of port and harbor. Features of a harbor, planning of harbor, breakwaters, dry docks, jetties, aprons, transit shed and warehouses, navigational aids, maintenance of port and harbors, inland water transport.

Text Books:

1. S.K.Khanna & C.E.G.Justo, "Highway Engineering", Nemchand & Bros., 7th Edition, 2000.
2. S.P.chadula, "Railway Engineering, A text book of Transportation Engineering", S.Chand & Co. Ltd., 2001.
3. Virendhra Kumar &Statish Chandhra , "Air Transportation Planning &design" ,Gal Gotia Publisher, 1999.

Reference Books:

1. August, “Railway Engineering”, Prabha & Co., 15th Edition, 1994.
2. S.K.Khanna and Arora , “Airport Planning and Design”, Nemchand Bros, 1969.

Web References:

1. http://nptel.ac.in/courses/105105107/
2. http:// www.imperial.ac.uk/civil-engineering

E-Text Books:

1. http://www.e-booksdirectory.com/listing.php?category=527
2. http://books.google.com/books?isbn=1439804818

Course Home Page:

INTELLIGENT TRANSPORTATION SYSTEMS

Group-IV : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE524	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Outline the fundamental characteristics of Intelligent Transportation System and the market economic perspectives.
II. Apply sensor technologies to traffic flow, automatic vehicle location, and automatic vehicle identifications.
III. Assess the advanced traffic management systems and vehicle control systems.
IV. Appraise the functionality of architecture of ITS and its applications in travel demand management, electronic toll collection and transportation network operations.

UNIT-I	FUNDAMENTALS OF ITS	Classes: 09

Definition of ITS, the historical context of ITS from both public policy and market economic perspectives, types of ITS; Historical background, benefits of ITS.

UNIT-II	SENSOR TECHNOLOGIES AND DATA REQUIREMENTS OF ITS	Classes: 09

Importance of telecommunications in the ITS. Information management, traffic management centers (TMC). application of sensors to traffic management; traffic flow sensor technologies; transponders and communication systems; data fusion at traffic management centers; sensor plan and specification requirements; elements of vehicle location and route navigation and guidance concepts; its data collection techniques, detectors, automatic vehicle location (AVL), automatic vehicle identification (AVI), GIS, video data collection.

UNIT-III	ITS USER NEEDS AND SERVICES AND FUNCTIONAL AREAS	Classes: 09

Introduction, advanced traffic management systems (ATMS), advanced traveler information systems (ATIS), commercial vehicle operations(CVO),

Advanced vehicle control systems (AVCS), advanced public transportation systems (APTS), advanced rural transportation systems (ARTS).

UNIT-IV	ITS ARCHITECTURE	Classes: 09

Regional and project its architecture; concept of operations; ITS models and evaluation methods; planning and human factor issues for ITS, case studies on deployment planning and system design and operation; ITS and safety, ITS and security, ITS as a technology deployment program, research, development and business models, its planning.

UNIT-V	ITS APPLICATIONS	Classes: 09

Traffic and incident management systems; ITS and sustainable mobility, travel demand management, electronic toll collection, ITS and road-pricing.; transportation network operations; commercial vehicle operations and intermodal freight; public transportation applications; ITS and regional strategic transportation planning, including regional architectures: ITS and changing transportation institutions automated highway systems- vehicles in platoons – integration of automated highway systems. ITS programs in the world – overview of ITS implementations in developed countries, ITS in developing countries.

Text Books:

1. Mashrur A. Chowdhury, Adel Wadid Sadek, "Fundamentals of Intelligent Transportation Systems Planning", Artech House Publishers, 2003.
2. Lawrence A. Klein , "Sensor technologies and Data requirements of ITS", Artech House Publishers, 2001.

Reference Books:

1. Kan PaulChen, John Miles,"ITS Hand Book: Recommendations for World Road Association" (PIARC), 2000.
2. Sussman, J. M., "*Perspective on ITS"*, Artech House Publishers, 2005.
3. National ITS Architecture Documentation, US Department of Transportation, 2007.

Web References:

1. https://en.wikipedia.org/wiki/Intelligent_transportation_system
2. https://en.wikipedia.org/wiki/Intelligent_transportation_applications
3. www.etsi.org/technologies-clusters/technologies/intelligent-transport

E-Text Books:

1. https://coeut.iitm.ac.in/ITS_synthesis.pdf
2. https://www.civil.iitb.ac.in/tvm/1111_nptel/591_ITS_1/plain/plain.html
3. www.its.dot.gov/itspac/ppt/april2010/1_ITSResearch_Evolution.pptx

Course Home Page:

ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

Group-V : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE525	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the objectives of environmental impact assessment and identify the potential impacts.
II. Generate environmental impact assessment database for impact identification and environmental monitoring.
III. Assess the air and water quality parameters; predict the impacts and their mitigation measures.
IV. Outline the impacts on soil, wetlands, flora and fauna, historical structures and the other socio-economic environment.

UNIT-I	VARIOUS TYPES OF ENVIRONMENTAL IMPACTS	Classes: 09

Introduction of EIA, various types of environmental impacts: direct impacts, cumulative impacts, induces impacts, EIA principles, process, benefits and flaws, environmental impact statement, objectives of EIA, environmental sustainability, identification of potential impacts, affected environment, impact prediction, impact assessment, impact mitigation, selecting the proposed action, environmental monitoring, public consultation.

UNIT-II	CREATION OF EIA DATABASE	Classes: 09

Creation of EIA base, compilation, environmental inventory: baseline data generation, environmental monitoring networking design (EMND), monitoring stations, data products and sources, impact identification methodologies, interaction-matrix methods, use of the leopold matrix, checklist methodologies: simple checklists, descriptive checklists, uses of checklists, network methodologies.

UNIT-III	IMPACTS OF WATER AND AIR ON ENVIRONMENT	Classes: 09

Meteorological data, ambient air quality monitoring, air quality standards and regulations, impact prediction, impact prediction approach, utilization of dispersion models, impact prediction tools, impact assessment. Significance and assessment of the impacts, impact mitigation measures.

Impacts on water environment: Sources of Pollution, major Pollutants, water quality parameters, surface water contaminants and their impacts, existing ground water quality environment; standards, prediction and assessment of impacts, mitigation measures.

UNIT-IV	IMPACTS OF POLLUTION	Classes: 09

Soil pollution, causes , soil erosion, desertification, stalinization, acidification, land filling of waste, impacts on soils, conceptual approach : identification, prediction and assessment of soil quantity – quality impacts, description of existing resources, identification and incorporation of mitigation measures, impacts on noise environment: basics of noise pollution, noise exposure forecast (NEF), standards and guidelines, impact prediction, assessment of impact significance, identification and incorporation of mitigation measures.

UNIT-V	IMPACTS ON SOCIOECONOMIC AND OTHER ENVIRONMENT	Classes: 09

Status of wetlands, threats to wetlands, ecology impact assessment system: importance of biological impact assessment, identification, prediction and assessment of biological impacts, mitigation measures, conservation of flora and fauna, impacts on socio – economic and other environment: socio economic factors- advantages of impact assessment- assessment of impact on historical structures- mitigation measures.

Text Books:

1. Canter, L.W.; "Environmental Impact Assessment", McGraw-Hill New York, 1977.
2. J. Glynn and Gary W. Hein Ke, "Environmental Science and Engineering", Prentice Hall Publishers, 1989.

Reference Books:

1. Y. Anjaneyulu, "Environmental Impact Assessment" , B.S Publications, 2003.
2. Erickson, P.A., "Environmental Impact Assessment Principles and Applications", Academic Press, Inc.1994.
3. Dr. M. Anji Reddy , "Environmental Impact Assessment: Theory and Practice", BS Publications, 2006.
4. Technological guidance manuals of EIA, MoEF, GoI.

Web References:

1. https://en.wikipedia.org/wiki/Environmental_impact_assessment
2. https://www.cbd.int/impact/whatis.shtml
3. http://www.eib.europa.eu/attachments/pipeline/20080021_eia_en.pdf
4. https://www.brookes.ac.uk/courses/postgraduate/environmental-assessment-and-management/
5. http://www.transport-links.org/rtkb/english/Module%205%5C5_4a%20Environmental%20Impact%20Assessment.pdf

E-Text Books:

1. http://www.amazon.in/Environmental-Impact-Assessment-Methodologies-Anjaneyulu/dp/0415665566
2. http://samples.sainsburysebooks.co.uk/9781134897728_sample_516543.pdf
3. https://www.scribd.com/doc/82411097/Environmental-Impact-Assessment-Methodologies-2nd-Edition
4. https://www.amazon.com/Environmental-Impact-Assessment-Practical-Guide/dp/0070404100
   http://ascelibrary.org/journal/jggefk

Course Home Page:

INDUSTRIAL WASTE WATER TREATMENT

Group-V :CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE526	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Enrich the knowledge on sources and characteristics of industrial wastewater.
II. Discuss the different methods of waste water treatment such as denitrification, membrane separation, air stripping, etc.
III. Understand the characteristics and composition of wastewater generated from industrial processes.
IV. Design and operate effluent treatment plants for joint treatment of raw industrial wastewater and domestic sewerage.

UNIT-I	**CHARACTERISTICS OF INDUSTRIAL WASTE WATER**	**Classes : 10**

Sources of pollution, physical, chemical, organic and biological properties of industrial wastes, difference between industrial and municipal waste waters, effects of industrial effluents on sewers and natural water bodies.

UNIT-II	**COMMMON TYPES OF TREATMENT PROCESS**	**Classes : 09**

Pre and primary treatment, equalization, proportioning, neutralization, oil separation by floatation, waste reduction, volume reduction, strength reduction.

UNIT-III	**DESCRIPTION OF MAIN TREATMENT METHODS**	**Classes : 09**

Waste treatment methods, nitrification and denitrification, phosphorous removal, heavy metal removal,

Membrane separation process, air stripping and absorption processes, special treatment methods, disposal of treated waste water.

UNIT-IV	**WASTE WATER FROM DIFFERENT INDUSTRIES**	**Classes : 08**

Characteristics and composition of waste water and manufacturing processes of industries like sugar, characteristics of industries like food processing industries, steel, petroleum refineries

UNIT-V	**COMPOSTION OF WASTE WATER AND COMMON EFFLUENT TREATMENT PLANTS**	**Classes : 09**

Characteristics and composition of industries like textiles, tanneries, atomic energy plants and other mineral processing industries, joint treatment of raw industrial waste water and domestic sewage, common effluent treatment plants location, design, operation and maintenance problems.

Text Books:

1. Metcalf and Eddy, "Wastewater engineering Treatment disposal reuse", Tata McGraw-Hill, 4th Edition, 2002.
2. Eckenfelder, W.W., "Industrial Water Pollution Control", McGraw-Hills, 3rd Edition, 1999.

Reference Books:

1. M.N. Rao and Dutta, "Waste Water treatment", Oxford and IBH publishing, 2009.
2. Mark J. Hammer, Mark J. Hammer, Jr., "Water & Wastewater Technology", Prentice Hall of India, 2013.
3. N.L. Nemerrow, "Theories and practices of Industrial Waste Engineering", B H Elsevier, 2007.
4. C.G. Gurnham, "Principles of Industrial Waste Engineering", Wiley, 1955.

Web References:

1. http://nptel.ac.in/courses/105106119/36
2. https://www.water.wa.gov.au/__data/assets/pdf_file/0008/4040/89343.pdf

E-Text Books:

1. http://neerienvis.nic.in/pdf/publications/e-book/Industrial%20Waste%20Treatment%20Handbook.pdf
2. http://inscoms.in/cenotes/introduction-to-wastewater-treatment.pdf

Course Home Page:

AIR POLLUTION AND CONTROL

Group-V : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE527	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Analyze a wide range of measures to control emissions from motor vehicles, marine vessels, and power plants, industrial and commercial processes locally.
II. Acquire knowledge and understanding necessary for developing preventive and corrective measures to control air pollution.
III. Outline the control methods of particulate matter and gaseous emissions such as NO_x and SO_x.
IV. Infer the air quality standards from Air Pollution Control Act for monitoring air pollution.

UNIT-I	AIR POLLUTION	Classes: 09

Air Pollution- Definitions, Scope, significance and episodes, air pollutants- Classifications- Natural and artificial- Primary and secondary air pollutants, point, line and areal sources of air pollution- Stationary and mobile sources. Effects of Air pollutants on man, material and vegetation: Global effects of air pollution- Green House effect, heat islands, acid rains, ozone holes etc.

UNIT-II	METEOROLOGY AND PLUME DISPERSION	Classes: 09

Meteorology and plume dispersion; properties of atmosphere; heat, pressure, wind forces, moisture and relative humidity, influence of meteorogical phenomena on air quality-wind rose diagrams. lapse rates, pressure systems, wind and moisture, plume behavior and plume rise models; gaussian model for plume dispersion.

UNIT-III	CONTROL OF PARTICULATES	Classes: 9

Control of particulate: Control at sources, process changes, equipment modifications, design and operation of control.

Equipment's: Settling chambers, cyclone separators, filters, dry and wet scrubbers, electrostatic precipitators.

UNIT-IV	CONTROL OF GASEOUS EMISSIONS	Classes: 9

Control of gaseous emissions: General methods of control of NOx and Sox emissions; in plant control measures, processes changes, dry and wet method of removal and recycling; adsorption- absorption-combustion.

UNIT-V	AIR QUALITY MANAGEMENT	Classes: 09

Air quality management- Monitoring of SPM, SO_x NO_x and CO emission standards; air sampling: sampling techniques; high volume air sampler; stack sampling; analysis of air pollutants; air quality standards; air pollution control act.

Text Books:

1. M.N.Rao, "Air pollution", Tata McGraw-Hill Company, 1988.
2. Wark and Warner, "Air pollution", Harper & Row, New York, 1998.

Reference Books:

1. R.K. Trivedy and P.K. Goel, “An introduction to Air pollution”, B.S. Publications, 2003.

Web References:

1. http://mjcetenvsci.blogspot.in/2013/11/air-pollution-causes-effects-and.html
2. https://www.britannica.com/technology/air-pollution-control
3. http://www.yourarticlelibrary.com/air-pollution/5-effective-methods-to-control-air-pollution-explained-with-diagram/28360/
4. http://www.transport-links.org/rtkb/english/Module%205%5C5_4a%20Environmental%20Impact%20Assessment.pdf

E-Text Books:

1. http://link.springer.com/book/10.1007%2F978-1-59259-778-9
2. http://www.sciencedirect.com/science/book/9780750674997
3. https://books.google.co.uk/books/about/Air_Pollution.html?id=hDoN0SPgLksC
4. http://ssu.ac.ir/cms/fileadmin/user_upload/Daneshkadaha/dbehdasht/behdasht_mohit/ebook/Fundamentals_of_Air_Pollution__Fourth_Edition.pdf

Course Home Page:

GREEN BUILDINGS AND ENERGY CONSERVATIONS

Group-V : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE528	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify the major environmental challenges and understand the concept of global warming.
II. Design green buildings that maximize the use of efficient construction materials and technologies.
III. Outline the energy conservation technologies and strategies for sustainable urban development.
IV. Synthesize economic green building projects with the implementation of green construction materials and resources.

UNIT-I	**PRINCIPLES OF SUSTAINABILITY**	**Classes: 09**

Major environmental challenges, global warming, introduction to green buildings, sustainable urban development, sustainable sites.

UNIT-II	**ENERGY CONSERVATION**	**Classes: 09**

Energy conservation in buildings, HVAC systems, energy and atmosphere, e-Quest energy simulations, conducting an energy audit, fossil fuels vs. renewable energy.

UNIT-III	**WATER CONSERVATION**	**Classes: 09**

Water conservation in buildings, water conservation technologies and strategies.

Storm water harvesting and management, implementation of a rainwater harvesting

UNIT-IV	**GREEN MATERIALS**	**Classes: 09**

Green construction materials, materials and resources, building deconstruction, C&D Recycling, indoor environmental quality – Basic, building commissioning,

UNIT-V	**ECONOMICS OF GREEN CONSTRUCTION**	**Classes: 09**

Economics of green buildings, LCC/LCA, green home construction

Text Books:

1. Abe Kruger, "Green Building: Principles and Practices in Residential Construction", Cengage Learning, 1st Edition, 2012.
2. Mike Guertin, "Green Applications for Residential Construction", Delmar Cengage Learning, 1st Edition, 2010.

Reference Books:

1. Miki Cook., "Green Home Building: Money-Saving Strategies for an Affordable, Healthy, High-Performance Home", 2014.
2. Bill Maclay, "The New Net Zero: Leading-Edge Design and Construction of Homes and Buildings for a Renewable Energy Future", 2014.

Web References:

1. http://carleton.ca/fmp/energy-and-sustainability/topics/green-buildings/
2. http://www.sunyorange.edu/hvec/green_building_maintenance.htm
3. http://www.eco-business.com/news/green-buildings-need-careful-management-perform/
4. http://ascelibrary.org/doi/abs/10.1061/(ASCE)EI.1943-5541.0000006

E-Text Books:

1. https://www.amazon.com/Contractors-Guide-Green-Building-Construction/dp/0470056215
2. http://as.wiley.com/WileyCDA/Section/id-292376.html
3. https://www.accessengineeringlibrary.com/browse/green-building-through-integrated-design-greensource-books
4. http://as.wiley.com/WileyCDA/WileyTitle/productCd-0470056215.html

Course Home Page:

SOLID WASTE MANAGEMENT

Group-V : CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE529	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Illustrate the concepts of solid waste management, waste hierarchy and waste prevention.
II. Summarize the methods of waste transformation and materials recovery through aerobic and anaerobic composting.
III. Describe solid waste, its different types, waste flow in society, amounts and composition of waste generated.
IV. Understand the construction techniques and operation of a modern landfill according to the demands.

UNIT-I	MUNICIPAL SOLID WASTE MANAGEMENT	Classes:09

Legal and organizational foundation: Definition of solid waste, waste generation major legislation, monitoring responsibilities, sources and types of solid waste sampling and characterization. Determination of composition of MSW storage and handling of solid waste. Future changes in waste composition.

UNIT-II	COLLECTION AND TRANSPORT OF SOLID WASTE	Classes:09

Waste collection systems, analysis of collection system alternative techniques for collection system. Need for transfer operation, transport means and methods, transfer station types and design requirements.

UNIT-III	PROCESS OF SOLID WASTE AND ENERGY RECOVERY	Classes:09

Unit operations for separation and processing, Materials recovery facilities, waste transformation through combustion and aerobic composting.

Anaerobic methods for materials recovery and treatment. Energy recovery, incinerators.

UNIT-IV	DISPOSAL OF SOLID WASTES	Classes:09

Land farming, deep well injections. Landfills, design and operation including: Site selection, geo-environmental investigations, engineered sites, liners and covers, leachate control and treatment, gas recovery and control, including utilization of recovered gas, and landfill monitoring and reclamation, requirements and technical solution, designated waste landfill remediation Integrated waste management facilities. TCLP tests and leachate studies. Economics of the on-site v/s off site waste management options. Natural attenuation process and its mechanisms.

UNIT-V	HOUSEHOLD HAZARDOUS WASTE MANAGEMENT	Classes:09

Design practices of solid wastes. Definition and identification of hazardous wastes-sources and characteristics hazardous wastes in municipal waste hazardous waste regulations, minimization of hazardous waste-compatibility, handling and storage of hazardous waste collection and transport. Regulatory requirements for identification, characterization and disposal of hazardous, non-hazardous and domestic waste.

Text Books:

1. Tchobanoglous, G., Theisen, H. M., and Eliassen, R. "Solid. Wastes: Engineering Principles and Management Issues", McGraw-Hill, New York, 1993.
2. Vesilind, P.A. and Rimer, A.E., "Unit Operations in Resource Recovery Engineering", Prentice Hall, Inc., 1981.
3. Paul T Willams, "Waste Treatment and Disposal", John Wiley and Sons, 2000.

Reference Books:

1. Government of India, "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Urban Development, New Delhi, 2000.
2. Bhide A.D. and Sundaresan, B.B. "Solid Waste Management Collection", Processing and Disposal, 2001.

Web References:

1. http://nptel.ac.in/courses/105107120/1#
2. www.sciencedirect.com/science/book/9780750675079

E-Text Book:

1. https://nebm.ist.utl.pt/repositorio/download/2429

Course Home Page:

RENEWABLE ENERGY TECHNOLOGIES

Group-V : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE530	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Describe the challenges and problems associated with the use of various energy sources, including fossil fuels, with regard to future supply and the environment.
II. Discuss remedies/potential solutions to the supply and environmental issues associated with fossil fuels and other energy resources.
III. Convert units of energy to quantify the energy demands and make comparisons among energy uses, resources, and technologies.
IV. Collect and organize the information on renewable energy technologies as a basis for further analysis and evaluation.

UNIT-I	**BASIC CHARACTERISTICS OF SUNLIGHT**	**Classes: 09**

Basic characteristics of sunlight: Solar energy source, photovoltaic characteristics, equivalent circuit, photo voltaic for battery charging, charge regulators.

UNIT-II	**ENERGY IN THE WIND**	**Classes: 09**

Source: Energy in the wind, aerodynamics, rotor types, and forces developed by blades, braking systems, control and monitoring system, power performance.

UNIT-III	**WIND DRIVEN INDUCTION GENERATORS**	**Classes: 09**

Wind driven induction generators, steady state performance, modelling.

Integration issues, impact on central generation, transmission and distribution systems.

UNIT-IV	**WIND AND DIESEL SYSTEM**	**Classes: 09**

Wind, diesel system, permanent magnet alternators, modelling, steady state equivalent circuit, self, excited induction generators, integrated wind, solar systems.

UNIT-V	**MICRO-HYDEL ELECTRIC SYSTEMS**	**Classes: 09**

Micro, hydel-electric systems, isolated and parallel operation of generators geothermal operation of generators, geothermal, tidal and OTEC systems.

Text Books:

1. John F.Walker & Jenkins.N.,"Wind Energy Technology", John Wiley and sons, Chichester, 1997.
2. Van Overstraeton. R.J. and MertensR.P., "Physics Technology and use of Photovoltaic" Adam Higher, Bristol, 1996.

Reference Books:

1. Freris LL, "Wind Energy Conversion Systems", Prentice Hall, U.K., 1990.
2. Imamura M S .et.al "Photovoltaic System Technology. European hand book" H.S. Stephen & Associates.1992.

Web References:
1. https://en.wikipedia.org/wiki/Biomedical_waste 2. africa-toolkit.reeep.org/modules/Module7.pdf 3. www.ucsusa.org/clean-energy/renewable-energy
E-Text Books:
1. www.nrel.gov/education/pdfs/educational_resources/high_school/re_intro.pdf 2. landartgenerator.org/LAGI-FieldGuideRenewableEnergy-ed1.pdf
Course Home Page:

GEOGRAPHICAL INFORMATION SYSTEMS

Group-VI : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE531	Elective	3	-	-	3	30	70	100
Contact Classes:45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the concepts, terminologies and utility of Geographical information system.
II. Explore the various GIS packages and the essential components of GIS for capturing, storing, checking, and displaying data related to entities on Earth's surface.
III. Distinguish between raster and vector data, storage and interpretation of remote sensing data.
IV. Apply GIS for disaster management with the help of spatial and mathematical operations.

UNIT-I	INTRODUCTION	Classes: 09

Introduction, geographical concepts and terminology, scanning and digitization, difference between image processing system and GIS, utility of GIS, registration of various maps and digitization.

UNIT-II	EGIS PACKAGES	Classes: 09

Various GIS packages and their salient features, essentials components of GIS, data acquisition through scanners and digitizers, database structure, hierarchical data, network systems, relational database, database management, data manipulation and analysis.

UNIT-III	RASTER AND VECTOR DATA	Classes: 09

Raster and Vector Data: Introduction, Descriptions: Raster and Vector data, raster versus vector, raster to vector conversion.

Remote Sensing Data in GIS, topology and spatial relationships, data storage verification and editing.

UNIT-IV	DISASTER RISK MANAGEMENT IN INDIA	Classes: 09

Spatial and mathematical operations in GIS, overlay, and query based measurement and statistical modeling, buffers, spatial analysis, statistical reporting and graphing.

UNIT-V	PSEUDO RANGE AND CARRIER PHASE	Classes: 09

Programming Languages In GIS, virtual GIS, web GIS, application of GIS to various natural resources mapping and monitoring and engineering problems.

Text Books:

1. Burrough, P.A. and Mc Donnel, R.A., "Principles of Geographic Information System", Oxford University Press, 2015.
2. Chrisman, Nicholas R., "Exploring Geographic Information Systems", John Wiley, 2002.
3. Demers, Michael N., "Fundamentals of Geographic Information System", 2nd Edition, Wiley, 2009.
4. Ghosh, S.K. and Chandra, A.M., "Remote Sensing and GIS", Narosa Publishing House, 2006.

Reference Books:

1. Lo, C.P. and Young, A.K.W., "Concepts and Techniques of Geographical Information System", Prentice Hall India. 2002.
2. Longley, Paul A, Goodchild, Michael F., Maguire, David J. and Rhind, David W., "Geographic Information Systems and Science", Wiley, 2010.

Web References:

1. http://nptel.ac.in/courses/105102015/
2. http://www.rceroorkee.in/pdf/pdfo/TCE605.pdf
3. https://www.itc.nl/library/papers_2009/general/principlesgis.pdf

E-Text Book:

1. https://books.google.co.in/books?id=_C6oPvJ5S_EC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
2. https://books.google.co.in/books?id=-FbVI-2tSuYC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false
3. https://books.google.co.in/books?id=fdXL4wx2akUC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

Course Home Page:

INTRODUCTION TO GEOSPATIAL TECHNOLOGIES

Group-VI : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE532	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the fundamental concepts and skills in human environment interactions, and geographic information science.
II. Apply descriptive and analytical knowledge about map reading, statistics, and geospatial technologies.
III. Integrate the domains of geography and apply their knowledge to issues concerning like people, places, and environments.
IV. Apply geospatial technologies in human interactions with physical phenomena on Earth's surface.

UNIT-I	GEOSPATIAL DATA	Classes: 09

Introduction Geospatial data, why to study geospatial data, importance of geospatial technology, spatial data infrastructure, three important geospatial technologies, spatial elements. Coordinates and coordinate systems: Definition and scope, history of photogrammetry and remote sensing basic electromagnetic radiation, map vs mosaic, ground control points. Energy interactions with atmosphere and earth surface features.

UNIT-II	IMAGE INTERPRETATION	Classes: 09

Factors affecting image interpretation; Image characteristics and preparation of image interpretation keys; Elements of Image interpretation; Methods and techniques of image interpretation; Multi concepts in image interpretation.

UNIT-III	MAPPING AND CARTOGRAPHY	Classes:09

What is map and its importance, map scale and types, elements of map and indexing, map coordinate systems, visual interpretation of satellite images, interpretation of terrain evaluation.

Introduction to digital data analysis: Cartographic symbolization, classification of symbols, colours in cartography, scale and purpose of a map, cartographic design, thematic cartography, digital cartography.

UNIT-IV	GEOGRAPHIC INFORMATION SYSTEM AND DATA MODEL	Classes: 09

Introduction to GIS, definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, a theoretical framework for GIS, GIS data structures, data collection and input overview, processing of spatial data, data input or output, vector data model, raster data model, geometric representation of spatial feature and data structure: Spatial data and modeling, TIN, DTM, overlay, spatial measurement etc.

UNIT-V	GEOSPATIAL TECHNOLOGIES APPLICATIONS	Classes: 09

Visual image analysis for land use/land cover mapping, land use and land cover in water resources, surface water mapping and inventory, geological and soil mapping, agriculture applications for forestry applications, water resources applications, urban and regional planning, environmental assessment, principles of land form identification and evaluation: Sedimentary, igneous and metamorphic rock terrain.

Text Books:

1. John D. Bossler, "Manual of Geospatial Science & Technology", Taylor &Francis, 2010.

2. M. Anji Reddy, "Textbook of Remote Sensing and Geographical Information Systems", BS Publication, 2008.

Reference Books:

1. C. P.Lo Albert, K.W. Yonng, "Concepts and Techniques of GIS", Prentice Hall (India) Publications, 2003.
2. Peter A Burragh and Rachael A. Mc Donnell, "Principles of Geo- Physical Information Systems", Oxford Publishers 2004.
3. M. Anji Reddy , "Geo-informatics for Environmental Management", BS Publications, 2004.

Web References:

1. https://www.aaas.org/content/what-are-geospatial-technologies
2. http://www.istl.org/10-spring/internet2.htmls
3. https://geography.columbian.gwu.edu/applied-geospatial-techniques
4. http://kiran.nic.in/pdf/publications/Geospatial_Techniques.pdf

E-Text Books:

1. http://link.springer.com/book/10.1007%2F978-94-007-1858-6
2. http://www.springer.com/us/book/9789400718579
3. http://cbseacademic.in/web_material/doc/2014/7_Geospatial%20Technology%20Text%20Book%20(Class-XII).pdf
4. http://freegeographytools.com/2009/two-free-textbooks-on-geospatialgeostatistical-analysis

Course Home Page:

DISASTER MANAGEMENT AND MITIGATION

Group-VI : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE533	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify the major disaster types and develop technologies of disaster management to minimize the loss due to environmental hazards.
II. Analyze, and communicate information on risks, relief needs and lessons learned from earlier disasters.
III. Formulate strategies and disaster management systems to mitigate the different types of emergencies due to cyclones, hailstorms, earthquakes, floods and other disaster events.
IV. Outline the organizations involved in natural disaster assistance systems and assess the working principles of the organizations.

UNIT-I	ENVIRONMENTAL HAZARDS & DISASTERS	Classes: 09

Environmental hazards & disasters: Meaning of environmental hazards, environmental disasters and environmental stress. Concept of environmental hazards, environmental stress and environmental disasters. Different approaches and relation with human ecology, landscape approach, ecosystem approach, perception approach, human ecology and its application in geographical researches.

UNIT-II	TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS	Classes: 09

Types of environmental hazards and disasters: Natural hazards and disasters, man induced hazards and disasters, natural hazards, planetary hazards/ disasters, extra planetary hazards/ disasters, planetary hazards, endogenous hazards, exogenous hazards.

UNIT-III	ENDOGENOUS HAZARDS AND EXOGENOUS HAZARDS	Classes: 09

Endogenous hazards, volcanic eruption, earthquakes, landslides, volcanic hazards/ disasters, causes and distribution of volcanoes, hazardous effects of volcanic eruptions, environmental impacts of volcanic eruptions, earthquake hazards/disasters, causes of earthquakes, distribution of earthquakes, hazardous effects of earthquakes, earthquake hazards in india, human adjustment, perception & mitigation of earthquake.

Exogenous hazards/ disasters, infrequent events, cumulative atmospheric hazards/ disasters, infrequent events: Cyclones, lightning, hailstorms; Cyclones: Tropical cyclones & local storms (causes, distribution human adjustment, perception & mitigation), cumulative atmospheric hazards/ disasters: Floods, droughts. cold waves; heat waves floods: Causes of floods, flood hazards india, flood control measures (human adjustment, perception & mitigation), droughts, impacts of droughts, drought hazards in india-drought control measures, extra planetary hazards/ disasters, man induced hazards /disasters, physical hazards/ disasters, soil erosion.

UNIT-IV	EMERGING APPROACHES IN DISASTER MANAGEMENT	Classes: 09

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post disaster stage rehabilitation.

UNIT-V	DISASTER MANAGEMENT- AN INTEGRATED APPROACH	Classes: 09

Disaster Management: An integrated approach for disaster preparedness, mitigation & awareness; mitigation: Institutions, discuss the work of following Institution: Meteorological observatory, seismological observatory, volcanology institution, hydrology laboratory, institution of urban & regional planners, engineering council, world meteorological organizations (WMO), geographical information system(GIS), world federation of engineering organizations(WFED).

Text Books:

1. Pardeep Sahni, "Disaster Mitigation: Experiences and Reflections", Prentice Hall Publishers, 2001.
2. J. Glynn and Gary W. Hein Ke, "Environmental Science and Engineering", Prentice Hall Publishers, 1996.

Reference Books:

1. R.B.Singh (Ed), "Environmental Geography", Heritage Publishers New Delhi, 1990.
2. Savinder Singh, "Environmental Geography", Prayag Pustak Bhawan, 1997.
3. Kates,B.I& White, "G.F The Environment as Hazards", oxford, New York, 1978 .
4. R.B. Singh (Ed), " Disaster Management", Rawat Publication, New Delhi, 2000.

Web References:

1. https://www.google.co.in/?gfe_rd=cr&ei=-iAwWLiDIazv8we8_5LADA#q=disater+mangement
2. http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf
3. http://www.eib.europa.eu/attachments/pipeline/20080021_eia_en.pdf
4. http://www.ndmindia.nic.in/

E-Text Books:

1. https://www.google.co.in/?gfe_rd=cr&ei=-iAwWLiDIazv8we8_5LADA#q=disaster+management+e+textbooks
2. http://cbse.nic.in/natural%20hazards%20&%20disaster%20management.pdf\
3. http://www.digitalbookindex.org/_search/search010emergencydisastera.asp
4. http://www.icbse.com/books/cbse-ebooks-download

Course Home Page:

APPLICATION OF REMOTE SENSING IN GIS

Group-VI : CE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE534	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Evaluate the concepts of Photogrammetry and its applications such as determination of heights of objects on terrain.
II. Illustrate Electromagnetic spectrum and utilize the energy interactions of EMR with atmosphere and earth surface features for GIS data generation.
III. Analyze the methods of map projections and understand coordinate systems on GIS Software packages to produce high resolution thematic maps.
IV. Understand the concepts of vector and raster data model for representation of topological earth features and its importance.

UNIT-I	INTRODUCTION TO PHOTOGRAMMETRY	Classes: 09

Introduction to Photogrammetry: Principle and types of aerial photograph, Geometry of vertical aerial photograph, scale and height measurement on single vertical aerial photograph, height measurement based on relief displacement, fundamentals of stereoscopy, fudicial points, parallax measurements using fudicial points.

UNIT-II	REMOTE SENSING	Classes: 09

Remote Sensing: Basic concept of remote sensing, data and information, remote sensing data collection, remote sensing advantages and limitations, remote sensing process; electromagnetic spectrum, energy interactions with atmosphere and with earth surface features(soil, water, vegetation), Indian satellites and sensors characteristics, resolution, map and image and false color composite, Introduction to digital data, elements of visual interpretation techniques.

UNIT-III	GEOGRAPHIC INFORMATION SYSTEM	Classes: 09

Geographic information system: Introduction to GIS, components of a GIS, geospatial data: Spatial data, attribute data, joining spatial and attribute data; GIS operations: Spatial data input, attribute data management, data display, data exploration, data analysis.

Coordinate systems: Geographic coordinate system: Approximation of the earth, datum; map projections: types of map projections, map projection parameters, commonly used map projections, projected coordinate systems.

UNIT-IV	DATA MODELS	Classes: 09

Vector Data Model: Representation of simple features, topology and its importance; coverage and its data structure, shapefile; geometric representation of spatial feature and data structure, topology rules. Raster data Model: Elements of the raster data model, types of raster data, raster data structure, data conversion, integration of raster and vector data. Data Input: Metadata, conversion of existing data, Creating new data; Remote sensing data, fields data, text data, digitizing, scanning, on screen digitizing, importance of source map, data editing.

UNIT-V	APPLICATION OF REMOTE SENSING AND GIS	Classes: 09

Water Resource Applications: Surface water mapping and inventory, rainfall runoff relations, watershed management for sustainable development, reservoir sedimentation, ground water targeting, identification for groundwater recharge.

Text Books:

1. John R. Jensen, "Remote Sensing of the environment- An earth resource perspective", 2nd Edition, Pearson Education, 2000.
2. kang – Tsung Chang, "Introduction to geographic information system", Tata McGraw- Hill Education Private Limited, 2013.

Reference Books:

1. C.P.Lo Albert, K.W. Yonng, "Concepts & Techniques of GIS", Prentice Hall (India) Publications, 2009.
2. M.Anji Reddy, "Remote Sensing and Geographical Information systems", JNTU Hyderabad, B.S. Publications, 2001.
3. Peter A Burragh and Rachael A. Mc Donnell, "Principals of Geo physical Information System", Oxford Publishers, 2004.
4. S. Kumar, "Basics of Remote sensing and GIS", Laxmi Publications, 2005.

Web References:

1. ps://en.wikipedia.org/wiki/Remote_sensing
2. http://www.scirp.org/journal/ars/
3. https://books.google.co.in/books?id=cgUMfv1kS7YC&pg=PR16&lpg=PR16&dq=remote+sensing+g

E-Text Books:

1. http://www.gisresources.com/wp-content/uploads/2013/09/anji-reddy_GIS.pdf
2. http://www.amazon.in/Remote-Sensing-GIS-Basudeb-Bhatta/dp/0198072392
3. https://books.google.co.in/books/about/Basics_of_Remote_Sensing_and_GIS.html?id=WmAo3qhDJz0C&redir_esc=y
4. https://www.bookdepository.com/category/1684/Geographical-Information-Systems-GIS-Remote-Sensing

Course Home Page:

INTRODUCTION TO PHOTOGRAMMETRY

Group-VI : CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE535	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify the different types of aerial photographs and understand the basic geometry of aerial photographs.
II. Explore the characteristics and geometry of aerial photograph; interpret the applications of photogrammetry in topographic mapping.
III. Describe the principles of stereo photogrammetry and understand the concepts of digital photogrammetry.
IV. Develop digital maps and three dimensional models such as DEM, DSM, DTM, and interpret data from digital maps.

UNIT-I	INTRODUCTION	Classes: 09

Basics of aerial photography, camera, films, filters, film density, characteristic curves, image movement, exposure interval, resolution; basic geometry of aerial photograph, central and orthographic projection, difference between map and aerial photograph, types of aerial photographs, wide angle, narrow angle, horizontal, vertical, oblique, scale and ground coverage of aerial photograph.

UNIT-II	AERIAL PHOTOGRAPHS	Classes: 09

Relief displacement in aerial photographs and its characteristics; geometry of tilted/oblique photograph, isocentre, nadir point, principle point and principle plane, tilt displacement, stereoscopy and binocular vision, concept of depth perception in monocular and binocular vision, base, height ratio, stereoscopic exaggeration.

UNIT-III	STEREO PHOTOGRAMMETRY	Classes: 09

Stereo photogrammetry, degrees of freedom in single photograph, principle of reprojection, stereo restitution, stereoscopes, stereoscopic parallax, parallax bar, floating mark and parallax bar formula; Orientation of aerial photograph, inner, relative and absolute orientation and model.

Deformation in stereo photogrammetry, mapping from stereo aerial photos; Basics of analytical photogrammetry, collinearity and coplanarity conditions, concept of rotation matrix.

UNIT-IV	DIGITAL PHOTOGRAMMETRY	Classes: 09

Introductory concepts in digital photogrammetry (digital data input(photogrammetric scanners, digital photogrammetric camera), H/W and S/W requirements, photogrammetric triangulation in DPWS, stereo view in DPWS, feature extraction on DPWS; stereo sensors in space, tilt across the track, tilt along the track, single push broom scanners (IRS-1C/1D, SPOT, IKONOS), three line scanners (MOMS).

UNIT-V	DIGITAL MAPS	Classes: 09

Satellite based digital photogrammetry (orbital parameters, orbital modeling, and data processing for stereo generation); concept of DEM, DSM and DTM, DEM extraction and orthoimage generation,

concept of image matching, automatic DEM generation, orthoimage generation, digital maps and their characteristics.

Text Books:

1. Toni Schenk, "Digital Photogrammetry", Volume I., Terra Science, 1999.
2. Paul Wolf, "Elements of Photogrammetry", McGraw Hill, 4th Edition, 2014.
3. Cliff Greve and ASPRS, "Digital Photogrammetry: An Addendum to Manual of Photogrammetry", Asprs Pubns; 4th Edition, April 1997.
4. Mikhail Edward, bethel James and Mcglone J Chris, "Introduction to Modern Photogrammetry", John Wiley & sons Inc., 2001.

Reference Books:

1. Sanjib K. Ghosh, "Analytical Photogrammetry", New York: Pergamon Press, 1979.
2. Sanjib K.Ghosh, "Fundamentals of computation Photogrammetry", Concept publishing, New Delhi, 2005.
3. Schmidt Milton O and Rayner William Horace, "Fundamentals of Surveying", Van Nostrand Reinhold Company, 1969.

Web References:

1. www.univie.ac.at/Luftbildarchiv/wgv/intro.htm
2. http://www.geodetic.com/Whatis.htm
3. http://www.kth.se/student/studiehandbok/index.asp?lang=1
4. http://web.pdx.edu/~emch/maps/maps.html#A

E-Text Book:

1. http://www.springer.com/gb/book/9783662067253
2. https://accessengineeringlibrary.com/browse/elements-of-photogrammetry-with-applications-in-gis-fourth-edition
3. http://www.mat.uc.pt/~gil/downloads/IntroPhoto.pdf
4. http://www.gutenberg.us/articles/Photogrammetry

Course Home Page:

LAND USE AND LAND COVER MAPPING

Group-VI :CE

Course Code	Category	Hours /Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE536	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Illustrate the principles of land use/ land cover and understand the factors influencing the land categories in urban planning and management.
II. Generate land use /land cover maps for land evaluation and suitability studies by remote sensing and GIS techniques.
III. Generate land use maps of urban sprawl to identify the issues in land use planning and mitigate the problems effectively.
IV. Describe the applications of land use mapping in forest, agriculture and soil change detection and monitoring.

UNIT-I	**INTRODUCTION**	**Classes: 09**

Concept and attributes of land, objectives and principles of land use, factors influencing land use and land categories, agricultural land use, non agricultural land use.

UNIT-II	**LAND RESOURCES**	**Classes: 09**

Appropriate methodology, rapid land use assessment, rapid land use information system; Land evaluation and suitability studies by remote sensing and GIS; Techniques of land use / land cover map preparation; Land use / land cover mapping and planning; Dynamic urban land use, semi dynamic land use.

UNIT-III	**LAND USE PLANNING AND SPACE USE**	**Classes: 09**

Issues in land use planning and land use policy in India; Land use/land cover classification system; Land use mapping of urban sprawl.

Space use classification system; NIROV system of classification of space use; Making of inventories.

UNIT-IV	**BASE MAPPING AND CADASTRAL MAPPING**	**Classes: 09**

Characteristics and scale of base maps, role of base maps in regional/district planning; Preparation of photomap, orthophotomap; Cadastral mapping.

UNIT-V	**LAND COVER DYNAMICS**	**Classes: 09**

Land cover change process, major land use/ land cover change driving forces, land use mapping and change analysis using remote sensing techniques, forest change detection and mapping, forest change detection and monitoring.

Text Books:

1. Curan,P.J.. "Principles of Remote Sensing", Longman group limited, England, 1985.
2. Sabin.F.F., Remote Sensing: Principles and interpretation, 2nd Freeman New York, 1986.

Reference Books:

1. Chandra P. Giri ,"Remote Sensing of Land Use and Land Cover: Principles and Applications", CRC Press, May 2012.
2. Manakos, Ioannis, Braun, Matthias,"Land Use and Land Cover Mapping in Europe", Practices & Trends, Springer, 2014.

Web References:

1. http://landcover.usgs.gov/pdf/anderson.pdf
2. https://www.lib.ncsu.edu/gis/lulc.html
3. http://www.fao.org/docrep/003/X0596E/X0596e01e.html

E-Text Book:

1. https://profile.usgs.gov/myscience/upload_folder/ci2013May22123716442062012_Sohl_Role%20of%20remote%20sensing%20for%20land%20use%20and%20land%20cover%20change%20modeling_in%20Giri.pdf
2. http://www.springer.com/in/book/9789400779686
3. https://www.crcpress.com/Remote-Sensing-of-Land-Use-and-Land-Cover-Principles-and-Applications/Giri/p/book/9781420070743

Course Home Page:

ELEMENTS OF MECHANICAL ENGINEERING

VI Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Familiarize with fundamentals of mechanical systems.
II. Understand and appreciate the significance of mechanical engineering in different fields of engineering.
III. Understanding of application and usage of various engineering materials.

UNIT-I	INTRODUCTION TO ENERGY SYSTEMS	Classes: 09

Introduction: Prime movers and its types, concept of force, pressure, energy, work, power, system, heat, temperature, specific heat capacity, change of state, path, process, cycle, internal energy, enthalpy, statement of zeroth law and first law; Energy: Introduction and application, of energy sources like fossil fuels, nuclear fuels, hydels, solar, wind, and bio-fuels, environment issues like global warming and ozone depletion; Properties of gases: Gas laws, Boyle's law, Charle's law, gas constant, relation between C_p and C_v, various non flow processes like constant volume processes, constant pressure process, isothermal process, adiabatic process, poly-tropic process.

UNIT-II	STEAM TURBINES, HYDRAULIC MACHINES	Classes: 09

Properties of steam: Steam formation, types of steam enthalpy, specific volume, internal volume, internal energy and dryness fraction of steam, use of steam tables, calorimeters; Heat engine: Heat engine cycle and heat engine, working substances, classification of heat engines, description and thermal efficiency of carnot, Rankine, otto cycle, diesel cycles; Steam boilers: Introduction, cochran, lancashire, babcock, and Wilcox boiler, functioning of different mountings and accessories.

UNIT-III	INTERNAL COMBSUTION ENGINES, REFRIGERATION AND AIR-CONDITIONING	Classes: 09

Internal combustion engines: Introduction, classification, engine details, four stroke, two stroke cycle, petrol engine, diesel engine, indicated power, brake power, efficiencies; Pumps: Types, operation of reciprocating. rotary, centrifugal pumps, priming.

Air compressors: Types, operation of reciprocating, rotary air compressors, significance of multi-staging; Refrigeration and air-conditioning: Refrigerant, vapor compression refrigeration system, vapor absorption refrigeration system, domestic refrigerator, window and split air conditioners.

UNIT-IV	MACHINE TOOLS AND AUTOMATION	Classes: 09

Machine tools and automation machine tools operation: Turning, facing , knurling, thread cutting, taper turning by swiveling the compound rest, drilling, boring, reaming, tapping, counter sinking, counter boring, plane milling, end milling, slot milling; Robotic and automation: Introduction, classification based on robot configuration, polar, cylindrical, cartesian, coordinate and spherical, application, advantages and advantages; Automation: Definition, types, fixed, programmable and flexible automation, NC/CNC machines, basic elements with simple block diagrams, advantages and disadvantages.

UNIT-V	ENGINEERING MATERIALS, JOINING PROCESS	Classes: 09

Engineering materials and joining processes: Types, applications of ferrous metals, non-ferrous metals, alloys; Composites: Introduction, definition, classification and application (Automobile and Air Craft).

Text Books:

1. V. K. Manglik, "Elements of Mechanical Engineering", Prentice Hall, 1st Edition, 2013.
2. Mikell P. Groover, "Automation, Production Systems and CIM", Prentice Hall, 4th Edition, 2015.

Reference Books:

1. S. Trymbaka Murthy, "A Text Book of Elements of Mechanical Engineering", University Press, 4th Edition, 2006.
2. K. P. Roy, S. K. Hajra Choudary, Nirjhar Roy, " Element of Mechanical Engineering", Media Promoters & Publishers, 7th Edition, 2012.
3. Pravin Kumar, "Basic Mechanical Engineering", Pearson, 1st Edition, 2013.

Web References:

1. http://www.nptel.ac.in/courses/112107144/
2. *http://www.*nptel.ac.in/courses/112101098/download/lecture-37.pdf

E-Text Books:

1. www.wiley-vch.de/vch/journals/2081/books/2081_rel_title_varadan.pdfM
2. www.ebooks.cawok.pro/Artech.House.Publishers.An.Introduction.to.Microelectrical.pdf

Course Home Page:

DISASTER MANAGEMENT

VI Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Identify the major disaster types and develop an understanding of modern disaster management.
II. Recognize and develop awareness of the chronological phases of natural disaster response and refugee relief operations.
III. Understand the key concepts of disaster management related to development and the relationship of different disaster management activities.
IV. Categorize the organizations that are involved in natural disaster assistance and relief system.

UNIT-I	ENVIRONMENTAL HAZARDS AND DISASTERS	Classes: 09

Environmental hazards and disasters: meaning of environmental hazards, environmental disasters and environmental stress; concept of environmental hazards, environmental stress and environmental disasters, different approaches and relation with human ecology, landscape approach, ecosystem approach, perception approach, human ecology and its application in geographical researches.

UNIT-II	TYPES OF ENVIRONMENTAL HAZARDS AND DISASTERS	Classes: 09

Types of environmental hazards and disasters: Natural hazards and disasters, man induced hazards and disasters, natural hazards, planetary hazards/ disasters, extra planetary hazards/ disasters, planetary hazards, endogenous hazards, exogenous hazards.

UNIT-III	ENDOGENOUS HAZARDS	Classes: 09

Endogenous hazards, volcanic eruption, earthquakes, landslides, volcanic hazards/ disasters, causes and distribution of volcanoes, hazardous effects of volcanic eruptions, environmental impacts of volcanic eruptions.

Earthquake hazards/ disasters, causes of earthquakes, distribution of earthquakes, hazardous effects of, earthquakes, earthquake hazards in India, human adjustment, perception and mitigation of earthquake.

UNIT-IV	EXOGENOUS HAZARDS	Classes: 09

Exogenous hazards/ disasters, infrequent events, cumulative atmospheric hazards/ disasters; Infrequent events: Cyclones , lightning , hailstorms; Cyclones: Tropical cyclones and local storms, destruction by tropical cyclones and local storms (causes, distribution human adjustment, perception and mitigation); Cumulative atmospheric hazards/ disasters: Floods, droughts, cold waves, heat waves floods; Causes of floods, flood hazards India, flood control measures (human adjustment, perception and mitigation); Droughts: Impacts of droughts, drought hazards in India, drought control measures, extra planetary hazards/ disasters, man induced hazards /disasters, physical hazards/ disasters, soil erosion, Soil erosion: Mechanics and forms of soil erosion, factors and causes of soil erosion, conservation measures of soil erosion; Chemical hazards/ disasters: Release of toxic chemicals, nuclear explosion, sedimentation processes; Sedimentation processes: Global sedimentation problems regional sedimentation problems, sedimentation and environmental problems, corrective measures of erosion and sedimentation, biological hazards/ disasters, population explosion.

UNIT-V	EMERGING APPROACHES IN DISASTER MANAGEMENT	Classes: 09

Emerging approaches in Disaster Management, Three Stages

1. Pre, disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage, Rehabilitation.

Text Books:

1. Pardeep Sahni, "Disaster Mitigation: Experiences and Reflections", PHI Learning Pvt. Ltd., 1st Edition, 2001.
2. J. Glynn, Gary W. Hein Ke, "Environmental Science and Engineering", Prentice Hall Publishers, 2nd Edition, 1996.

Reference Books:

1. R.B.Singh (Ed), "Environmental Geography", 2nd Edition, 1990.
2. R.B. Singh (Ed), "Disaster Management", 2nd Edition, 2006.

Web References:

1. https://www.google.co.in/?gfe_rd=cr&ei=,iAwWLiDIazv8we8_5LADA#q=disater+mangement
2. http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf
3. http://www.eib.europa.eu/attachments/pipeline/20080021_eia_en.pdf
4. http://www.ndmindia.nic.in/

E-Text Books:

1. https://www.google.co.in/?gfe_rd=cr&ei=,iAwWLiDIazv8we8_5LADA#q=disaster+management+e+textbooks
2. http://cbse.nic.in/natural%20hazards%20&%20disaster%20management.pdf\
3. http://www.digitalbookindex.org/_search/search010emergencydisastera.asp
4. http://www.icbse.com/books/cbse,ebooks,download

Course Home Page:

GEOSPATIAL TECHNIQUES

VI SEMESTER: Common for all branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACE552	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Apply the technical skills to use geo-referenced data for the purpose of economic, educational, and social development.
II. Apply descriptive and analytical knowledge about map reading, statistics, and geospatial technologies.
III. Integrate the domains of geography and apply their knowledge to issues concerning people, places, and environments.
IV. Describe**,** analyze, and explain the patterns, processes, and interactions of human and physical phenomena on Earth's surface.

UNIT-I	**INTRODUCTION TO GEOSPATIAL DATA**	**Classes: 09**

Introduction geospatial data, why to study geospatial data, importance of geospatial technology, spatial data infrastructure, three important geospatial technologies, spatial elements, coordinates and coordinate systems, basic electromagnetic radiation.

UNIT-II	**PHOTOGRAMMETRY AND REMOTE SENSING**	**Classes: 09**

Definition and scope, history of photogrammetry and remote sensing, principle, remote sensing data acquisition, remote sensing data analysis methods, advantages and limitations, hardware and software required; Map vs mosaic, ground control points; Energy interactions with atmosphere and earth surface features.

UNIT-III	**MAPPING AND CARTOGRAPHY**	**Classes: 09**

What is map and its importance, map scale and types, elements of map and indexing, map coordinate systems, visual interpretation of satellite images, interpretation of terrain evaluation.

Introduction to digital data analysis, cartographic symbolization, classification of symbols, colours in cartography, scale and purpose of a map, cartographic design, thematic cartography, digital cartography.

UNIT-IV	**GEOGRAPHIC INFORMATION SYSTEM**	**Classes: 09**

Introduction to GIS, definition and terminology, GIS categories, components of GIS, fundamental operations of GIS, a theoretical framework for GIS, GIS data structures, data collection and input overview, processing of spatial data, data input or output, vector data model, raster data model, geometric representation of spatial feature and data structure; Spatial data and modeling, tin, DTM, overlay, spatial measurement etc.

UNIT-V	**GEOSPATIAL TECHNOLOGIES APPLICATIONS**	**Classes: 09**

Visual image analysis for land use/land cover mapping, land use and land cover in water resources, surface water mapping and inventory, geological and soil mapping, agriculture applications for forestry applications, water resources applications, urban and regional planning, environmental assessment, principles of land form identification and evaluation: sedimentary, igneous and metamorphic rock terrain.

Text Books:

1. John D. Bossler, Taylor, Francis, "Manual of Geospatial Science and Technology", CRC Press, 2010.
2. M. Anji Reddy, "Textbook of Remote Sensing and Geographical Information Systems", BS Publication, 2001.

Reference Books:

1. C. P. Lo Albert, K.W. Yonng, "Concepts and Techniques of GIS", 2nd Edition, 2007.
2. Otto Huisman and Rolf A. de "Principles of Geographic Information Systems", 4th Edition, 2009

Web References:

1. https://www.aaas.org/content/what-are-geospatial-technologies
2. http://www.istl.org/10-spring/internet2.htmls
3. https://geography.columbian.gwu.edu/applied-geospatial-techniques
4. http://kiran.nic.in/pdf/publications/Geospatial_Techniques.pdf

E-Text Books:

1. http://link.springer.com/book/10.1007%2F978-94-007-1858-6
2. http://www.springer.com/us/book/9789400718579
3. http://cbseacademic.in/web_material/doc/2014/7_Geospatial%20Technology%20Text%20Book%20(Class-XII).pdf
4. http://freegeographytools.com/2009/two-free-textbooks-on-geospatialgeostatistical-analysis.

Course Home Page:

PRINCIPLES OF OPERATING SYSTEMS

VI Semester: Common for all Braches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACS551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the functionalities of main components in operating systems.
II. Analyze the algorithms used in memory and process management.
III. Understand the clock synchronization protocols.
IV. Interpret the concepts of input and output storage for file management.

UNIT-I	INTRODUCTION	Classes: 10

Operating systems objectives and functions: Computer system architecture, operating systems structure, operating systems operations; Evolution of operating systems: Simple batch, multi programmed, time shared, real time systems, operating system services; Systems calls: Types of systems calls.

UNIT-II	PROCESS AND CPU SCHEDULING, PROCESS COORDINATION	Classes: 10

Process concepts: The process, process state, process control block, threads; process scheduling: Scheduling queues, schedulers, context switch, preemptive scheduling, dispatcher, scheduling criteria, scheduling algorithms, Process synchronization, the critical section problem; semaphores and monitors.

UNIT-III	MEMORY MANAGEMENT AND VIRTUAL MEMORY	Classes: 08

Logical and physical address space: Swapping, contiguous memory allocation, paging, structure of page table.

Segmentation: Segmentation with paging, virtual memory, demand paging; Page replacement, page replacement algorithms, thrashing.

UNIT-IV	FILE SYSTEM INTERFACE	Classes: 09

The concept of a file, access methods, directory structure, file system mounting, file sharing, protection, file system structure, file system implementation, allocation methods, free space management, directory implementation.

UNIT-V	DEADLOCKS, PROTECTION	Classes: 08

System model: Deadlock characterization, methods of handling deadlocks, deadlock prevention, dead lock avoidance, dead lock detection, principles of protection, domain of protection, access matrix, implementation of access matrix.

Text Books:

1. Abraham Silberschatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", Wiley Student Edition, 8th Edition, 2010.
2. William Stallings, "Operating System- Internals and Design Principles", Pearson Education, 6th Edition, 2002.

Reference Books:

1. Andrew S Tanenbaum, "Modern Operating Systems", PHI, 3rd Edition, 2007.
2. D. M. Dhamdhere, "Operating Systems a Concept based Approach", Tata McGraw Hill, 2nd Edition, 2006.

Web References:

1. https://www.smartzworld.com/notes/operatingsystems
2. https://www.scoopworld.in
3. https://www.sxecw.edu.in
4. https://www.technofest2u.blogspot.com

E-Text Books:

1. https://it325blog.files.wordpress.com/2012/09/operating-system-concepts-7-th-edition.pdf
2. http://mpathinveco.blog.com/2014/11/25/operating-systems-william-stalling-6th-edition/
3. http://www.e-booksdirectory.com/details.php?ebook=10050
4. http://www.e-booksdirectory.com/details.php?ebook=9907
5. http://www.e-booksdirectory.com/details.php?ebook=9460

Course Home Page:

JAVA PROGRAMMING

VI Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACS552	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand fundamentals of object-oriented terminology and programming concepts in java.
II. Acquire basics of how to translate solution problem into object oriented form.
III. Develop programs in java for solving simple applications.
IV. Design and implement simple program that use exceptions and multithreads.

UNIT-I	OOP CONCEPTS AND JAVA PROGRAMMING	Classes: 08

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, constructors, methods, data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, arrays, parameter passing.

UNIT-II	INHERITANCE	Classes: 10

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, Polymorphism**:** Dynamic binding, method overriding, abstract classes and methods.

UNIT-III	EXCEPTION HANDLING AND MULTI THREADING	Classes: 08

Exception Handling: Benefits of exception handling, the classification of exceptions, usage of try, catch, throw, throws and finally.

Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads.

UNIT-IV	INTERFACES AND PACKAGES	Classes: 09

Interface: Interfaces vs Abstract classes, defining an interface, implement interfaces, Packages: Defining, creating and accessing a package, importing packages.

UNIT-V	FILES, AND CONNECTING TO DATABASE	Classes: 10

Files: streams – byte streams, character stream, text input/output, binary input/output, file management; Connecting to Database: Connecting to a database, querying a database and processing the results, updating data with JDBC.

Text Books:

1. Herbert Schildt, Dale Skrien, "Java Fundamentals – A Comprehensive Introduction", McGraw-Hill, 1st Edition, 2013.
2. Herbert Schildt, "Java the Complete Reference", McGraw Hill, Osborne, 8thEditon, 2011.
3. T. Budd, "Understanding Object-Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

Reference Books:

1. P. J. Deitel, H. M. Deitel, "Java: How to Program", Prentice Hall, 6th Edition, 2005.
2. P. Radha Krishna, "Object Oriented Programming through Java", Universities Press, CRC Press, 2007.
3. Bruce Eckel, "Thinking in Java", Prentice Hall, 4th Edition, 2006.
4. Sachin Malhotra, Saurabh Chaudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014.

Web References:

1. http://www.javatpoint.com/java-tutorial
2. http://www.javatutorialpoint.com/introduction-to-java/

E-Text Books:

1.http://bookboon.com/en/java-programming-language-ebooks
2.https://en.wikibooks.org/wiki/Java_Programming

Course Home Page:

EMBEDDED SYSTEM DESIGN

VI SEMESTER: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Imbibe knowledge about the basic functions, structure, concepts and applications of Embedded Systems.
II. Understand Real time operating system concepts.
III. Analyze different tools for development of embedded software.
IV. Understand the architecture of advanced processors.

UNIT-I	EMBEDDED COMPUTING	Classes: 09

Definition of embedded system, embedded systems vs. general computing systems, history of embedded systems, complex systems and microprocessor, classification, major application areas, the embedded system design process, , formalisms for system design, design examples

UNIT-II	THE 8051 ARCHITECTURE	Classes: 09

Introduction, 8051 Micro controller Hardware, Input/output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/output, Interrupts. The Assembly Language Programming Process, Instructions of 8051 Programming Tools and Techniques, Simple Programs.

UNIT-III	INTRODUCTION TO EMBEDDED C AND APPLICATIONS	Classes: 09

Embedded systems programming in C, binding and running embedded C program in Keil IDE, dissecting the program, building the hardware;

Basic techniques for reading and writing from I/O port pins, LED interfacing, interfacing with keyboards, displays, D/A and A/D conversions, using embedded C interfacing

UNIT-IV	INTRODUCTION TO REAL – TIME OPERATING SYSTEMS	Classes: 09

Tasks and Task States, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Interrupt Routines in an RTOS Environment. Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine

UNIT-V	INTRODUCTION TO ADVANCED ARCHITECTURES	Classes: 09

ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus.

Text Books:

1. Wayne Wolf, "Principles of Embedded Computing System Design", Elseveir., 2nd Edition 2014.
2. Kenneth J.Ayala, "The 8051 Microcontroller", Thomson, 3rd Edition 2016.
3. Dr. K V K K Prasad, "Embedded / Real-Time Systems : Concepts, Design And Programming", Black Book, DreamTech Press, ISBN: 9788177224610

Reference Books:

1 Embedding system building blocks, Labrosse, via CMP publishers.
2 Embedded Systems, Raj Kamal, TMH.
3 Micro Controllers, Ajay V Deshmukhi, TMH.
4 Embedded System Design, Frank Vahid, Tony Givargis, John Wiley
5 Microcontrollers, Raj kamal, Pearson Education.
6 An Embedded Software Primer, David E. Simon, Pearson Education.
7 8051 Microcontroller and Embedded Systems, by Muhammad Ali Mazadi,Janice Mazidi,Janice Gillispie Mazdi

Web References:

1. https://www.smartzworld.com/notes/embedded-systems-es/
2. http://notes.specworld.in/embedded-systems-es/
3. http://education.uandistar.net/jntu-study-materials
4. http://www.nptelvideos.in/2012/11/embedded-systems.html

E-Text Books:

1. https://www.scribd.com/doc/233633895/Intro-to-Embedded-Systems-by-Shibu-Kv
2. http://www.ee.eng.cmu.ac.th/~demo/think/_DXJSq9r3TvL.pdf
3. https://www.scribd.com/doc/55232437/Embedded-Systems-Raj-Kamal
4. https://docs.google.com/file/d/0B6Cytl4eS_ahUS1LTkVXb1hxa00/edit
5. http://www.ecpe.nu.ac.th/ponpisut/22323006-Embedded-c-Tutorial-8051.pdf

INTRODUCTION TO AUTOMOBILE ENGINEERING

VI Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME552	Elective	3	-	-	3	30	70	100
Contact Classes:45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the function of various parts of automobile, features of fuel supply systems for S.I and C.I engines.
II. Distinguish the features of various types of cooling, ignition and electrical systems.
III. Identify the merits and demerits of the various transmission and suspension systems.
IV. Recognize the working of various braking and steering systems.
V. Summarize the ways and means of reducing the emissions from automobiles.

UNIT-I	INTRODUCTION	Classes: 09

Introduction to automobile engineering, chassis and automobile components, automobile engines, otto cycle, diesel cycle, dual cycle, engine lubrication, lubricating oil, lubrication oil filter, engine servicing; Fuel supply system; Fuel tank, strainer, feed pump, fuel filter, injection pump, injector, filters, electronic controlled fuel injection, common rail direct injection systems.

UNIT-II	COOLING SYSTEM	Classes: 09

Cooling requirements, air cooling, liquid cooling, water forced circulation system, radiators, cooling fan, water pump, thermostat, pressure sealed cooling, antifreeze solutions, intelligent cooling; Ignition system: Function of an ignition system, battery ignition system, storage battery, condenser and spark plug, magneto coil ignition system, electronic ignition system, electronic ignition, spark advance mechanisms; Electrical system: Charging circuit, generator, current-voltage regulator, starting system, bendix drive mechanism solenoid switch, lighting systems, automatic high beam control, horn, wiper, fuel gauge, oil pressure gauge, engine temperature indicator.

UNIT-III	TRANSMISSION AND SUSPENSIONS SYSTEMS	Classes: 09

Transmission system: Clutches, principle, types, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel.

Gear boxes, types, constant mesh, synchro mesh gear boxes, epicyclic gear box, auto transmission, continuous variable transmission, propeller shaft, Hotch-Kiss drive, Torque tube drive, universal joint, differential, rear axles types, wheels and tyres; Suspension system: Objects of suspension systems, rigid axle suspension system, torsion bar, shock absorber, independent suspension system.

UNIT-IV	BRAKING AND STEERING SYSTEMS	Classes: 09

Braking system: Mechanical brake system, Hydraulic brakes system, Master cylinder, wheel cylinder, Requirements of brake fluid, pneumatic and vacuum brake, ABS; Steering system: Steering geometry, camber, castor, king pin, rake, combined angle toe-in, toe-out, types of steering mechanism, Ackerman steering mechanism, Davis steering mechanism, steering gears types, steering linkages.

UNIT-V	EMISSIONS FROM AUTOMOBILES	Classes: 09

Emissions from automobiles, pollution standards national and international, pollution control techniques, petrol injection, common rail diesel injection, variable valve timing; Energy alternatives, solar, photo-voltaic, hydrogen, biomass, alcohols, LPG, CNG, liquid fuels and gaseous fuels, hydrogen as a fuel for internal combustion engines, their merits and demerits.

Text Books:

1. Willam H crouse, Donald L. Anglin, "Automobile Engineering", McGraw Hill, 10th Edition, 2006.
2. Manzoor, Nawazish Mehdi, Yosuf Ali, "A Text Book Automobile Engineering", Frontline Publications, 1st Edition, 2011.

Reference Books:

1. R. K. Rajput, "A Text Book of Automobile Engineering", Laxmi Publications, 1st Edition, 2015.
2. Joseph Heinter, "Automotive Mechanics", CBS, 2nd Edition, 2006.
3. K. Netwon, W. Steeds, T. K.Garrett, "Automotive Engineering", Butterworth-Heinamann, 13th Edition, 2016.
4. S. Srinivasan, "Automotive Engines", Tata McGraw-Hill, 2nd Edition, 2003.
5. Khalil. U. Siddiqui, "A Text Book of Automobile Engineering", New Age International, 1st Edition, 2012.

Web References:

1. http://www.nptel.kmeacollege.ac.in/syllabus/125106002/
2. http://www.nptel.ac.in/courses/125106002/

E-Text Books:

1. http:// www.engineeringstudymaterial.net/tag/automotive-engineering-books
2. https://www.studynama.com/.../299-Automobile-engineering-lecture-notes-ebook-pdf

Course Home Page:

INTRODUCTION TO ROBOTICS

VI Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME553	Elective	3	-	-	3	30	70	100
Contact Classes:45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Familiarize with the automation and brief history of robot and applications.
II. Understand the kinematics of robots and knowledge about robot end effectors and their design.
III. Apply robot actuators and feedback components to automation.

UNIT-I	INTRODUCTION TO ROBOTICS	Classes: 09

Introduction: Automation and robotic, an over view of robotics, classification by coordinate system and control systems; Components of the industrial robotics: Degrees of freedom, end effectors: Mechanical gripper, magnetic, vacuum cup and other types of grippers, general consideration on gripper selection and design.

UNIT-II	MOTION ANALYSIS AND KINEMATICS	Classes: 09

Motion analysis: Basic rotation matrices, composite rotation matrices, Euler angles, equivalent angle and axis, homogeneous transformation, problems; Manipulator kinematics: D-H notations, joint coordinates and world coordinates, forward and inverse kinematics, problems.

UNIT-III	KINEMATICS AND DYNAMICS	Classes: 09

Differential kinematics: Differential kinematics of planar and spherical manipulators, Jacobians, problems.

Robot dynamics: Lagrange, Euler formulations, Newton-Euler formulations, problems on planar two link manipulators.

UNIT-IV	TRAJECTORY PLANNING AND ACTUATORS	Classes: 09

Trajectory planning: Joint space scheme, cubic polynomial fit, avoidance of obstacles, types of motion**:** Slew motion, joint interpolated motion, straight line motion, problems; Robot actuators and feedback components; Actuators: pneumatic and hydraulic actuators.

UNIT-V	ELECTRIC ACTUATORS AND ROBOTIC APPLICATIONS	Classes: 09

Electric actuators: DC servo motors, stepper motors, feedback components: position sensors, potentiometers, resolvers and encoders, velocity sensors, tactile sensors; Robot application in manufacturing: Material handling, assembly and inspection.

Text Books:

1. Groover M. P, "Industrial Robotics", Tata McGraw-Hill, 1st Edition, 2013.
2. J. J Craig," Introduction to Robotic Mechanics and Control", Pearson, 3rd Edition, 2013.

Reference Books:

1. Richard D. Klafter, "Robotic Engineering", Prentice Hall, 1st Edition, 2013.
2. Fu K S, "Robotics", McGraw-Hill, 1st Edition, 2013.

Web References:

1. https://www.doc.ic.ac.uk/~ajd/Robotics/RoboticsResources/lecture1.pdf
2. http://opencourses.emu.edu.tr/course/view.php?id=32
3. https://www.researchgate.net/publication/277712686_Introduction_to_Robotics_class_notes_UG_level

E-Text Books:

1. http://*www.robot.bmstu.ru/*
2. http://www.robotee.com/index.php/download-free-robotic-e-books/

Course Home Page:

AEROSPACE PROPULSION AND COMBUSTION

VI Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AAE551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Demonstrate with an overview of various aerospace propulsion systems and a sound foundation in the fundamentals of thermodynamics.
II. Distinguish the elementary principles of thermodynamic cycles as applied to propulsion analysis.
III. Prioritize an introduction to combustion& gas kinetic theory.
IV. Discover a working knowledge of and the tools to measure various flight propulsion systems such as turbojets, turbofans, ramjets, rockets, air turbo-rockets and nuclear/electric propulsion systems.

UNIT-I	ELEMENTS OF AIRCRAFT PROPULSION	Classes: 10

Classification of power plants, methods of aircraft propulsion, propulsive efficiency, specific fuel consumption, thrust and power, factors affecting thrust and power, illustration of working of gas turbine engine, characteristics of turboprop, turbofan and turbojet, ram jet, scram jet, methods of thrust augmentation, atmospheric properties, turbojet, turbofan, turboprop, turbo-shaft engine construction and nomenclature, theory and performance, introduction to compressors, turbines, combustors and after burners for aircraft engines.

UNIT-II	PROPELLER THEORY	Classes: 08

Momentum theory, Blade element theory, combined blade element and momentum theory, propeller power losses, propeller performance parameters, prediction of static thrust and in flight, negative thrust, prop fans, ducted propellers, propeller noise, propeller selection, propeller charts.

UNIT-III	INLETS, NOZZLES AND COMBUSTION CHAMBERS	Classes: 10

Subsonic and supersonic inlets, relation between minimum area ratio and external deceleration ratio, starting problem in supersonic inlets, modes of inlet operation, jet nozzle, efficiencies, over expanded, under and optimum expansion in nozzles, thrust reversal.

Classification of combustion chambers, combustion chamber performance flame tube cooling, flame stabilization.

UNIT-IV	THERMODYNAMICS OF REACTING SYSTEMS	Classes: 09

Chemical kinetics: equilibrium, analysis of simple reactions, steady, state and partial equilibrium approximations, explosion theories; Transport phenomena: Molecular and convective transports; Conservation equations of multicomponent, reacting systems.

UNIT-V	PREMIXED FLAMES	Classes: 08

Rankine hugoniot relations, theories of laminar premixed flame propagation, quenching and flammability limits; Diffusion flames: Burke-Schumann theory, laminar jet diffusion flame, droplet combustion, turbulent combustion, closure problem, premixed and non-premixed turbulent combustion, introduction to DNS and LES.

Text Books:

1. Stephen R. Turns, "An Introduction to Combustion", McGraw-Hill, 3rd Edition, 2012.
2. Thomas A. Ward, "Aerospace Propulsion Systems", John Wiley and Sons, 1st Edition, 2010.

Reference Books:

1. M. H. Sadd, "Elasticity: Theory, Applications, and Numerics", Academic Press, 2nd Edition, 2009.
2. R. G. Budynas, "Advanced Strength and Applied Stress Analysis", McGraw-Hill, 2nd Edition, 1999.
3. A. P. Boresi, R.J. Schmidt, "Advanced Mechanics of Materials", John Willey & Sons, 5th Edition, 2003.

Web References:

1. https://www.nptel.ac.in/courses/101101002/
2. https://www.en.wikipedia.org/wiki/Airbreathing_jet_engine
3. https://www.en.wikipedia.org/wiki/Combustor
4. https://www.aero.iisc.ernet.in/page/propulsion

E-Text Books:

1. https://www.as.wiley.com/WileyCDA/WileyTitle/productCd-1118307984.html
2. https://www.sciencedirect.com/science/book/9781856179126
3. https://www.books.google.co.in/books?id=iUuPAQAAQBAJ&source=gbs_similarbooks

Course Home Page:

FUNDAMENTALS OF IMAGE PROCESSING

VII SEMESTER: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC552	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the image fundamentals and the relationship between pixels.
II. Understand the image enhancement techniques in spatial domain and frequency domain.
III. Analyze the image restoration technique from degraded image using various filtering techniques.
IV. Design segmentation of the image for boundary detection.
V. Differentiate redundancy techniques and apply for image compression.

UNIT-I	**INTRODUCTION**	**Classes: 09**

Digital image fundamentals and image transforms digital image fundamentals, sampling and quantization, relationship between pixels.

UNIT-II	**IMAGE ENHANCEMENT**	**Classes: 09**

Introduction, image enhancement in spatial domain, enhancement through point processing, types of point processing, histogram manipulation, linear and non-linear gray level transformation, local or neighborhood operation, median filter processing; Spatial domain high pass filtering, filtering in frequency domain, obtaining frequency domain filters from spatial filters, generating filters directly in the frequency domain, low pass (smoothing) and high pass (sharpening) filters in frequency domain

UNIT-III	**IMAGE RESTORATION**	**Classes: 9**

Image restoration degradation model, algebraic approach to restoration, inverse filtering.

Least mean square filters, constrained least square restoration, interactive restoration.

UNIT-IV	**IMAGE SEGMENTATION, MORPHOLOGICAL IMAGE PROCESSING**	**Classes: 9**

Image segmentation detection of discontinuities, edge linking and boundary detection, threshold, region oriented segmentation. Morphological image processing dilation and erosion, structuring element decomposition, the Strel function, erosion; Combining dilation and erosion: Opening and closing the hit and miss transformation.

UNIT-V	**IMAGE COMPRESSION**	**Classes: 09**

Image compression: Redundancies and their removal methods, fidelity criteria, image compression models, source encoder and decoder, error free compression, lossy compression, JPEG 2000 standard.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing‖, Pearson", 3rd Edition, 2008.
2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, "Digital Image Processing", TMH, 3rd Edition, 2010.

Reference Books:

1. Rafael, C. Gonzalez, Richard E woods, Stens L Eddings, "Digital Image Processing using MATLAB", Tata McGraw Hill, 2nd Edition, 2010.
2. A.K. Jain, "Fundamentals of Digital Image Processing", PHI, 1st Edition, 1989.
3. Somka, Hlavac, Boyle, "Digital Image Processing and Computer Vision", Cengage Learning, 1st Edition, 2008.
4. Adrain Low, "Introductory Computer vision Imaging Techniques and Solutions", Tata McGraw-Hill, 2nd Edition, 2008.
5. John C. Russ, J. Christian Russ, "Introduction to Image Processing & Analysis", CRC Press, 1st Edition, 2010.

Web References:

1. https://imagingbook.com/
2. https://en.wikipedia.org/wiki/Digital_image_processing
3. http://www.tutorialspoint.com/dip/
4. http://www.imageprocessingplace.com/
5. http://web.stanford.edu/class/ee368/
6. https://sisu.ut.ee/dev/imageprocessing/book/1
7. https://in.mathworks.com/discovery/digital-image-
8. processing.html?requestedDomain=www.mathworks.com

E-Text Books:

1. http://www.sci.utah.edu/~gerig/CS6640-F2010/dip3e_chapter_02.pdf
2. http://www.faadooengineers.com/threads/350-Digital-Image-Processing
3. http://newwayofengineering.blogspot.in/2013/08/anil-k-jain-fundamentals-of-digital.html
4. http://bookboon.com/en/digital-image-processing-part-one-ebook

FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS

VII Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACS553	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understand the role of database management system in an organization and learn the database concepts.
II. Design databases using data modeling and data normalization techniques.
III. Construct database queries using relational algebra and calculus.
IV. Understand the concept of a database transaction and related database facilities.
V. Learn how to evaluate set of queries in query processing.

UNIT-I	CONCEPTUAL MODELING	Classes: 10

Introduction to file and database systems: Database system structure, data models: entity relationship model, relational model.

UNIT-II	RELATIONAL APPROACH	Classes: 08

Relational algebra and calculus: Relational algebra, selection and projection, set operations, renaming, joins, division, examples of algebra queries, relational calculus, tuple relational calculus.

UNIT-III	BASIC SQL QUERY AND NORMALIZATION	Classes: 10

SQL data definition; Queries in SQL: updates, views, integrity and security, relational database design.

Normal Forms: 1NF, 2NF, 3NF and BCNF.

UNIT-IV	TRANSACTION MANAGEMENT	Classes: 09

Transaction processing: Introduction, need for concurrency control, desirable properties of transaction, schedule and recoverability, Serializability and schedules.

UNIT-V	CONCURRENCY CONTROL	Classes: 08

Concurrency control; Types of locks: Two phases locking, deadlock, timestamp based concurrency control, recovery techniques, concepts, immediate update, deferred update, shadow paging.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw-Hill, 4th Edition, 2002.

Reference Books:

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamental Database Systems", Pearson Education, 3rd Edition, 2003.
2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 3rd Edition, 2003.
3. Hector Garcia Molina, Jeffrey D. Ullman, Jennifer Widom, "Database System Implementation", Pearson Education, United States, 1st Edition, 2000.
4. Peter Rob, Corlos Coronel, "Database System, Design, Implementation and Management", Thompson Learning Course Technology, 5th Edition, 2003.

Web References:

1. https://www.youtube.com/results?search_query=DBMS+onluine+classes
2. http://www.w3schools.in/dbms/
3. http://beginnersbook.com/2015/04/dbms-tutorial/

E -Text Books:

1. http://www.e-booksdirectory.com/details.php?ebook=10166
2. http://www.e-booksdirectory.com/details.php?ebook=7400re

Course Home Page:

BASICS OF INFORMATION SECURITY AND CRYPTOGRAPHY

VII Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AIT551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Learn the basic categories of threats to computers and networks.
II. Understand various cryptographic algorithms and be familiar with public-key cryptography.
III. Apply authentication functions for providing effective security.
IV. Analyze the application protocols to provide web security.
V. Discuss the place of ethics in the Information Security Area.

UNIT-I	ATTACKS ON COMPUTERS	Classes: 08

Attacks on computers and computer security: Introduction, the need for security, security approaches, types of security attacks and security services. \

UNIT-II	SYMMETRIC KEY CIPHERS	Classes: 10

Symmetric key ciphers: Block cipher principles and algorithms (DES, AES), differential and linear cryptanalysis, block cipher modes of operation, stream ciphers; Asymmetric key ciphers: Principles of public key cryptosystems, algorithms (RSA Diffie – Helman).

UNIT-III	MESSAGE AUTHENTICATION AND CRYPTOGRAPHY	Classes: 08

Message authentication algorithm and hash functions: Authentication requirements, functions, message, authentication codes, hash functions, secure hash algorithm, whirlpool, digital signatures.

Cryptography: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, steganography.

UNIT-IV	E-MAIL SECURITY	Classes: 10

E-mail security: Pretty good privacy; S/MIMI IP Security: IP security overview, IP security architecture, authentication header, encapsulating security payload, combining security associations, key management.

UNIT-V	WEB SECURITY	Classes: 09

Web security: Web security considerations, secure electronic transaction intruders; Virus and firewalls: Intruders, intrusion detection password management, virus and related threats, firewall design principles; Types of firewalls.

Text Books:

1. William Stallings, "Cryptography and Network Security", Pearson Education, 4th Edition, 2005.
2. AtulKahate, "Cryptography and Network Security", McGraw-Hill, 2nd Edition, 2009.

Reference Books:

1. C K Shymala, N Harini, Dr. T R Padmanabhan, "Cryptography and Network Security", Wiley India, 1st Edition, 2016.
2. Behrouz A. Forouzan, Debdeep Mukhopadhyay , "Cryptography and Network Security", McGraw-Hill, 2nd Edition, 2010.

Web References:

1. http://bookboon.com/en/search?q=INFORMATION+SECURITY
2. https://books.google.co.in/books/about/Cryptography_Network_Security_Sie_2E.html?id=Kokjwdf0E7QC
3. https://books.google.co.in/books/about/Information_Security.html?id=Bh45pU0_E_4C

E-Text Books:

1. https://books.google.co.in/books/about/Information_Security.html
2. http://www.amazon.in/Cryptography-Network-Security-Behrouz-Forouzan/dp/007070208X

Course Home Page:

MODELING AND SIMULATION

VII Semester: Common to All Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the basic system concept and definitions of system.
II. Study the techniques to model and to simulate various systems.
III. Analyze a system and to make use of the information to improve the performance.

UNIT-I	**INTRODUCTION**	**Classes: 08**

When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of models; Discrete event system simulation; Steps in a simulation study; The basics of spreadsheet simulation; Simulation example: Simulation of queuing systems in a spreadsheet.

UNIT-II	**GENERAL PRINCIPLES SIMULATION SOFTWARE**	**Classes: 10**

Concepts in discrete-event simulation: The event-scheduling / time-advance algorithm, world views, manual simulation using event scheduling; List processing, simulation in java; Simulation in GPSS review of terminology and concepts; Useful statistical models; Discrete distributions; Continuous distributions; Poisson process; Empirical distributions.

UNIT-III	**QUEUING MODELS AND RANDOM NUMBERS**	**Classes: 08**

Characteristics of queuing systems; Queuing notation; Long-run measures of performance of queuing systems; Steady-state behavior of M/G/1 queue; Networks of queues; Rough-cut modeling: An illustration.

Properties of random numbers: Generation of pseudo random numbers; Techniques for generating random numbers; Tests for random numbers random-variate generation: Inverse transforms technique; Acceptance-rejection technique; Special properties.

UNIT-IV	**INPUT MODELING**	**Classes: 10**

Data collection; Identifying the distribution with data; Parameter estimation; Goodness of fit tests; Fitting a non-stationary poisson process; Selecting input models without data; Multivariate and time-series input models.

UNIT-V	**ESTIMATION OF ABSOLUTE PERFORMANCE**	**Classes: 09**

Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations; Model building, verification and validation; Verification of simulation models; Calibration and validation of models, optimization via simulation.

Text Books:

Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol, "Discrete-Event System Simulation", Pearson Education, 5th Edition, 2010.

Reference Books:

1. Lawrence M. Leemis, Stephen K. Park, "Discrete – Event Simulation: A First Course", Pearson Education, 1st Edition, 2006.
2. Averill M., "Law: Simulation Modeling and Analysis", Tata McGraw-Hill, 4th Edition, 2007.

Web References:

1. https://storage.googleapis.com/northwestern14-edu/Vtu-Notes-For-System-Modeling-And Simulation.pd.
2. http://www.slideshare.net/qwerty626/system-simulation-modeling-notessjbit.

E-Text Books:

1. http://www.e-booksdirectory.com/listing.php?category=100
2. https://www.google.co.in/?gfe_rd=cr&ei=YGRCWOWMKuPx8AfQqaaoCg#q=simulation+and+modeling+e+books&start=30

Course Home Page:

RESEARCH METHODOLOGIES

VII Semester: Common for All Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS552	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Orient the student to make an informed choice from the large number of alternative methods and experimental designs available.
II. Empower the student with the knowledge and skills they need to undertake a research project, to present a conference paper and to write a scientific article.
III. Develop a thorough understanding of the fundamental theoretical ideas and logic of research.
IV. Identify various sources of information for literature review and data collection.

UNIT-I	**INTRODUCION TO RESEARCH AND PHILOSOPHIES**	**Classes: 07**

Introduction to research: The role of research, research process overview; Philosophies and the language of research theory building: Science and its functions, what is theory, the meaning of methodology.

UNIT-II	**A RESEARCHER PROBLEMS AND HYPOTHESES**	**Classes: 10**

Thinking like a researcher: Understanding concepts, constructs, variables, and definitions; Problems and hypotheses: Defining the research problem, formulation of the research hypotheses, the importance of problems and hypotheses.

UNIT-III	**RESEARCH DESIGN AND DATA COLLECTION**	**Classes: 09**

Research design: Experimental and no experimental research design, field research, and survey research.

Methods of data collection: Secondary data collection methods, qualitative methods of data collection, and survey methods of data collection.

UNIT-IV	**ATTITUDE MEASUREMENT , SCALING AND SAMPLING TECHNIQUES**	**Classes: 09**

Attitude measurement and scaling: Types of measurement scales; Questionnaire designing, reliability and validity; Sampling techniques: The nature of sampling, probability sampling design, non probability sampling design, and determination of sample size.

UNIT-V	**PROCESSING AND ANALYSIS OF DATA,ETHICAL ISSUES**	**Classes: 10**

Processing and analysis of data ; Ethical issues in conducting research; Report generation, report writing, and APA format; Title page, abstract, introduction, methodology, results, discussion, references, and appendices.

Text Books:

1. Bryman, Alan, Bell, Emma, "Business Research Methods", Oxford University Press, 3rd Edition, 2011.
2. Kerlinger, F.N., Lee, H.B.,"Foundations of Behavioral Research", Harcourt Inc., 4th Edition, 2000.
3. Rubin, Allen, Babbie, Earl, "Essential Research Methods for Social Work", Cengage Learning Inc., USA, 2009.

Reference Books:

1. Anantasi A., Urbina S., "Psychological Testing", Pearson Education, 2004.
2. Chawla, Deepak, Sondhi, Neena, "Research Methodology: Concepts and Cases", Vikas Publishing House Pvt. Ltd. Delhi, 2011.
3. Pawar B. S., "Theory Building For Hypothesis Specification In Organizational Studies", Response Books, New Delhi, 2009.
4. NeumanW.L., "Social Research Methods: Qualitative and Quantitative Approaches", Pearson Education, 2008.

Web References:

1. https://en.wikipedia.org/wiki/Online_research_methods
2. https://www.prescott.edu/library/resources/research-bibliography.php

E-Text Books:

1. https://www.hcmuaf.edu.vn/.../Research%20Methodology%20-%20Methods%20and%20T...
2. https://www.federaljack.com/ebooks/My%20collection%20of%20medical%20books,%2020...

Course Home Page

ENERGY FROM WASTE

VII Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEE551	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			

OBJECTIVES:

The course should enable the students to:

I. Understand the principles associated with effective energy management and to apply these principles in the day to day life.
II. Develop insight into the collection, transfer and transport of municipal solid waste.
III. Explain the design and operation of a municipal solid waste landfill.
IV. Device key processes involved in recovering energy from wastes, systematically evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities.

UNIT - I	INTRODUCTION TO WASTE AND WASTE PROCESSING	Classes: 08

Solid waste sources solid waste sources, types, composition, properties, global warming; Municipal solid waste: Physical, chemical and biological properties, waste collection and, transfer stations, waste minimization and recycling of municipal waste, segregation of waste, size reduction, managing waste, status of technologies for generation of energy from waste treatment and disposal aerobic composting, incineration, furnace type and design, medical waste / pharmaceutical waste treatment technologies, incineration, environmental impacts, measures to mitigate environmental effects due to incineration .

UNIT - II	WASTE TREATMENT AND DISPOSAL	Classes: 10

Land fill method of solid waste disposal land fill classification, types, methods and sitting consideration; Layout and preliminary design of landfills: Composition, characteristics, generation, movement and control of landfill leach ate and gases, environmental monitoring system for land fill gases.

UNIT - III	BIO-CHEMICAL CONVERSION	Classes: 09

Energy generation from waste bio-chemical conversion: Sources of energy generation, anaerobic digestion of sewage and municipal waste, direct combustion of MSW-refuse derived solid fuel.

Industrial waste, agro residues and anaerobic digestion.

UNIT - IV	THERMO-CHEMICAL CONVERSION	Classes: 10

Biogas production, land fill gas generation and utilization, thermo-chemical conversion: Sources of energy generation, gasification of waste using gasifies briquetting, utilization and advantages of briquetting, environmental benefits of bio-chemical and thermo- chemical conversion.

UNIT - V	E-WASTE MANAGEMENT	Classes: 08

E-waste: E-waste in the global context: Growth of electrical and electronics industry in India, environmental concerns and health hazards; Recycling e-waste: A thriving economy of the unorganized sector, global trade in hazardous waste, impact of hazardous e-waste in India; Management of e-waste: E-waste legislation, government regulations on e-waste management, international experience, need for stringent health safeguards and environmental protection laws of India.

Text Books:

1. Nicholas P Cheremisinoff, "Handbook of Solid Waste Management and Waste Minimization Technologies", An Imprint of Elsevier, New Delhi, 2003.
2. P Aarne Vesilind, William A Worrell and Debra R Reinhart, "Solid Waste Engineering", 2nd edition 2002.
3. M Dutta , B P Parida, B K Guha and T R Surkrishnan, "Industrial Solid Waste Management and Landfilling practice", Reprint Edition New Delhi, 1999.
4. Rajya Sabha Secretariat, "E-waste in India: Research unit", Reprint Edition, June, 2011.
5. Amalendu Bagchi Design, "Construction and Monitoring of Landfills", John Wiley and Sons, New York, 1994.
6. M. L. Davis and D. A. Cornwell, "Introduction to environmental engineering", International Edition, 2008.
7. C. S. Rao, "Environmental Pollution Control Engineering", Wiley Eastern Ltd. New Delhi, 1995.
8. S. K. Agarwal, "Industrial Environment Assessment and Strategy", APH Publishing Corporation, New Delhi, 1996.
9. Sofer, Samir S. (ed.), Zaborsky, R. (ed.), "Biomass Conversion Processes for Energy and Fuels", New York, Plenum Press, 1981.
10. Hagerty, D.Joseph; Pavoni, Joseph L; Heer, John E., "Solid Waste Management", New York, Van Nostrand, 1973.
11. George Tchobanoglous, Hilary Theisen and Samuel Vigil Prsl: Tchobanoglous, George Theisen, Hillary Vigil, Samuel, "Integrated Solid Waste management: Engineering Principles and Management issues", New York, McGraw Hill, 1993.

Reference Books:

1. C Parker and T Roberts (Ed), "Energy from Waste", An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985.
2. KL Shah, "Basics of Solid and Hazardous Waste Management Technology", Prentice Hall, Reprint Edition, 2000.
3. M Datta, "Waste Disposal in Engineered Landfills", Narosa Publishing House, 1997.
4. G Rich et.al, Hazardous, "Waste Management Technology", Podvan Publishers, 1987.
5. AD Bhide, BB Sundaresan, "Solid Waste Management in Developing Countries", INSDOC, New Delhi, 1983.

Web References:

1. https://www.e-waste Management: From waste to Resource Klaus Hieronymi, Ramzy Kahnat, Eric williams Tech. & Engg.-2013 (Publisher: Earthscan 2013
2. https://www.What is the impact of E-waste: Tamara Thompson
3. https://www. E-waste poses a Health Hazard: Sairudeen Pattazhy

E-Text Books:

1. https://www.unep.org
2. https://www.outledge.com
3. https://www.bookdepository.com
4. https://www.ecoactiv.com

Course Home Page:

FINITE ELEMENT ANALYSIS

VII Semester: Common for all branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AAE552	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Possess a good understanding of the theoretical basis of the weighted residual finite element method.
II. Use the commercial finite element package ANSYS to build finite element models and solve a selected range of engineering problems.
III. Communicate effectively in writing to report (both textually and graphically) the method used, the implementation and the numerical results obtained.

UNIT-I	INTRODUCTION	Classes: 10

Review of various approximate method, variational approach and weighted residual approach application to structural mechanics problems; Finite difference methods- governing equation and convergence criteria of finite element method.

UNIT-II	DISCRETE ELEMENTS	Classes: 10

Bar elements, uniform section, mechanical and thermal loading, varying section, 2D and 3D truss element. Beam element, problems for various loadings and boundary conditions 2D and 3D Frame elements, longitudinal and lateral vibration; Use of local and natural coordinates.

UNIT-III	CONTINUUM ELEMENTS	Classes: 09

Plane stress, plane strain and axi-symmetric problem; Derivation of element matrices for constant.

Linear strain triangular elements and axi-symmetric element.

UNIT-IV	ISOPARAMETRIC ELEMENTS	Classes: 08

Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, stiffness matrix and consistent load vector, evaluation of element matrices using numerical integration.

UNIT-V	FIELD PROBLEM AND METHODS OF SOLUTIONS	Classes: 08

Heat transfer problems, steady state fin problems, derivation of element matrices for two dimensional problems, torsion problems. Bandwidth, elimination method and method of factorization for solving simultaneous algebraic equations, features of software packages, sources of error.

Text Books:

1. Tirupathi. R. Chandrapatha, Ashok D. Belegundu, "Introduction to Finite Elements in Engineering", Printice Hall India, 3rd Edition, 2003.
2. Rao. S.S., "Finite Element Methods in Engineering", Butterworth and Heinemann, 5th Edition 2010.
3. Reddy J.N., "An Introduction to Finite Element Method", McGraw-Hill, 3rd Edition, 2005.

Reference Books:

1. Krishnamoorthy C.S, "Finite Element Analysis", Tata McGraw Hill, 2nd Edition 2001.
2. K. J. Bathe, E. L. Wilson, "Numerical Methods in Finite Elements Analysis", Prentice Hall of India, 1985.
3. Robert D Cook, David S Malkus, Michael E Plesha, "Concepts and Applications of Finite Element Analysis", John Wiley and Sons, Inc., 4th Edition, 2003.
4. Larry J Segerlind, "Applied Finite Element Analysis", John Wiley and Sons, Inc, 2nd Edition, 1984.

Web References:

1. http://home.iitk.ac.in/~sbasu/me623_2006/fem_notes_me623.pdf
2. http://nptel.ac.in/courses/112104116/
3. http://www.me.berkeley.edu/~lwlin/me128/FEMNotes.pdf

E-Text Books:

1. http://www.civilenggforall.com/2015/09/finite-element-analysis-by-ss-bhavikatti-free-download-pdf-civilenggforall.com.html
2. https://books.google.co.in/books/about/Finite_Element_Analysis_For_Engineering.html?id=3XJoK4x5fZwC

Course Home Page:

BASIC REFRIGERATION AND AIR-CONDITIONING

VI Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AME554	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Analyze and understand various concepts and laws of thermodynamics.
II. Understand the concepts of refrigeration and air refrigeration.
III. Understand vapour compression refrigeration system and also vapour absorption refrigeration system.
IV. Identify various psychometric properties and processes.

UNIT-I	RECAPITULATION OF THERMODYNAMICS	Classes : 09

Recapitulation of thermodynamics: Thermodynamic systems, laws of thermodynamics, phase, state, process, cycle, concepts of enthalpy, entropy, specific heat, sensible heat, latent heat, dryness fraction, correlations involving enthalpy, entropy and dryness fraction, types of various processes and their representation on T-s, P-V and P-h diagrams, carnot cycle, reversed carnot cycle.

UNIT-II	INTRODUCTION AND AIR REFRIGERATION	Classes : 09

Introduction to Refrigeration: Basic concepts, unit of refrigeration; C.O.P: Refrigerators, heat pump, Carnot refrigerators and applications of refrigerator; Air refrigeration cycle: Bell Coleman cycle, open and dense air system – ideal and actual refrigeration, applications, aircraft refrigeration cycles; Refrigerants: Desirable properties, nomenclature and selection of refrigerants, effects of refrigerants on ozone depletion and global warming, alternate refrigerants.

UNIT-III	VAPOUR COMPRESSION REFRIGERATION	Classes: 09

Vapor compression refrigeration, ideal cycle, effect of variation in evaporator pressure, condenser pressure, super heating of vapor, sub cooling of liquid.

Evaporator and condenser temperatures, deviations of practical (actual cycle) from ideal cycle, construction and use of p-h chart problems.

UNIT-IV	VAPOUR ABSORPTION REFRIGERATION	Classes: 09

Vapor absorption refrigeration: description, working of NH3-Water, Li Br–water system, calculation of HCOP, principle and operation of three fluid vapor absorption refrigeration systems, steam jet refrigeration system, working principle, basic operation, principle and operation of thermo electric and vortex tube or hilsch tube refrigeration systems.

UNIT-V	INTRODUCTION TO AIR CONDITIONING	Classes : 09

Psychometric properties and processes, sensible and latent heat loads, characterization, need for ventilation, consideration of infiltration, load concepts of RSHF, ASHF, ESHF and ADP; Concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning and requirements, air conditioning load calculations.

Text Books:

1. S. C. Arora, Domkundwar, "A Course in Refrigeration and Air-conditioning", Dhanpatrai Publications, 2nd Edition, 2014.
2. C. P. Arora, "Refrigeration and Air Conditioning", Tata McGraw-Hill, 17th Edition, 2006.

Reference Books:

1. Manohar Prasad, "Refrigeration and Air Conditioning", New Age International, 3rd Edition, 2015.
2. P. N Ananthanarayanan, "Basic Refrigeration and Air Conditioning", Tata McGraw-Hill, 2015.

Web References:

1. http://www.engineeringstudymaterial.net/tag/air-conditioning-and-refrigeration-books/
2. https://www.en.wikipedia.org/wiki/Air_conditioning

E-Text Book:

1. http://www.mechanicalgeek.com/refrigeration-and-air-conditioning-by-rs-khurmi-pdf/
2. http://www.engineeringstudymaterial.net/tag/air-conditioning-and-refrigeration-books/

Course Home Page:

LAUNCH VEHICLES AND CONTROLS

VII Semester: Common to all branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AAE553	Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

OBJECTIVES:

The course should enable the students to:

I. Understand the various configurations of launch vehicles and application of controls.
II. Identify different tracking systems for launch vehicles.
III. Distinguish between different errors associated with navigation system and compensation errors.
IV. Compare the guidance systems for short medium and long range missile.

UNIT-I	INTRODUCTION	Classes: 10

Types of rockets and missiles, various configurations, components forces on the vehicle during atmospheric flight, nose cone design and drag estimation; Concepts of navigation ADF, VOR/DME, Doppler, LORAN and OMEGA, guidance and control; Introduction to basic principles; Air data information; Guidance trajectories; Radar systems; Principle of working of radar; Radar equations and applications; MTI and pulse Doppler radar; moving target detector; limitation of MTI performance.

UNIT-II	TRACKING WITH RADAR	Classes: 10

Mono pulse tracking: Conical scan and sequential lobbing; Automatic tracking with surveillance radar (ADT); CW radar; Applications; Other guidance systems; Gyros and stabilized platforms; Inertial guidance and laser based guidance; Components of inertial navigation system; imaging infrared guidance; Satellite navigation; GPS; Accelerometers.

UNIT-III	INERTIAL NAVIGATION SYSTEM	Classes: 09

INS transfer function and errors; Different coordinate system, compensation errors, schuler loops; Cross coupling; Missile control system; Guided missile concept; Augmented systems.

Control of aerodynamic missile; Missile parameters for dynamic analysis; Missile autopilot schematics; Longitudinal and Lateral autopilots.

UNIT-IV	MISSILE GUIDANCE	Classes: 08

Missile guidance laws, short and medium range missiles; Proportional navigation guidance; Command guidance; Comparison of guidance system performance; Bank to turn missile guidance; Terminal guidance; Weapon control missile guidance.

UNIT-V	INTEGRATED FLIGHT/FIRE CONTROL SYSTEM	Classes: 08

Director fire control system; Fire control modes; Tracking control laws; Longitudinal flight control system; Lateral flight control system; Rate of change of Euler angle, auto pilot; Integrated flight and fire control (IFFC) flight testing.

Text Books:

1. Merrilh I. Skolnik, " Introduction to Radar Systems", Tata McGraw-Hill, 3rd Edition, 2001.
2. John H Blakelock, "Automatic control of Aircraft and Missiles", Wile –Inter Science Publication, 2nd Edition, May 1990.

Reference Books:

1. R.B. Underdown, Tony Palmer, "Navigation", Black Well Publishing, 6th Edition, 2001.
2. R P G Collinson, "Introduction to Avionics Systems", Kulwar Academic Publishers, 3rd Edition, 2003.

Web References:

1. http://home.iitk.ac.in/~sbasu/me623_2006/fem_notes_me623.pdf
2. http://nptel.ac.in/courses/112104116/
3. http://www.me.berkeley.edu/~lwlin/me128/FEMNotes.pdf

E-Text Books:

1. http://www.civilenggforall.com/2015/09/finite-element-analysis-by-ss-bhavikatti-free-download-pdf-civilenggforall.com.html
2. https://books.google.co.in/books/about/Finite_Element_Analysis_For_Engineering.html?id=3XJoK4x5fZwC

Course Home Page:

INTELLECTUAL PROPERTY RIGHTS

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS601	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Explore the knowledge in determination of trade secrets status.
II. Adequate knowledge in New Developments in trade law.
III. Understand the complexities involved in the process of attributing intellectual property rights to people.
IV. Learn the legalities of intellectual property to avoid plagiarism and other IPR relates crimes like copyright, infringements, etc.
V. Learn the fundamental principles and the application of those principles to factual, real-world disputes.

UNIT-I INTRODUCTION TO INTELLECTUAL PROPERTY

Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

UNIT-II TRADE MARKS

Purpose and function of trademarks, acquisition of trademarks rights, protectable matter, selecting and evaluating trademark, trademark registration processes.

UNIT-III LAW OF COPYRIGHTS AND LAW OF PATENTS

Fundamentals of copyrights law, originality of material, rights to reproduction, rights to perform the work publicly, copyright ownership issues.

Copyright registration, notice of copyright, international copyright law, foundation of patent law, patent searching process, ownership rights and transfer.

UNIT-IV TRADE SECRETS AND UNFAIR COMPETITION:

Trade secrets law, determination of trade secrets status, liability for misappropriations of trade secrets, protection for submission, trade secrets litigation, misappropriation of right of publicity and false advertising.

UNIT-V NEW DEVELOPMENTS OF INTELLECTUAL PROPERTY

New developments in trade law, copyright law, patent law, intellectual property audits international overview of intellectual property, international-trademark law, copyright law, international patent law, international development in trade secrets law.

Text Books:

1. Deborah.E.Bouchoux, "Intellectual Property Right", Cengage Learning, 4th Edition, 2013.
2. Prabuddha Ganguli, "Intellectual Property Right: Unleashing the Knowledge Economy", Tata McGraw-Hill Publishing Company Ltd., 3rd Edition, 2005.

Reference Books:

1. Catherine J. Holland, "Intellectual Property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, CDR Edition, 2007.
2. Stephen Elias, "Patent, Copyright & Trademark: A Desk Reference to Intellectual Property Law", Lisa Goldoftas Publishers, Nolo Press, 1996.

Web References:

1. https://en.wikipedia.org/wiki/Intellectual_property
2. http://sokogskriv.no/en/sources-and-references/why-cite-sources/intellectual-property-rights/

E-Text Books:

1. http://www.e-booksdirectory.com/listing.php?category=269
2. http://www.lexisnexis.com/store/catalog/catalog.jsp?id=80

Course Home Page:

TOTAL QUALITY MANAGEMENT

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS602	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Understand the philosophy and core values of Total Quality Management (TQM).
II. Determine the voice of the customer and the impact of quality on economic performance and long-term business success of an organization.
III. Apply and evaluate best practices for the attainment of total quality.
IV. Utilize Statistical Process Control (SPC) techniques as a means to diagnose, reduce and eliminate causes of variation.
V. Describe and apply the development and nature of quality control charts.

UNIT-I **PRINCIPLES AND PRACTICES-1**

Introduction, gurus of TQM, historic review, benefits of TQM leadership, characteristics of quality leaders, the deming philosophy, quality councils, strategic planning, customer satisfaction, customer perception of quality service quality, customer retention, employee involvement, employee survey-empowerment, gain sharing, performance appraisal.

UNIT-II **PRINCIPLES AND PRACTICES-2**

Continuous process improvement, the juran trilogy, the PDCA cycle-kaizen, reengineering; Supplier partnership, partnering, sourcing, supplier selection, supplier rating, performance measures, basic concept, strategy quality cost bench marking, reasons for bench marking, process understanding current performance, pitfalls and criticism of benchmarking.

UNIT-III **TOOLS AND TECHNIQUES-1**

Information technology, computers and the quality functions, information quality issues, quality management system, benefits of ISO registration, ISO 9000 series standards, and internal audits.

Environmental management system, ISO 14000series, benefits of EMS, relation to healthy and safety quality function deployment, the voice of the customer, building a house of quality, QFD process.

UNIT-IV **TOOLS AND TECHNIQUES-2**

Quality by design benefits, communication model, failure mode and effective analysis, failure rate, FMEA documentation, the process of FMEA documentation, product liability, proof and expert witness; Total productive maintenance, promoting the philosophy and training-improvements and needs, autonomous work groups.

UNIT-V **MANAGEMENT TOOLS**

Management tools introduction-forced field analysis, tree diagram, process decision program chart statistical process control, cause and effect diagram-histogram, state of control, process capability, experimental design, hypothesis, orthogonal design two factors and full factors-quality strategy for Indian industries, quality management in India.

Text Books:

Joel E Ross, "Total Quality Management", CRC Press, 3rd Edition,2015

Reference Books:

1. Dale H.Besterfeild, Carlon Besterfeild, "Total Quality Management", Pearson Education, 1st Edition, 2015.
2. Sridhara Bhatt, "Total Quality Management Texts and Cases", Himalaya, 1st Edition, 2015.
3. Poornima M Charantimath, "Total Quality Management", Pearson Education, 1st Edition, 2015.

Web References;

http://managementhelp.org/quality/total-quality-management.htm
2. http://www.tandfonline.com/toc/ctqm20/current

E-Text Books:

1. https://www.scribd.com/doc/19378602/Quality-Management-eBook
2. http://bookboon.com/en/quality-management-ebook

Course Home Page:

PROFESSIONAL ETHICS AND HUMAN VALUES

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS603	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Understand the fundamental theoretical and historic graphical topics of professional ethics and human values.
II. Study independence and self-evaluation professional ethics and human values, so that they can grasp the core values as independent thinkers.
III. Develop their analytical and pragmatic abilities & situational reasoning aligned towards right and wrong.

UNIT-I INTRODUCTION TO PROFESSIONAL ETHICS

Basics of profession: Engineering and professionalism, two models of professionalism, three types of ethics or morality, the negative face of engineering ethics, the positive face of engineering ethics, responsibility in engineering, engineering standards, the standard care, blame responsibility and causation.

UNIT-II PROFESSIONAL ETHICS IN ENGINEERING

Engineering ethics , variety of moral issues, types of inquiry moral dilemmas, moral autonomy, the problems of many hands, Kohlburg's theory, Gilligan's theory impediments to responsible action, engineering as social experimentation, framing the problem, determining the facts, codes of ethics, clarifying concepts application issues, common ground, general principles, utilitarian thinking respect for persons.

UNIT-III ETHICS AND HUMAN VALUES

Human values, morals, values, and ethics, integrity, work ethic, service learning, civic virtue, respect for others, living peacefully.

Caring, sharing, honesty, courage, valuing time, co-operation, commitment, empathy, self-confidence, spirituality, character.

UNIT-IV MORAL RESPONSIBILITIES & RIGHTS

Ethics consensus, controversy, models of professional roles, theories about right action, self, interest, customs and religion, uses of ethical theories, responsibility for rights, respect for authority, conflicts of interest, occupational crime, professional rights and employee rights, communicating risk and public policy, collective bargaining.

UNIT-V GLOBAL ETHICS & VALUES

Global issues, multinational corporations, environmental ethics, engineers as managers, advisors, and experts witnesses, moral leadership sample codes of ethics problem of bribery, extortion and grease payments, problem of nepotism, excessive gifts, paternalism, different business practices, negotiating tax, global trends.

Text Books:

1. PSR Murthy, "Indian Culture Values and Professional Ethics", BS Publications, 1st Edition, 2013.
2. Mike Martin, Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, 3rd Edition, 2003.
3. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, 4th Edition, 2012.
4. George Reynolds, "Ethics in Information Technology", Cengage Learning, 5th Edition, 2012.

Reference Books:

1. Mike Martin, Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, 4th Edition, 2004.
2. Charles E Harris, Micheal J Rabins, "Engineering Ethics", Cengage Learning, 5th Edition, 2014.
3. Edmund G Seebauer, Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 1st Edition, 2000.

Web References:

1. http://www.imd.inder.cu/adjuntos/article/524/Professional%20Ethics%20and%20Human%20Values.pdfhttp://bit.ly/29SyL7i
2. https://books.google.com/books/about/Textbook_on_Professional_Ethics_and_Huma.html?id=-dPiHmlV_

E-Text Books:

1. https://www.amazon.com/Professional-Ethics-Human-Values-Govindarajan-ebook/dp/B00K6GSSUW
2. http://bookboon.com/en/business-ethics-ebook

Course Home Page:

LEGAL SCIENCES

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS604	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Acquaint the student with the scientific method of social science research.
II. Provide the knowledge of the technique of selection, collection and interpretation of primary and secondary data in socio legal research.
III. Emphasis would be laid on practical training in conducting research.

UNIT-I	CONCEPT OF LEGAL SCIENCE

Fundamentals of legal science, law systems in India, comparative public law, law and justice in a globalizing world. Impact of the human rights instruments on domestic law.

UNIT-II	TECHNOLOGY & LEGAL SYSTEMS

Principles of corporate law conjunction, temporal, subordinate clauses complex sentences, intellectual property rights, contract law, cyber law.

UNIT-III	CONSTITUTION AND ADMINISTRATIVE LAW

Minorities law, human rights, international and national sphere, media law.

Health law, globalization vis-à-vis human rights, significance of human rights.

UNIT-IV	HUMAN RIGHTS INTERNATIONAL AND NATIONAL SPHERE

Human rights with special reference to right to development, rights of disadvantaged and vulnerable groups, critical analysis, cultural relativism and human rights, human rights in the Indian sphere, an over view, constitution and the analysis of preamble, social action litigation and the role of Indian judiciary, critical examination of the human rights council and human rights commission, treaty mechanism with respect to covenants ICESCR and ICCPR, convention on the elimination of discrimination against women and child rights convention.

UNIT-V	SCIENTIFIC METHODOLOGY IN LEGAL SYSTEMS

The science of research and scientific methodology ,analysis of law with scientific methods, scientific approach to socio legal problems, interrelation between speculation, fact and theory building fallacies of scientific methodology with reference to socio legal research ,inter-disciplinary research and legal research models, arm chair research vis-a-vis empirical research, legal research-common law and civil law legal systems.

Text Books:

1. Robert Watt, "Concise book on Legal Research", Abe Books publishers, 1st Edition, 2015.
2. Ram Ahuja, "Research Method", News Way Publishers, 1st Edition, 2012.
3. Goode and Hatt, "Research Methodology", Eastern Limited Publication, 1st Edition reprinted, 2006.

Reference Books:

1. B. Somekh & C. Lewin, "Research Methods", Vistaar Publications, 1st Edition, 2005.
2. Bhandarkar, "Research Methods, Research styles and Research Strategies", Wilkinson Publishers, 1st Edition, 2009.

Web References:

1. http://humansecurityconf.polsci.chula.ac.th/Documents/Presentations/Shanawez.pdf
2. http://www.lexisnexis.com/documents/pdf/20080806034945_large.pdf
3. http://www.theglobaljusticenetwork.org/journal
4. http://humansecurityconf.polsci.chula.ac.th/Documents/Presentations/Shanawez.pdf
5. http://as.nyu.edu/docs/IO/1172/globaljustice.pdf

E-Text Books:

www.bookboon.com/en/natural-sciences-eBooks

Course Home Page:

CLINICAL PSYCHOLOGY

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS605	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Develop the knowledge pertinent to the organism, developmental, social and situational factors those are relevant to the initiation and maintenance of human behavior.
II. Understand the present and implement effective strategies to deal with these issues during work with patients.
III. Study the professional identity and practice as clinical psychologists through fundamental knowledge of psychology, commitment to professional ethics.
IV. Understand the multiculturalism, diversity and participation in life-long learning.

UNIT-I BASIC PSYCHOLOGY

Introduction: Psychology, definition, psychology as a science, early schools of psychology, modern perspectives, methods of psychology, experimental method, systematic observation, case study method, survey method, fields of psychology.

UNIT-II BIOLOGY OF BEHAVIOR AND SENSORY PROCESS

Neurons and synapses: Nervous system , peripheral and central nervous system: brain and sleep: importance of fore brain, association cortex, left and right hemisphere functions; Some general properties of senses, subliminal stimuli, the visual sense, auditory sense, the other senses; Consciousness, meaning, functions, divided consciousness, stages of sleep, dreams, meditation, hypnosis.

UNIT-III ATTENTION AND PERCEPTION

Selective attention; physiological correlates of attention, internal influences on perception, learning set, motivation and emotion, cognitive styles.

External influences on perception, figure ground, movement, illusions, perceptual organization, constancy, depth perception, binocular and monocular cues.

UNIT-IV MOTIVATION AND EMOTION MOTIVES

Definitions, motivation cycle, theories of motivation, biological motivation, social motives, frustration and conflicts of motives, defense mechanism, emotion, expression and judgment of emotion, the physiology of emotion, theories of emotion.

UNIT-V CLINICAL PSYCHOLOGY & MENTAL HEALTH

History of clinical psychology and its role in understanding and alleviation of mental illness, promotion of mental health and rehabilitation of the mentally ill, role and functions of clinical psychologists in DMHP, professional code of conduct and ethical issues

Text Books:

1. M. S. Bhatia, "Clinical Psychology", B J Publishers, 1st Edition, 2008.
2. Paul Bennett, "Abnormal and Clinical Psychology: An Introductory Textbook", Pearson Publishers, 2nd Edition, 2006.

Reference Books:

1. Robert A. Baron, Girishwar Misra, "Psychology: Indian Subcontinent Edition", Pearson Education, 5th Edition, 2009.
2. Hill Gard, E. R., C.A. Richard, L.A. Rita, "Introduction to Psychology", Oxford & IBH, New Delhi, 6th Edition, 1976.

Web References:

1. https://www.amazon.com/Clinical-Psychology-Counseling-Books/b?ie=UTF8&node=11143
2. https://global.oup.com/academic/content/series/o/oxford-textbooks-in-clinical-psychology-otcp/?cc=in&lang=en&

E-Text Books:

1. https://www.amazon.com/Clinical-Psychology-Counseling-Books/b?ie=UTF8&node=11143
2. https://books.google.co.in/books/about/Clinical_Psychology.html?id=u4aDPdw0Fi4C&redir_esc=y

Course Home Page:

ENGLISH FOR SPECIAL PURPOSES

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS606	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Learn the structure and style of effective sentences, paragraphs, and essays.
II. Focus on diction and spelling, punctuation and mechanics, and functional grammar in direct relation to students' own writing.
III. Understand and apply the basic conventions of syntax and mechanics; and proofread competently and prepare acceptable manuscripts.
IV. Emphasize the importance of language in academic and employability
V. Empower the communicative skills which enhance the employability skills with self-confidence.

UNIT-I	PRESENTATION SKILLS

English presentation, effective presentation, live presentation, web access, language orientation, classifications, method of presentations, declarations ,impact, concepts of presentation, skill oriented presentations, analysis of presentation, types of presentations.

UNIT-II	NON-VERBAL COMMUNICATION

Overview, this unit includes body language, posture, distance different levels of physical closeness appropriate to different types of relationship, right usage of gestures, open and closed postures, to be aware of facial expressions and their importance in non-verbal communication.

UNIT-III	INTERPERSONAL SKILLS

To build rapport, handling the criticism, giving and receive the feedback, be assertive, influencing and negotiation skills.

Methods of interpersonal skills, problem solving, decision making, verbal communication, peer negotiation, effective participating.

UNIT-IV	LISTENING

Listen effectively, how to make notes, the difference between active listening and passive listening to understand different dialects. Initiating the contact, the important context in communicating. the reluctant speaker, appendices, problems in listening.

UNIT-V	SPEAKING AND READING

Actively participate in GDs and debates, deal with JAM topics, answer questions in interviews, vocabulary section, useful information, discussing, socializing the effectiveness; How to read critically, to understand the main idea and tone of the author to understand complex ideas.

Text Books:

1. Susan E. Boyer, "Word Building Activities for Beginners of English" Birrong Book Publishers, 1st Edition, 2009.
2. Clive Oxenden , Christina Latham -Koenig, Paul Seligson, "New English File. Intermediate. Workbook", Oxford Publications, 1st Edition, 2006.
3. P Peter Bullions, "Practical Lessons in English Grammar and Composition", ESL Publications, 1st Edition, 1849.

Reference Books:

1. Wren and Martin, "High school English Grammar and Composition", S Chand Publications, 1st Edition, 2013.
2. Ron Cowan, "The Teacher's Grammar of English, Cambridge University Press, 1st Edition, 2008.

Web References:

1. http://www.cde.ca.gov/be/st/ss/documents/englangdevstnd.pdf
2. http://ell.stanford.edu/sites/default/files/ELP_task_force_report_rev.pdf

E-Text Books:

1. http://www.linguistik-online.org/40_09/dahmardeh.pdf
2. http://bookboon.com/en/english-language-ebooks

Course Home Page:

ENTREPRENEURSHIP

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS607	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Identify and apply the elements of entrepreneurship and to entrepreneurial processes;
II. Recognize the importance of entrepreneurship and identify the profile of entrepreneurs and their role in economic growth.
III. Analyze the business environment, opportunity recognition, and the business idea-generation process;
IV. Develop an idea on the legal framework and also understand strategic perspectives in entrepreneurship.

UNIT-I UNDERSTANDING ENTREPRENEURIAL MINDSET

The revolution impact of entrepreneurship-The evolution of entrepreneurship-Approaches to entrepreneurship-Process approach-Twenty first centaury trend s in entrepreneurship.

UNIT-II THE INDIVIDUAL ENTREPRENEURIAL MINDSET

The individual entrepreneurial mind set and personality, the entrepreneurial journey, stress and the entrepreneur, the entrepreneurial ego, entrepreneurial motivation, corporate entrepreneurial mindset the nature of corporate entrepreneur, conceptualization of corporate entrepreneurship strategy sustaining corporate entrepreneurship

UNIT-III LAUNCHING ENTREPRENEURIAL VENTURES

Opportunities identification, entrepreneurial imagination and creativity, the nature of the creativity process, innovation and entrepreneurship, methods to initiate ventures.

Creating new ventures acquiring an established entrepreneurial venture, franchising-hybrid disadvantage of franchising.

UNIT-IV LEGAL CHALLENGES OF ENTREPRENEURSHIP

Intellectual property protection, patents, copyrights trademarks and trade secrets-avoiding trademark pitfalls, formulation of the entrepreneurial plan, the challenges of new venture start-ups, poor financial understanding, and critical factors for new venture development-the evaluation process-feasibility criteria approach.

UNIT-V STRATEGIC PERSPECTIVES IN ENTREPRENEURSHIP

Strategic planning, strategic actions, strategic positioning business stabilization, building the adaptive firms-understanding the growth stage, unique managerial concern of growing ventures.

Text Books:

1. D F Kuratko,T V Rao, "Entrepreneurship: A South Asian Perspective", Cengage Learning, 1st Edition,2012.
2. Gordon, K .Natarajan, "Entrepreneurship Development", Himalaya, 4th Edition, 2008.
3. Coulter, "Entrepreneurship in Action", PHI, 2nd Edition, 2002.
4. S.S. Khanka, "Entrepreneurial Development", S. Chand & Co. Ltd, 5th Edition, 2007.

Reference Books:

1. Vijay Sathe, "Corporate Entrepreneurship", Cambridge, 1st Edition, 2009.
2. Vasanth Desai, "Dynamics of Entrepreneurial Development and Management", HPH, Millenium Edition, 2007.
3. P. Narayana Reddy, "Entrepreneurship – Text and Cases", Cengage Learning", 1st Edition, 2010.
4. David H. Hott, "Entrepreneurship New Venture Creation", PHI, 1st Edition, 2004.

Web References:

1. http://www.tutorialspoint.com/entrepreneurship_development/entrepreneurship_development_tutorial.pdf
2. http://www.advalue-project.eu/content_files/EN/33/AdValue_Personal_Effectiveness_EN.pdf

E-Text Books:

1. http://www.freebookcentre.net/Business/Entrepreneurship-Books.html
2. http://www.e-booksdirectory.com/listing.php?category=390
3. http://www.bookboon.com/en/entrepreneurship-ebooks

Course Home Page:

GERMAN LANGUAGE

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS608	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Complete reading, writing, speaking, and listening assignments with ever increasing proficiency and accuracy.
II. Increase grammatical accuracy on written assignments.
III. Implement the language skills in listening, speaking, reading and writing in German language.

UNIT-I	GERMAN SOUNDS

Vowels, consonants, diphthongs, umlaut, the nouns, gender distinctions, cases, definite and indefinite articles, conjugation of verbs, verbs with separable and inseparable prefixes, modal verbs, personal pronouns, possessive pronouns, reflexive pronouns, cases nominative, accusative and dative; Structure of sentence and categories of sentences, subordinate clause, causative and conditional sentences; A very interesting slideshow presentation is held to enlighten the students about the culture, people, and lifestyle in Germany.

UNIT-II	SENTENCES FORMATION

Infinite sentences, use of conjunctive and conjunctive ii (contd.) plusquam perfect, modal verb (contd.) conjunction, temporal, subordinate clauses complex sentences.

UNIT-III	GERMAN BASIC GRAMMAR

Verbs: Different forms, past tense and present perfect tense, adjectives and their declension, degrees of comparison; Prepositions, genitive case, conjunctive.

Different conjunctions (co-coordinating and subordinating), simple, complex and compound sentences, active and passive voice, relative pronouns.

UNIT-IV	PURPOSE OF LANGUAGE STUDY

Pictures and perceptions, conflicts and solutions, change and the future, the purpose of the study of the German language, listening, understanding, reacting, speaking, communicating, use of language, pronunciation and intonation ,reading, reading and understanding, writing, text writing, text forming, use of language, language reflection, building up the language, language comparison, culture reflection, other cultures and cultural identity.

UNIT-V	GERMAN ADVANCED COMMUNICATION LEVEL-1

The significance of language study 1. Speaking and thinking 2. Self – discovery 3. Communication 4. Language Competence 5. Language and culture 6. Language changes 7. Connection with other areas of study 8. The mother—language 9. Other languages.

Text Books:

1. Korbinian, Lorenz Nieder Deutschals Fremds prache IA. Ausländer, "German Language", Perfect Paperback Publishers, 1st Edition, 1992.
2. Deutsch als Fremdsprache, IB, Ergänzungskurs,"German Language", Front Cover. Klett, Glossar Deutsch-Spanish Publishers, 1st Edition, 1981.

Reference Books:

1. Griesbach, "Moderner Gebrauch der deutschen Sprache", Schulz Publishers,10th Edition, 2011.
2. Anna Quick , Hermann Glaser U.A, "Intermediate German: A Grammar and workbook", Paperback, 1st Edition, 2006.

Web References:

1. http://www.prsformusicfoundation.com/docs/408/Schenke%20-%20Seago%20-%20Basic%20German.pdf
2. https://upload.wikimedia.org/wikipedia/commons/2/2d/German.pdf

E-Text Books:

1. http://www.staidenshomeschool.com/files/Learning_German_Ebook.pdf
2. http://weblearn.ox.ac.uk/access/content/group/modlang/general/handbooks/09-10/prelims/german_language_guide_0910.pdf

Course Home Page:

DESIGN HISTORY

IV Semester: Common for all Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS609	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Understand the fundamental theoretical and historic graphical topics of design, from the fifties of the twentieth century to the present day.
II. Use methodological tools and develop their analytical and critical capacities, so that they can grasp the bonds that link works of design with their respective social, economic and cultural backdrop.
III. Identify the influences at work between the various different creative disciplines.
IV. Develop their analytical and critical abilities, focusing on their search for their own expressive design language.

UNIT-I **INTRODUCTION TO DESIGN HISTORY**

Materials and techniques of design, design in the machine age, design body, environmental design.

UNIT-II **DESIGN PRODUCTS**

Innovative ideas of design products, intellectual and creative research, commercial and critical perspectives on design products, social, ethical and economic impact of your design.

UNIT-III **GLOBAL INNOVATION IN DESIGN**

Styles of global innovation design, the service design basics.

Concepts of vehicle design, techniques of design engineering (IDE).

UNIT-IV **THE DESIGN INTERACTIONS**

Interaction design, digital media, fine art, products, graphic and furniture design, architecture, life sciences, biotech, social sciences, and computer science, human consequences of different technological design futures.

UNIT-V **RESEARCH IN DESIGN HISTORY**

Research in craftsmanship and artisanal cultures, design, trade and exchange, design exhibitions, curatorial practice, history and theory, design and national, global identities ,the design and material culture of the domestic interior, material history and the history of materiality, Asian design history.

Text Books:

1. R.S. Khurmi, "A Textbook of Machine Design", Eurasia Publishing House (pvt.) Ltd., 14th Edition, 2005.
2. Nicolas, "Beyond", Nova Publishers, 2nd Edition, 2014.
3. Mariana Amatullo**, "**Career Pathways in Design for Social Innovation; Design matters at Art Center College of Design", LEAP Dialogues, 1st Edition, 2016.

Reference Books:
1. Max Bruinsma, "Design for the Good Society", Paperback, 1st Edition, 2015. 2. Beppe Finessi, "How to Break the Rules of Brand Design", Global Publishers, 1st Edition, 2009.
Web References:
1. https://en.wikipedia.org/wiki/Web_design 2. https://en.wikipedia.org/wiki/Responsive_web_design
E-Text Books:
1.http://www.creativebloq.com/design/free-ebooks-designers-7133700 2.https://www.amazon.com/Designing-History-East-Asian-Textbooks/dp/0415855586
Course Home Page:

GENDER SENSITIVITY

III Semester: Common to All Branches

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS017	Perspective	-	-	-	-	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: Nil		

OBJECTIVES:

The course should enable the students to:

I. Understand the basic concepts relating to gender and to provide logical understanding of gender roles.
II. Analyze present various perspective of body and discourse on power relationship.
III. Develop cultural construction of masculinity and femininity.
IV. Study the evolution of gender studies from women's studies

UNIT-I	INTRODUCTION

Sex and gender; types of gender, gender roles and gender division of labour, gender stereotyping and gender discrimination the other and objectification, male gaze and objectivity.

UNIT-II	GENDER PERSPECTIVES OF BODY

Biological, phenomenological and socio-cultural perspectives of body, body as a site and articulation of power relations, cultural meaning of female body and women's lived experiences, gender and sexual culture.

UNIT-III	SOCIAL CONSTRUCTION OF FEMININITY

Bio-social perspective of gender, gender as attributional fact, essentialism in the construction of femininity, challenging cultural notions of femininity.

Butler, Douglas, Faucault and Haraway, images of women in sports, arts, entertainment and fashion industry, media and feminine identities.

UNIT-IV	SOCIAL CONSTRUCTION OF MASCULINITY

Definition and understanding of masculinities, sociology of masculinity, social organization of masculinity and privileged position of masculinity, politics of masculinity and power, media and masculine identities.

UNIT-V	WOMEN'S STUDIES AND GENDER STUDIES

Evolution and scope of women's studies, from women's studies to gender studies: A paradigm shift, women's studies vs. gender studies, workshop, gender sensitization through gender related.

Text Books

1. Gender," How Gender Inequality Persists in the Modern World", Oxford University Press, Reprinted Edition, 2011.
2. William M Johnson "Recent reference books in religion", Duke University Publications, Reprinted Edition, 2014.

Reference Books

4. Alolajis. Mustapha, Sara Mils, "Gender Representation in Learning Materials", Pearson Publications, 1st Edition, 2015.

Web References:

1. https://www.google.co.in/search?q=clinical++pscyology+ebooks&ie=utf-8&oe=utf-8&client=firefox-b-ab&gfe_rd=cr&ei=xPmJV6OhFcuL8Qf3qam4Cw#q=gender+sensitivity+web+references
2. https://en.wikipedia.org/wiki/Gender_sensitization

E-Text Books:

1. http://ebooklibrary.org/articles/gender_sensitization
2. http://cbseacademic.in/publication_ebooks.html

Course Home Page:

1. Analyse pipe and valve criticality
2. Assess fire flow capacity
3. Build and manage hydraulic models
4. Design water distribution systems
5. Develop flushing plans
6. Identify water loss
7. Manage energy use
8. Prioritize pipe renewal
9. Simulate network in real time

1. Introduction to STADD. Pro
2. Analysis of continuous beam
3. Analysis of single storey frame
4. Analysis of multi-storey frame
5. Design of multi-storey frame
6. Analysis of multi-storeyed building
7. Design of multi-storeyed building
8. Wind load analysis on RCC building
9. Analysis and design of steel truss
10. Analysis and design of isolated footing
11. Analysis and design of combined footing
12. Analysis of bridge deck

1. Fundamentals of land surveying & GPS
2. Global positioning system (GPS)
3. Global positioning system (GPS)
4. Total Station(TS)
5. TS & digital land surveying (DLS)
6. DLS& digital mapping (DM)
7. DM & digital data manipulation (DDM)
8. Digital Land Surveying and Mapping (DLS&M)

COURSE CODE: ACE804 COURSE NAME: INTRODUCTION TO REMOTE SENSING

1. Satellite based Remote Sensing & Development of Remote Sensing technology and advantages.
2. Different platforms of remote sensing, EM spectrum, solar reflection and thermal emission remote sensing.
3. Interaction of EM radiation with atmosphere including atmospheric scattering, absorption and emission.
4. Interaction mechanisms of EM radiation with ground, spectral response curves& Principles of image interpretation.
5. Multi-spectral scanners and imaging devices, Salient characteristics of LANDSAT, IRS, Cartosat, ResourceSat etc. sensors.
6. Image characteristics and different resolutions in Remote Sensing & Image interpretation of different geological landforms, rock types and structures.
7. Remote Sensing integration with GIS and GPS. Georeferencing Technique.
8. Basic image enhancement techniques & Spatial filtering techniques
9. Image classification techniques & InSAR Technique and its applications
10. Hyperspectral Remote Sensing.
11. Integrated applications of RS and GIS in groundwater studies.
12. Limitations of Remote Sensing Technique.

VISION AND MISSION OF THE INSTITUTE

VISION

To bring forth professionally competent and socially sensitive engineers, capable of working across cultures meeting the global standards ethically.

MISSION

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

B.TECH - PROGRAM OUTCOMES (POS)

PO-1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering Knowledge**).

PO-2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences **(Problem Analysis).**

PO-3: 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 **(Design/Development of Solutions).**

PO-4: 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 **(Conduct Investigations of Complex Problems).**

PO-5: 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 **(Modern Tool Usage).**

PO-6: 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 **(The Engineer and Society).**

PO-7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development **(Environment and Sustainability).**

PO-8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice **(Ethics).**

PO-9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

PO-10: 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 **(Communication).**

PO-11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12: 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 **(Life-long learning).**

OBJECTIVE OF THE DEPARTMENT

DEPARTMENT OF CIVIL ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

The Program Educational Objectives (PEOs) of the Civil Engineering undergraduate program at the Institute of Aeronautical Engineering are:

PEO - I: To impart proficiency in engineering knowledge and skills to analyze, design, build, maintain, or improve civil engineering based systems. **(Professional Excellence)**

PEO - II: To offer broad education and practical skills so that the students can carry out technical investigations within realistic constraints such as economic, environmental, societal, safety and sustainability. **(Understanding Socio-Economic Aspects)**

PEO - III: To impart ability to collaborate with and function on multidisciplinary teams to offer engineering solutions to the society **(Technical Collaboration)**

PEO - IV: To create interest in the students to engage in life-long learning in advanced areas of civil engineering and related fields. **(Continued Self-Learning)**

PEO - V: To educate the students in ethical values and social responsibility to use engineering techniques and modern tools necessary for civil engineering practice to serve the society effectively. **(Effective Contribution to Society)**

PROGRAM SPECIFIC OUTCOMES (PSO's)

The Program Specific outcomes (PSO's) listed below were developed specifically to meet the Program Educational Objectives (PEO's). The focus of these PSO's is consistent with the set of required PO's identified in the NBA accreditation guidelines.

The Civil Engineering PSO's require that graduates receiving a Bachelor of Technology in Civil Engineering degree from IARE demonstrate the following.

PSO - I: **Engineering Knowledge**: Graduates shall demonstrate sound knowledge in analysis, design, laboratory investigations and construction aspects of civil engineering infrastructure, along with good foundation in mathematics, basic sciences and technical communication.

PSO – II: **Broadness and Diversity:** Graduates will have a broad understanding of economical, environmental, societal, health and safety factors involved in infrastructural development, and shall demonstrate ability to function within multidisciplinary teams with competence in modern tool usage.

PSO – III: **Self-Learning and Service**: Graduates will be motivated for continuous self-learning in engineering practice and/or pursue research in advanced areas of civil engineering in order to offer engineering services to the society, ethically and responsibly.

FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

1. Who grants Autonomy? UGC, Govt., AICTE or University

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

2 Shall IARE award its own Degrees?

No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name IARE on the Degree Certificate.

3 What is the difference between a Deemed University and an Autonomy College?

A Deemed University is fully autonomous to the extent of awarding its own Degree. A Deemed University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4 How will the Foreign Universities or other stake – holders know that we are an Autonomous College?

Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Telangana mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5 What is the change of Status for Students and Teachers if we become Autonomous?

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

6 Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition the highest academic council also supervises the academic matters. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7 Will the students of IARE as an Autonomous College qualify for University Medals and Prizes for academic excellence?

No. IARE has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

8 Can IARE have its own Convocation?

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at IARE.

9 Can IARE give a provisional degree certificate?

Since the examinations are conducted by IARE and the results are also declared by IARE, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

10 Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly, the number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11 What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 70 % external and 30% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12 Is it possible to have complete Internal Assessment for Theory or Practicals?

Yes indeed. We define our own system. We have the freedom to keep the proportion of external and internal assessment component to choose.

13 Why Credit based Grade System?

The credit based grade system is an accepted standard of academic performance the world over in all Universities. The acceptability of our graduates in the world market shall improve.

14 What exactly is a Credit based Grade System?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like A, B,C,D, etc. are assigned for a Range of Marks. (e.g. 91% and above is A+, 80 to 90 % could be A etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

15 What are the norms for the number of Credits per Semester and total number of Credits for UG/ PG programme?

These norms are usually defined by UGC or AICTE. Usually around 25 Credits per semester is the accepted norm.

16 What is a Semester Grade Point Average (SGPA)?

The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

$$SGPA = \sum_{i=1}^{n} (C_i G_i) / \sum_{i=1}^{n} C_i$$

Where, C_i is the number of credits of the i^{th}course and G_i is the grade point scored by the student in the i^{th} course and i represent the number of courses in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

17 Whatis a Cumulative Grade Point Average (CGPA)?

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \sum_{j=1}^{m} (C_j S_j) / \sum_{j=1}^{m} C_j$$

Where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits up to the semester and m represent the number of semesters completed in which a student registered up to the semester. CGPA is rounded to two decimal places.

18 Is there any Software available for calculating Grade point averages and converting the same into Grades?

Yes, the institute has its own MIS software for calculation of SGPA, CGPA, etc.

19 Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

20 Will there be any Revaluation or Re-Examination System?

No. There will double valuation of answer scripts. There will be a makeup Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a 'summer term' (compressed term) followed by the End Semester Exam, to save the precious time of students.

21 How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

22 Will the Degree be awarded on the basis of only final year performance?

No. The CGPA will reflect the average performance of all the semester taken together.

23 What are Statutory Academic Bodies?

Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in everybody is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

24 Who takes Decisions on Academic matters?

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Boared of Studies level are to be ratified at the Academic Council and Governing Body.

25 What is the role of Examination committee?

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and make up Examinations. All matters involving the conduct of examinations, spot valuations, tabulations preparation of Grade Cards, etc. fall within the duties of the Examination Committee.

26 Is there any mechanism for Grievance Redressal?

The institute has grievance redressal committee, headed by Dean - Student affairs and Dean - IQAC.

27 How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulation

28 Who declares the result?

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29 Who will keep the Student Academic Records, University or IARE?

It is the responsibility of the Dean, Academics of the Autonomous College to keep and preserve all the records.

30 What is our relationship with the JNT University?

We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

31 Shall we require University approval if we want to start any New Courses?

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

32 Shall we get autonomy for PG and Doctoral Programmes also?

Yes, presently our PG programmes also enjoying autonomous status.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S. No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculator, cell phone, pager, palm computer or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute premises or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already

		appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

UNDERTAKING BY STUDENT/PARENT

"To make the students attend the classes regularly from the first day of starting of classes and be aware of the College regulations, the following Undertaking Form is introduced which should be signed by both student and parent. The same should be submitted to the Dean, Academic".

I, Mr./Ms. ---------- joining I Semester / III Semester for the academic year 2016-2017 / 2017-2018 in Institute of Aeronautical Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the ACKNOWLEDGEMENT duly signed by me and my parent and submit it to the Dean, Academic.

1. I will attend all the classes as per the timetable from the starting day of the semester specified in the institute Academic Calendar. In case, I do not turn up even after two weeks of starting of classes, I shall be ineligible to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure attendance of not less than 75% in every course as stipulated by Institute. I am fully aware that an attendance of less than 65% in more than three theory courses will make me lose one year.
3. I will compulsorily follow the dress code prescribed by the college.
4. I will conduct myself in a highly disciplined and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the institute.
5. I will concentrate on my studies without wasting time in the Campus/Hostel/Residence and attend all the tests to secure more than the minimum prescribed Class/Sessional Marks in each course. I will submit the assignments given in time to improve my performance.
6. I will not use Mobile Phone in the institute premises and also, I will not involve in any form of ragging inside or outside the campus. I am fully aware that using mobile phone to the institute premises is not permissible and involving in Ragging is an offence and punishable as per JNTUH/UGC rules and the law.
7. I declare that I shall not indulge in ragging, eve-teasing, smoking, consuming alcohol drug abuse or any other anti-social activity in the college premises, hostel, on educational tours, industrial visits or elsewhere.
8. I will pay tuition fees, examination fees and any other dues within the stipulated time as required by the Institution / authorities, failing which I will not be permitted to attend the classes.
9. I will not cause or involve in any sort of violence or disturbance both within and outside the college campus.
10. If I absent myself continuously for 3 days, my parents will have to meet the HOD concerned/ Principal.
11. I hereby acknowledge that I have received a copy of IARE - R16 Academic Rules and Regulations, Syllabus copy and hence, I shall abide by all the rules specified in it.

ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per Institute/JNTUH/AICTE/UGC rules and the law. I undertake that I/he/she will strictly follow the above terms.

Signature of Student with Date

Signature of Parent with Date
Name & Address with Phone Number