Prasad V. Potluri Siddhartha Institute of Technology
(Autonomous)
Approved by AICTE and Affiliated to JNTUK
Accredited by NAAC : A+
All UG programs accredited by NBA, ISO 9001-2015 Certified Institute
Vijayawada, Andhra Pradesh, India.

ACADEMIC RULES &REGULATIONS (PVP20)
and
FOUR Years B.Tech Course Structure and Syllabus

Applicable for the batch of students admitted from the Academic Year 2020-2021

DEPARTMENT OF CIVIL ENGINEERING

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY
(Autonomous)
AICTE approved, NBA & NAAC A+ Accredited, An ISO 9001:2015 certified Institution
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w.e.f. A.Y 2020 – 2021

PREFACE

PVP Siddhartha Institute of technology, established in 1998, is one of the seventeen educational institutions sponsored and run by Siddhartha Academy of General & Technical Education. The 250 members of the Academy are a group of industrialists, educationists, auditors and philanthropists with vast experience in their respective fields and above all with an ardent desire to spread quality Education. All the academic organizations of Siddhartha Academy stand symbolic of the pragmatic vision of its founders. PVP Siddhartha Institute of Technology has the advantage of inheriting the higher academic standards. The college is approved by AICTE and is permanently affiliated to JNTUK. It is certified by ISO 9001-2015 for its quality standard. All the UG Programs are accredited by the National Board of Accreditation and NAAC with A^+ grade. It is an Autonomous institute.

The curriculum is revised continuously to address the challenges of industry and academia and to foster the global competencies among the students. The curriculum is revised thrice since 2012. The present curriculum(PVP20) is designed incorporating the features such as outcome based approach, encouraging self-learning through MOOCs platforms i.e., Swayam, COURSERA, EDX, NPTEL, etc., Transformation of creative ideas into a prototype through Internship & Project, enhancing depth & breadth by introducing more number of programs, open electives in core and multi-disciplinary areas, offering courses by industry experts to improve Industry Institute Interaction in addition to internships at industry and introduction of wide range of value added courses beyond curriculum to choose according to their interest to enhance their employability skills.

Institute Vision

To provide rich ambience for Academic and Professional Excellence, Research, Employability skills, Entrepreneurship and Social responsibility.

Institute Mission

To empower the students with Technical knowledge, Awareness of up-to-date technical trends, Inclination for research in the areas of human needs, Capacity building for Employment / Entrepreneurship, Application of technology for societal needs.

Quality Policy

At PVPSIT, We commit ourselves to offer Quality professional education in engineering & Management by adhering to applicable statutory and regulatory requirements and through continuous improvement in the Quality of our services by,

- Regular up gradation of knowledge and skills of faculty
- Improving the teaching methods and strategies
- Providing state of art infrastructure
- Recruiting competent faculty and maintaining prescribed Teacher Student ratio
- Improving the employability of students
- Enhanced Collaboration with industry and institutions of National Repute

DEPARTMENT OF CIVIL ENGINEERING

VISION OF THE DEPARTMENT

The Department of Civil Engineering will provide quality education on par with the premier organizations of the country so that our students become leaders in education, industry and governance. Department strives to attain national recognition in research, teaching and professional service ensuring sustainability to various upcoming developments in the society at the regional and national scenario.

MISSION OF THEDEPARTMENT

- To provide state of art education in Civil Engineering with a well-balanced program of instruction and practical experience
- To impart managerial skills for construction and sustainable development for societal needs.
- To generate research opportunities that creates synergy among faculty, students, and practicing professionals.
- To contribute to the quality of life through innovation in the knowledge generation, sharing and its use.

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PROGRAM EDUCATIONAL OBJECTIVES	
PEO	**STATEMENTS**
PEO I	The graduates will have analytical and experimental abilities and design capabilities in Civil Engineering career.
PEO II	The graduates will have good scientific and engineering domain to play an appropriate role in multidisciplinary professional activities with effective communicative skills to provide integrated and sustainable solutions for engineering problems.
PEO III	The graduates will have attitude for lifelong learning and pursue higher education and research. They will perform with engineering ethics and social responsibility in their professional career making use of state of art, modern tools and managerial skills.

PROGRAM OUTCOMES (PO's)	
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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	**Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PROGRAM SPECIFIC OUTCOMES (PSOs)	
PSO1	**UNDERSTANDING:** 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**.**
PSO2	**BROADNESS AND DIVERSITY:** Graduates will have a broad understanding of economic, 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.

QUALITY POLICY

At PVPSIT, We commit ourselves to offer Quality professional education in engineering & Management by adhering to applicable statutory and regulatory requirements and through continuous improvement in the Quality of our services by,

- Regular up gradation of knowledge and skills of faculty
- Improving the teaching methods and strategies
- Providing state of art infrastructure
- Recruiting competent faculty and maintaining prescribed Teacher Student ratio
- Improving the employability of students
- Enhanced Collaboration with industry and institutions of National Repute

CONTENTS

Engineering UG Programmes

Introduction

The redesigned curriculum focused on up skilling the graduates on the skills relevant to the need and demands of the industry. The curriculum mandates students to take up five skill courses which are relevant to the industry from second year onwards, two basic level skill courses, one on soft skills and other two on advanced level skill courses. The students are also given the option of choosing between skill courses offered by the Institute and a certificate course offered by industry, a professional body, APSSDC or any other accredited body.

Another major change brought in the curriculum is the introduction of B.Tech. with Honors or a B.Tech with a Minor. This is to give an opportunity for the fast learners to earn additional credits either in the same domain or in a related domain, making them more proficient in their chosen field of discipline or be a graduate with multidisciplinary knowledge and job ready skills.

Mandatory Internship, both industry and social, is included in the revised curriculum that aims at making engineering graduates connect with the needs of the industry and society at large. It will be mandatory for the students to intern in the industry/field for four to six weeks during the summer vacation and also in the final semester to acquire the skills required for job.

The redesigned curriculum offers academic flexibility by introducing a pool of inter-disciplinary and job-oriented skill courses which are integrated in to the curriculum of each branch of engineering, from which a student can pick his choice. Flexibility is not only given to students in the choices of courses, but flexibility is given in choosing courses either from the pool of courses offered by the concerned department or in choosing the courses offered by APSSDC or by any other reputed organization/professional body which offers with certification, as decided by respective BoS. Hence, the students are given wide choice and flexibility to undertake courses, while at the same time offering relevance to the interest of individual student in their own context. The curriculum also gives flexibility to the institution in offering a variety of courses to the students of a particular discipline. The Board of Studies is empowered to identify as many tracks and pools as possible in emerging technologies and industrial relevance, and also in humanities and sciences.

1. SHORT TITLE AND COMMENCEMENT

a. The regulations listed under this head are common for all degree level undergraduate programmes (B.Tech.), offered by the college with effect from the academic year 2020-21 and they are called as "PVP20" regulations.

b. The regulations here under are subjected to amendments as may be made by the Academic Council of the college from time to time, keeping in view of the recommendations of the Board of Studies. Any or all such amendments will be effective from such date and to such batches of candidates including those already undergoing the programme, as may be decided by the Academic Council.

2. DEFINITIONS

a. "**Commission**" means University Grants Commission(UGC);

b. "**Council**" means All India Council for Technical Education(AICTE);

c. "**University**" means Jawaharlal Nehru Technological University Kakinada(JNTUK);

d. "**College**" means Prasad V Potluri Siddhartha Institute of Technology, Vijayawada;

e. An **Academic Programme** means any combination of courses and/or requirements leading to award of a degree.

f. "**Course**" means a subject either theory or practical identified by its course title and code number and which is normally studied in a semester.

g. "**Degree**" means an academic degree conferred by the university upon those who complete the under graduate curriculum.

h. "**MOOC**" means Massive Open Online Course

i. "**Regular Students**" means students enrolled into the four year programme in the first year.

j. "**Lateral Entry Students**" means students enrolled into the four year programme in the second year.

3. ACADEMIC PROGRAMMES

3.1 Nomenclature of Programmes

3.1.1 The nomenclature and its abbreviation given below, shall continue to be used for the Degree programmes under the University, as required by the Council and the Commission:

Bachelor of Technology (B. Tech)

Besides, the name of specialization shall be indicated in brackets after the abbreviation, for example, engineering degree in Mechanical Engineering programme is abbreviated as B.Tech (Mechanical Engineering).

3.1.2 Bachelor of Technology (B. Tech.) degree programme is offered in:

1. Civil Engineering(CE)
2. Computer Science and Engineering(CSE)
3. Electronics and Communication Engineering(ECE)
4. Electrical and Electronics Engineering(EEE)
5. Information Technology(IT)
6. Mechanical Engineering(ME)

4. DURATION OF THE PROGRAMMES

4.1 Normal Duration

4.1.1. The duration of an academic programme shall be four years consisting of eight semesters.

4.1.2. The duration of the programme for lateral entry students who are admitted in II year shall be three years that consists of six semesters.

4.2 Maximum Duration

4.2.1 The maximum period for which a student can take to complete a full time academic programme shall be double the normal duration of the programme, i.e., for regular students eight years, for lateral entry students six years.

4.3 Minimum Duration of a Semester

Each semester consists of a minimum of 90 instruction days with about minimum 20 and maximum 33 contact hours per week.

5. ADMISSION CRITERIA

The eligibility criteria for admission into UG Engineering programmes are as per the norms approved by Government of Andhra Pradesh from time to time. The sanctioned seats in each programme in the college are classified into CATEGORY-A, and CATEGORY-B at I year level and only CATEGORY-A at Lateral Entry II year level.

The percentages of Category–A, Category-B and Lateral Entry Seats are decided from time to time by the Government of Andhra Pradesh.

5.1 CATEGORY – A Seats

Category - A seats are filled as per the norms approved by the Government of Andhra Pradesh.

5.2 CATEGORY – B Seats

Category - B seats are filled by the College as per the norms approved by the Government of Andhra Pradesh.

5.3 CATEGORY - Lateral Entry Seats

Lateral entry candidates shall be admitted into the III semester directly as per the norms approved by Government of Andhra Pradesh.

6. CREDIT SYSTEM AND GRADE POINTS

6.1 Credit Definition

'Credit' means quantified and recognized learning. Credit is measured in terms of contact hours per week in a semester. Typically one credit is given to:

(a) Theory/Tutorial course conducted for one contact period.

(b) Laboratory course conducted for two contact periods.

Each course is assigned a certain number of credits depending upon the number of contact hours (Lectures/Tutorials/Practical) per week.

The curriculum of the eight semesters B.Tech program is designed to have a total of 160 credits for the award of B.Tech degree.

For lateral entry students, the curriculum of six semesters B.Tech program is designed to have a total of 121 credits for the award of B.Tech degree.

6.2 Semester Course Load

The average course load shall be fixed at 20 credits per semester with its minimum and maximum limits being set at 12 and 23 credits.

6.3 Grade Points and Letter Grade for a Course

The grade points and letter grade will be awarded to each course based on student's performance as per the grading system shown in the Table.

Table : Grading System for B. Tech Programme(PVP20 Regulations)

Grades and Grade Points (PVP20 Regulations)

Theory / Drawing (Max-100)	Laboratory/ Mini Project/ Internship etc. (Max – 50)	Level	Grade Point	Letter Grade
≥ 90	≥ 45	Outstanding	10	A+
≥ 80 to ≤ 89	≥ 40 to ≤ 44	Excellent	9	A
≥ 70 to ≤ 79	≥ 35 to ≤ 39	Very Good	8	B
≥ 60 to ≤ 69	≥ 30 to ≤ 34	Good	7	C
≥ 50 to ≤ 59	≥ 25 to ≤ 29	Fair	6	D
≥ 40 to ≤ 49	≥ 20 to ≤ 24	Satisfactory	5	E
< 40	< 20	Fail	0	F (FAIL)
ABSENT	ABSENT	ABSENT	0	AB

* For Major Project same (%) percentages will be followed for grading

6.4 Semester Grade Points Average(SGPA)

The performance of each student at the end of each semester is indicated in terms of SGPA calculated as shown in equation (1)

$$SGPA = \frac{\sum (CR \times GP)}{\sum CR \text{ (for all courses offered in the semester)}} \quad \text{-- (1)}$$

Where CR= Credits of a course

GP = Grade points awarded for a course

$\sum CR$ = Summation of all the courses offered in the semester

6.5 Cumulative Grade Point Average (CGPA)

The Cumulative Performance of each student at the end of each semester is indicated in terms of CGPA which is calculated as shown in equation (2).

$$CGPA = \frac{\sum CR \; X \; GP}{\sum CR (for\ all\ courses\ offered\ upto\ that\ semester/entire\ program)} \text{-- (2)}$$

Where CR = Credits of a course

GP = Grade points awarded for a course

Percentage equivalent of CGPA = (CGPA – 0.75) * 10

7.CURRICULUM FRAMEWORK

7.1. Regular and Honors B.Tech Programmes of all Branches

1. Award of the Degree: A student will be declared eligible for the award of

B. Tech. degree if he/she fulfills the following:

i. Pursues a course of study in not less than four and not more than eight academic years.

ii. After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.

iii. Registers for 160 credits and must secure all the 160 credits.

iv. A student shall be eligible for the award of B.Tech degree with Honors or Minor if he / she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

2. Structure of the Undergraduate Engineering program:

Every course of B.Tech. Program shall be placed in one of the nine categories as listed in table below:

S. No.	Category	Code	Suggested breakup of Credits (APSCHE)	Suggested breakup of Credits (AICTE)
1	Humanities and social science including Management courses	HSMC	10.5	12
2	Basic Science courses	BSC	21	25
3	Engineering Science courses	ESC	24	24
4	Professional core Courses	PCC	51	48
5	Open Elective Courses	OEC	12	18
6	Professional Courses Elective	PEC	15	18
7	Internship, project work seminar,	PROJ	16.5	15
8	Mandatory courses	MC	Non-credit	Non-credit
9	Skill Oriented Courses	SC	10	-
Total Credits			160	160

3. Assigning of Credits:

   1 Hr. Lecture (L) per week - 1 credit

   1 Hr. Tutorial (T) per week - 1 credit

   1 Hr. Practical (P) per week - 0.5 credits

   2 Hours Practical (Lab)/week - 1 credit

4. There shall be mandatory student induction program for fresher's, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc., shall be included in the guidelines issued by AICTE

5. All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Completed or Not Completed in the mark sheet on the basis of participation, attendance, performance and behavior, and it is treated as student practice course . If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

6. Courses like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be

offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

7. Institution may swap some of the courses between first and second semesters to balance the workload.

8. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.

9. There shall be 05 Professional Elective courses and 04 Open Elective courses. All the Professional & Open Elective courses shall be offered for 03 credits, wherever lab component is involved it shall be (2-0-2) and without lab component it shall be (3-0- 0). If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.

10. All Open Electives are offered to students of all branches in general. However, a student shall choose an Open Elective from the list in such a manner that he/she has not studied the same course in any form during the Programme.

11. A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the Programme. Each of the courses must be of minimum 12 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to pursue and acquire a certificate for a MOOC course only from the organizations/agencies approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester.

12. The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

13. Students shall undergo mandatory summer internships for a minimum of four to six weeks duration at the end of second and third year of the Programme. There shall also be mandatory full internship in the final semester of the Programme along with the project work.

14. There shall be 05 skill-oriented courses offered during III to VII semesters. Among the five skill courses, four courses shall focus on the basic and advanced skills related to the domain courses and the remaining one shall be a soft skills course.

15. Under graduate Degree with Honors / Minor shall be issued by the institute to the students who fulfil all the academic eligibility requirements for the B. Tech program and Honors/Minor program. The objective is to provide additional learning opportunities to academically motivated students.

16. Assessment: The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 50 marks for practical subject. The distribution shall be 30 marks for Internal Evaluation and 70 marks for the End Semester Theory Examinations. 15 marks for Internal Evaluation and 35 marks for the End Semester practical Examinations A student has to secure not less than 35% of marks in the end semester examination and minimum 40% of marks in the sum total of internal and end semester examination marks to earn the credits allotted to each course.

Detailed guidelines for continuous evaluation shall be planned by concerned combined BOS of the Universities.

17. **Attendance Requirements**:

i. A student shall be eligible to appear for end semester examinations if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.

ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

iii. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

iv. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

v. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.

vi. A stipulated fee shall be payable towards condonation of shortage of attendance to the college. A student is eligible to write the semester end examinations if he acquires 75% of attendance in aggregate of all the subjects.

7.2 General Issues

7.2.1 Curriculum framework is important in setting the right direction for a degree programme as it takes into account the type and quantum of knowledge necessary to be acquired by a student in order to qualify for the award of degree in his/her chosen branch or specialization.

7.2.2 Besides, this also helps in assigning the credits for each course, sequencing the courses semester-wise and finally arriving at the total number of courses to be studied and the total number of credits to be earned by a student in fulfilling the requirements for conferment of degree.

7.2.3 Each theory course shall consist of five units.

7.3 Curriculum Structure

The curriculum is designed to facilitate B. Tech (Honors) and B.Tech (Major, Minor) incorporates courses required to attain the expected knowledge, skills and attitude by the time of graduation as per the needs of the stakeholders. The curriculum structure consists of various course categories (as described in 7.3.1 to7.3.5) to cover the depth and breadth required for the programme and for the attainment of programme outcomes of the corresponding programme.

7.3.1 Institutional Core

Institutional Core consists of the courses required for all UG Engineering Programmes offered in this college. The courses offered under this category cover the required knowledge in the following areas:

a) Basic Sciences:

Basic Science courses include Engineering Physics, Applied Physics, Engineering Physics Lab, Applied Physics Lab Engineering Chemistry, Engineering Chemistry Lab, and Engineering Mathematics, etc.

b) Engineering Sciences:

Engineering Science courses include Problem Solving and Programming, AI Tools, Internet of Things, Design Thinking, Basic Electrical and Electronics Engineering, Engineering Graphics, Problem Solving & Programming Lab, Basic Electrical & Electronics Engineering Lab, AI Tools Lab, Internet of Things Lab, Design Thinking Lab and Basic Workshop, etc.

c) Humanities and Social Sciences:

Humanities and Social Science Courses consist of Communicative English I, Communicative English II, HS Elective, Communicative English-I Lab and Communicative English-II Lab, etc.

7.3.2 Elective Courses

Elective courses are offered across the programmes to enhance the knowledge breadth and professional competency of the students.

Courses	Branch Specific	Compulsory
Elective courses	Professional Electives	Supportive to the discipline courses with expanded scope in a chosen track of specialization or cross track courses
	HS Management Elective	Nurture the student interests in management courses.
	Open Electives	Common to all disciplines that helps general interest of a student

7.3.3 Professional Core

The Professional core consists of set of courses considered which are necessary for the students of the specific programme. The courses under this category satisfy the Programme Specific Criteria prescribed by the appropriate professional societies.

7.3.4 Project

In the final semester, the student should mandatorily undergo internship and in parallel he/she should work on a project with well-defined objectives.

7.3.5 Mandatory Learning Courses

According to the guidelines given by statutory bodies, Courses on Environmental Science, Constitution of India and Engineering Ethics, Life Sciences for Engineers and Life Sciences for Engineers Lab shall be offered. Induction program shall be offered in I semester for all the branches.

7.3.6 Honors Programme

In order to obtain honors degree students shall earn additional 20 credits in addition to the 160 credits for obtaining the UG degree. Students can register for additional courses by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from IV semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

1. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.
2. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 CGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 CGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme. A CGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Honors registration active.
    - SGPA or CGPA in excess of 8.0 has to be maintained in the subsequent semesters in major as well as Honors degree without any backlogs in order to keep the Honors degree registration active.
    - Should both the SGPA and CGPA fall below 8.0 at any point after registering for the Honors; the Honors degree registration will cease to be active
3. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.
4. In addition to fulfilling all the requisites of a Regular B.Tech Programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).
5. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.
6. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.
7. The concerned BOS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.
8. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component.
9. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the Institute/academic council.
10. The concerned BOS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

11. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: The courses which were not done under the dropped Honors will not be shown in the transcript.
12. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.
13. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

7.4 Minor Programme:

In order to obtain Minor degree students shall earn additional 20 credits in addition to the 160 credits for obtaining the UG degree. Students can register for additional courses by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from IV semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

1. A student shall be permitted to register for Minors program at the beginning of 4^{th} semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 7.75 CGPA (Cumulative Grade point average) up to the end of 2^{nd} semester without any history of backlogs. It is expected that the 3^{rd} semester results may be announced after the commencement of the 4^{th} semester. If a student fails to acquire 7.75 CGPA up to 3^{rd} semester or failed in any of the courses, his registration for Minors program shall stand cancelled. A CGPA of 7.75 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.
    - An SGPA or CGPA in excess of 7.75 has to be maintained in the subsequent semesters in major as well as minor without any backlogs in order to keep the minor registration active.
    - Should both the SGPA and CGPA fall below 7.75 at any point after registering for the minor; the minor registration will cease to be active.

2. a) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

   b) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

3. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the

minor tracks can be the fundamental courses in CE, EEE, ME, ECE, CSE, AND IT etc., or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, VLSI etc.

4. The list of disciplines / branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BOS.

5. There shall be no limit on the number of programs offered under Minor. The Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

6. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BOS along with prerequisites. It is the responsibility of the student to acquire / complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he / she has not studied in any form during the Programme.

7. The concerned BOS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

8. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160credits).

9. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4credits.If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the Institute/academic council.

10. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BOS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

11. A committee should be formed at the level of College / Universities / department to evaluate the grades / marks given by external agencies to a student which are approved by concerned BOS. Upon completion of courses the departmental committee should convert the obtained grades / marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

12. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass(P)" grade and also choose to omit the mention of the course as for the following: The courses which were not done under the dropped Minors will not be shown in the transcript.

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

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

7.6 Industrial Collaboration (Case Study)

Institute - Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Institutes in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Institution is permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Institution can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Universities / Institutions shall also explore the possibilities of collaborations with major Industries in the core sectors and professional bodies to create specialized domain skills.

7.7 Mandatory Internships

1. Two summer internships each with a minimum of four to six weeks duration, done at the end of second and third years, respectively are mandatory. The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs.

2. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the Institute.

3. Evaluation of the summer internships shall be through the departmental committee. A student will be required to submit a summer internship report to the concerned department and appear for an oral presentation before the departmental committee consisting of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. The report and the oral presentation shall carry 40% and 60% weightages respectively.

4. It shall be evaluated for 50 external marks at the end of the semester. There shall be no

internal marks for Summer Internship.

5. In the final semester, the student should mandatorily undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

6. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

7.8 Skill Oriented Courses

1. For skill oriented / skill advanced course, one theory and 2 practical hours or two theory hours may be allotted as per the decision of concerned BOS.

2. Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

3. A pool of interdisciplinary skill oriented courses shall be designed by a common Board of studies by the participating departments / disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

4. The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries / Professional bodies / APSSDC, COURSERA or any other accredited bodies as approved by the concerned BOS.

5. The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest courses based on industrial demand.

6. If a student chooses to take a Certificate Course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency / professional bodies as approved by the Board of studies.

7. If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

8. A committee shall be formed at the level of the college to evaluate the grades / marks given for a course by external agencies and convert to the equivalent marks / grades. The recommended conversions and appropriate grades / marks are to be approved by the Institute / Academic Council.

9. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the skill oriented courses.

7.9 Course Numbering Scheme

The Course code consists of Eight / Nine characters. The following is the structure of the course Code (Figure 1).

2	0	C	S	3	2	0	1	A
Regulation		Course Category		Kind of course	Semester	Type	Course Number	[Elective code]
Last two digits of Regulation offered(i.e. 20 for PVP20 regulations)		HS-Humanities and Social Sciences including Management courses BS-Basic Science courses ES-Engineering Science MC- Mandatory Courses		1. Institutional Core(i.e. HS,BS,ES,MC)	1-First 2-Second 3-Third 4-Fourth 5- Fifth 6-Sixth 7-Seventh 8-Eigth	0-Theory 1-Theory studied in MOOCS Mode 4- NCC/NSS 5- Practical 6-Project Work 7-Seminar	i.e. Course sequence Number in that semester	In case if the course is Elective then this field will specify the elective code (i.e A,B,C...)
		Respective Handling department code is placed		2. Open Elective/ Job Oriented Elective				
		In case of Professional Core/ Professional Elective courses department code is placed: CE-Civil Engineering EE- Electrical & Electronics Engineering ME- Mechanical Engineering EC- Electronics and Communication Engineering CS- Computer Science & Engineering IT- Information Technology		3. Professional Core 4. Professional Elective				
		Respective chosen minor department code is placed		5. Minor Course				
		Respective department code is placed		6. Honors Course				
		Respective Handling department code is placed		7. Humanities and Social Science Elective				
		SO- Skill Oriented Course SA- Skill Advanced Course SS- Soft Skill Course		8. Skill Oriented/ Skill Advanced/ Soft Skill Course		8. Summer/ Industrial/ Research Internship		A - Summer B - Industrial C - Research

Figure 1: Course numbering scheme

7.10 Medium of Instruction and Examination

The medium of instruction and examinations shall be English.

7.11 Registration

Every student has to register himself/herself for the courses in each semester individually at the time as specified in academic calendar.

8. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) shall be introduced with effect from 2019-20 academic years, based on guidelines of the statutory bodies in order to promote:

- Activity based learning
- Student centered learning
- Students to choose courses of their choice
- Learning at their own pace

Flexibility is extended to the fast learning students to take the courses of higher semesters in advance as per their convenience to concentrate on their placement activity/ project work, etc., during the VII/VIII semesters.

8.1 CBCS Course Registration Policy

Fast learning students can register for additional courses from higher semesters by satisfying the pre-requisite course(s) to a maximum of 8 credits in each of the semesters from III semester onwards along with the regular semester courses as prescribed. There is no minimum limit to the credits for taking additional courses.

Eligibility for choosing CBCS flexibility:

- **Regular Students (4 Year duration),** entering the n^{th} semester with no backlog courses up to $(n-1)^{th}$ semester, are only eligible to opt for this flexibility.
- **Lateral entry students (3 year duration)** with 70% Marks in their Diploma are eligible to opt for this flexibility during III and IV Semesters. Those students entering into V/ VI /VII semester with no backlog courses up to $(n-1)^{th}$ semester, are only eligible to opt for this flexibility.

  The list of additional courses offered in the even & odd semesters, registration dates will be notified by the respective departments well in advance.

  A student can withdraw from the respective course within 15 days after the commencement of the course.

  The choice of utilizing this flexibility is purely optional to the students.

  A minimum number of students required to register for an additional course shall be twenty (20). In case, the registered strength for the additional course is less than twenty (20), the course may be offered on the recommendation of the Head of the Department and subsequent approval of the Principal.

8.2 Continuous Internal Evaluation (CIE) for CBCS opted Courses

The contact hours, continuous assessment pattern, eligibility criteria to write end semester

examinations and revaluation scheme for these additional courses will be as per the current academic regulations [PVP20].

8.3 Eligibility to appear CBCS registered courses for Semester End Examinations

The registered additional courses will be dealt separately as individual courses for the calculation of attendance and continuous assessment of marks for assessing the eligibility to write the end semester examinations for these courses.

The performance of the student in the registered additional courses will be separately mentioned in the semester end grade card and it will not be taken into account for the calculation of the SGPA for that semester.

The performance of the student in the registered additional courses will be taken into account in the corresponding semesters.

8.4 CBCS Course Detention

8.4.1 In case, the student is detained for want of minimum specified attendance and continuous assessment marks criterion either in the regular semester or in the additional courses, he/she will forfeit the eligibility for registering additional courses from that semester onwards. However, the additional courses completed by the students in the earlier semesters will be valid and taken into consideration.

8.4.2 In case, the student is detained for want of minimum specified attendance and continuous assessment marks criterion in the regular semester but meets minimum specified attendance and continuous assessment marks criterion in the registered additional courses, he/she shall write the end semester examinations for these additional courses along with the regular students in the corresponding semester only.

8.4.3 In case, the student fails / is absent in the end semester examinations of the registered additional courses or in the regular semester courses in a particular semester, he will forfeit the eligibility for registering additional courses from that semester onwards. However, the additional courses completed by the students in the earlier semesters will be valid and taken into consideration. They can write the end semester examinations for additional courses in which they failed/were absent, along with regular students in the corresponding semesters only.

8.4.4 The criterion for the promotion to higher semesters will be as per PVP20 regulations, taking only the regular semester courses into consideration for the fast learners.

8.4.5 Additional courses, in which the fast learning student fails, will not be considered as backlogs for them.

8.4.6 The fast learning students shall register for all the courses of a regular semester excluding the courses completed in the previous semesters.

8.4.7 The credits scored by students through CBCS subjects shall not be considered for credit promotion from II year to III year or from III year to IV year B.Tech.

8.4.8 The student opting for the said flexibility will be considered for the award of the division on par with other regular students.

8.4.9 The students who have earlier history of indulging in malpractices in semester end examinations are

not eligible for opting CBCS.

8.4.10 If the student fails to register for opted CBCS courses for semester end examination, he/she will forfeit the eligibility for registering additional courses from that semester onwards and marks secured through continuous assessment will not be considered.

8.4.11 The choice of utilizing this flexibility is purely optional to the students.

8.4.12 If a student fails/absent in a CBCS course, he/she is bound to appear in the same course when studied in regular semester.

9 EXAMINATIONS & SCHEME OF EVALUATION

9.1 Description of Evaluation

1. **Continuous Internal Evaluation (CIE):** The performance of the student in each course is evaluated by the faculty/course coordinator all through the semester; with mid-term tests (sessional-1and sessional-2), assignments, project reviews, viva-voce, laboratory assessment and other means covering the entire syllabus of the course.

2. **Semester End Examination (SEE):** It shall be conducted by chief controller of examinations at the end of each semester, as per the academic calendar and with a written examination for theory courses and practical/project examination with built-in oral part for laboratory/project.

9.2 Continuous Internal Evaluation (CIE)

9.2.1 Theory Courses

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one objective examination (20 multiple choice questions) for 10 marks for duration of 20 minutes (ii) one descriptive examination (3 full questions for 5 marks each) for 15 marks for duration of 90 minutes and (iii) one assignment for 5 marks. Mid-1 shall be conducted from first 50% of the syllabi.

b) In the similar lines, the second objective, descriptive examinations, assignment shall be conducted on the rest of the 50% syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The first mid marks (Mid-1) consisting of marks of objective examination, descriptive examination and assignment shall be submitted by the concerned teacher to the department examination section within one week after completion of first mid examination.

d) The mid marks submitted to the department examination section shall be displayed in the concerned department notice boards for the benefit of the students.

e) If any discrepancy found in the submitted Mid-1 marks, it shall be brought to the notice of Head of the department within one week from the submission.

f) Second mid marks (Mid-2) consisting of marks of objective examination, descriptive Examination and assignment shall also be submitted by the concerned teacher to the department examination section within one week after completion of second mid examination and it shall be displayed in the notice boards. If any discrepancy found in the submitted mid-2 marks, it shall be brought to the notice of Head of the department within one week from the submission.

g) Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam.

Example:

Mid-1 marks = Marks secured in (Objective-1+Descriptive examination-1 +Assignment-1)

Mid-2 marks = Marks secured in (Objective-2+Descriptive examination-2 +Assignment-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8

+ Least of (Mid-1/Mid-2) marks x 0.2)

h) With the above criteria, concerned departments have to display the consolidated marks obtained by the students in the department notice boards. If any discrepancy found, it shall be brought to the notice of Head of the department through proper channel within one week with all proofs.

9.2.2 Mandatory Learning Courses

Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, Life Sciences for Engineers, etc. non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the college internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

9.2.3 Drawing Based Courses:

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests) and 70 marks for end examination. There shall be two internal tests in a Semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two tests and 20% weightage for other test and these are to be added to the marks obtained in day to day work

9.2.4 Laboratory Courses

For practical subjects there shall be continuous evaluation during the semester for 15 internal marks and 35 end examination marks. The internal 15 marks shall be awarded as follows: day today work - 5 marks, Record-5 marks and the remaining 5 marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner appointed.

Table: Distribution of Marks (CIE)

S. No.	Criterion	Marks
1	Day to Day Evaluation	5
2	Record	5
3	Internal Examination	5

9.2.5 MOOCs Courses

There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall pass.

9.3 Semester End Examination (SEE)

9.3.1 Theory Courses:

a) The semester end examinations will be for 70 marks consisting of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

b) The job oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external and internal examiner (course instructor or mentor). There are no internal marks for the job oriented skill courses.

9.3.2 Laboratory Courses: 35 marks

i. The Semester end examination for laboratory courses shall be conducted with three hour duration at the end of semester for 35 marks as given below:

Table : Distribution of Marks (SEE)

S.No.	Criterion	Marks
1	Procedure	5
2	Experiment / Programme Execution	15
3	Result	10
4	Viva-Voce	5

ii. Each Semester end Laboratory Examination shall be conducted by an External Examiner along with the Internal Examiner.

Internship: 50 Marks (Only external marks)

Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this course during summer vacation just before its offering as per course structure. The minimum duration of this course is at least 6 weeks. The student shall register for the course as per course structure after commencement of academic year. A supervisor / mentor / advisor have to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the Institute. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner; Head of the Department; supervisor of the internship and a senior faculty member of the department. A certificate from industry / skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the Institute.

Major Project

(Project - Project work, seminar and internship in industry):

In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

Evaluation: The total marks for project work for **200 marks** and distribution shall be **60 marks for internal** and **140 marks** for **external** evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner and is evaluated for 140 marks

9.4 Conditions for Pass Marks

I. Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Institution Examination section from time to time.

II. To maintain the quality, external examiners and question paper setters shall be selected from premier institutes and Universities, NITs, Autonomous colleges.

III. For non-credit mandatory courses, like Life sciences for Engineers, Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

IV. A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/practical design/drawing subject/ project etc by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the sum total of the internal marks and end semester examination marks together.

V. **Distribution and Weightage of marks**:
The assessment of the student's performance in each course will be as per the details given

SNo	Component	Internal	External	Total
1	Theory	30	70	100
2	Lab	15	35	50
3	Mandatory	30	70	100
4	Drawing	30	70	100
5	Project	60	140	200
6	Mini Project/Internship/Industrial Training / Skill Development Programs/Research Project	-	50	50

9.5 Revaluation

9.5.1 Continuous Internal Evaluation

The continuous Evaluation scripts shall be shown to the students before finalizing the marks. However, if the student has any concern, not addressed before the finalization of marks, he/she may submit the application for revaluation to the concerned head of the department. The Head of the Department may constitute a two-member committee for re-evaluating the script. The evaluation of the committee is final and binding.

9.5.2 Semester End Examination

1. As per the notification issued by the Controller of Examinations, the students can submit the applications for revaluation, along with the requisite fee receipt for revaluation of his/her answer script(s) of theory course(s), if he/she is not satisfied with the marks obtained.
2. The Controller of Examinations shall arrange for re-evaluation of those answer script(s).
3. A new external examiner, other than the first examiner, shall re-evaluate the answer script(s).
4. Revaluation marks will be taken into consideration only if the difference between the two valuations is more than or equal to 15%. Better marks between the two shall be taken into consideration. However, if the revaluation marks facilitates passing of the

candidate, then the revaluation marks will be considered even if the difference of marks is less than 15%.

5. If the difference of marks between the two valuations is more than 20%, the answer script will be referred to third valuation. The average of nearest two marks will be awarded.

9.6 Withholding of Results

If the student has not paid the dues to the college, or if any case of malpractice or indiscipline is pending against him, the result of the student will be kept as withheld and he/she will not be allowed to enter the next semester. His/her degree shall be considered as withheld in such cases.

10 CRITERIA TO ATTEND SEMESTER END EXAMINATION AND PROMOTION TO HIGHER SEMESTER

10.1 Eligibility for Semester End Examinations

10.1.1 Students shall put in a minimum average attendance of 75% in the courses. computed by totalling the number of periods of lectures, tutorials, drawing, practical and project work as the case may be, held in every course as the denominator and the total number of periods attended by the student in all the courses put together as the numerator, to be eligible to write semester end examinations.

10.1.2 Condonation of shortage in attendance may be recommended by respective Heads of Departments on genuine medical grounds, provided the student puts in at least 65% attendance as calculated above and provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

10.1.3 Students, having more than 65% and less than 75% of attendance, shall have to pay requisite fee towards condonation.

10.2 Promotion Rules

1. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirements.
2. A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.
3. A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

11. SUPPLEMENTARY EXAMINATIONS

1. General

Semester end Supplementary examinations shall be conducted along with regular

semester end examinations.

2 Advanced Supplementary Exams

Candidate(s), who fails in Theory or Laboratory courses of VIII semester, can appear for advanced supplementary examination conducted within one month after declaration of the revaluation results. However, those candidates who fail in the advanced supplementary examinations of VIII semester shall appear for subsequent examinations along with regular candidates conducted at the end of the respective academic year.

12 READMISSION CRITERIA

A candidate, who is detained in a semester due to lack of attendance/credits, has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling all the required norms stipulated by the college in addition to paying an administrative fee of **Rs. 1,000/-**

Rules for calculation of attendance for readmitted students

a) Number of classes conducted shall be counted from the commencement day of the semester concerned, irrespective of the date of payment of tuition fee.

b) They shall submit a written request to the principal of the college, along with a challan paid towards tuition and other fee, for readmission before the commencement of the class work.

c) They can get the information regarding date of commencement of class work for each semester that will be made available in the college notice boards/website from time to time.

13 BREAK IN STUDY

Student, who discontinues the studies for valid reason permitted by the principal, shall get readmission into appropriate semester of B.Tech. programme after break-in study, with the prior permission of the Principal and following the transitory regulations applicable to such batch in which he/she joins. An administrative fee of **Rs**. 1**000/-**per each year of break in study, in addition to the prescribed tuition and special fee has to be paid by the candidate to condone his/her break in study.

14 GAP YEAR

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at Institution level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

15 TRANSITORY REGULATIONS

A candidate, who is detained or discontinued in a semester, on re-admission, the academic regulations under which he/she has originally admitted will continue to be applicable to him/her on re-admission.

16 ELIGIBILITY FOR AWARD OF B.TECH DEGREE

1. The B.Tech. Degree shall be conferred on a candidate who satisfies the following requirements.

   a) A Regular student (four year programme) shall register and secure himself/herself for **160** Credits

   b) A Lateral Entry student (three year programme) shall register and secure himself/herself for**12**1 credits

2. Award of Division

The criteria for award of division, after successful completion of programme are as shown in Table:

Table : Criteria for Award of Division

Class Awarded	CGPA to be secured	Remarks
First class with distinction	≥7.75 (Without any supplementary appearance)	From the CGPA secured from 160 credits
First class	≥6.75	
Second class	≥5.75 to <6.75	
Pass Class	≥5.00 to <5.75	

- Awarded only if all the courses prescribed are cleared in single attempt within four years for regular candidates and three years for lateral entry candidates
- Detained and break-in study candidates are not eligible for the award of First Class with Distinction
- The cases of students who are absent for semester end examination only once in his/her duration of B.Tech. programme on valid medical grounds/humanitarian grounds shall also be considered for the award of First class with Distinction subject to the recommendations of the committee constituted by the Principal.

For the purpose of awarding First, Second and Pass Class CGPA obtained in the examinations appeared within the maximum period allowed for the completion of the programme shall be considered.

Consolidated Grade Card

A consolidated grade card containing credits & grades obtained by the students will be issued after successful completion of the four year B.Tech Programme.

17 CONDUCT AND DISCIPLINE

1. Students shall conduct themselves within and outside the premises of the Institute in a manner befitting the students of our Institution.

2. As per the order of Honorable Supreme Court of India and AICTE guidelines, ragging in any form is considered a criminal offence and is banned. Ragging within or outside any educational institution is prohibited. Ragging means doing an act, that causes or is likely to cause insult or annoyance or fear of apprehension or threat or intimidation or outrage of modesty or injury to a student. Any form of ragging will be severely dealt with as per AP Prohibition of Ragging Act-1997 section-4.

Table : Punishments for Ragging

Nature of ragging	Punishment
Teasing, embarrassing and humiliating	Imprisonment up to 6 months or fine up to Rs.1,000/- or both
Assaulting or using criminal force or criminal intimidation	Imprisonment up to 1 year or fine up to Rs.2,000/- or both
Wrongfully restraining or confining or causing hurt	Imprisonment up to 2 years or fine up to Rs.5,000/- or both
Causing grievous hurt kidnapping or raping or committing unnatural offence	Imprisonment up to 5 years and fine up to Rs.10,000/-
Causing death or abetting suicide	Imprisonment up to 10 years and fine up to Rs.50,000/-

3. A student who is convicted of an offence and punished with imprisonment for a term of more than six months shall not be admitted into the institution.

4. Whenever any student complains of ragging to the head or manager of an educational institution, such head or manager should inquire into the complaint and if the complaint is prima-facie found true, should suspend the student or students complained against.

5. If the head or manager of an educational institution fails or neglects to take action in the manner specified in the Act, the person shall be deemed to have abetted the offence and shall be punished with the punishment provided for the offence.

6. If a student commits suicide due to or in consequence of ragging, the person who commits such ragging shall be deemed to have abetted such suicide.

7. The following acts of omission and/or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures.

i. Lack of courtesy and decorum; indecent behaviour anywhere within or outside the campus

ii. Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

The following activities are not allowed within the campus:

- Mutilation or unauthorized possession of library books.
- Noisy and unseemly behaviour, disturbing studies of fellow students.

- Hacking computer systems (such as entering into other person's areas without prior permission, manipulation and/or damage of computer hardware and software or any other cybercrime etc.)
- Use of mobile phones.
- Plagiarism of any nature.
- Any other act of gross indiscipline as decided by the Institute from time to time.
- Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarment from a examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- For an offence committed in (i) a hostel, (ii) a department or in a class room and (iii) elsewhere, the Chief Warden, the Head of the Department and the Principal, respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/or any malpractice in an examination shall be reported to the Principal for taking appropriate action.
- Unauthorized collection of money in any form is strictly prohibited.
- Detained and break-in-study candidates are allowed into the campus for academic purposes only with the permission from authorities.
- Misconduct committed by a student outside the Institute campus but having the effect of damaging, undermining & tarnishing the image & reputation of the institution will make the student concerned liable for disciplinary action commensurate with the nature and gravity of such misconduct.
- The disciplinary action committee constituted by the Principal, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- Grievance redressal committee, constituted by the Principal, shall deal with all grievances pertaining to the academic/ administrative and disciplinary matters.
- All the students must abide by the code and conduct rules of the Institute.

18 MALPRACTICES

The Principal shall refer the cases of malpractices by students in internal assessment tests and end semester examinations, to a malpractice enquiry committee constituted for the purpose. The committee shall follow the approved scales of punishment.
The committee consists of:

1. Heads of Department (Three)
2. Controller of Examinations
3. Assistant Controller of Examinations

Table – 10: Disciplinary action for malpractices/improper conduct in examinations

	Nature of Malpractices/Improper conduct	Punishment

1 (a)	If the candidate possesses or keeps accessible, any paper, note book, programmable calculators, mobile phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in the examination hall but has not made use of (material shall include any marks on the student's body that can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through mobile phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate 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. He 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.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the 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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4	If the candidate smuggles in an answer book or additional sheet or takes out or arranges to send out the question paper during the examination or	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

	answer book or additional sheet, during or after the examination.	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 other examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	If the candidate refuses to obey the orders of the Chief Superintendent/Assistant - Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which results in damage to or destruction of property in the examination hall or any part of the Institute campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the Institute, 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	If the candidate leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that 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 other examinations. The continuation of

		the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the candidate possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that 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 Institute, who is not a candidate for the particular examination or any person not connected with the Institute indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the Institute: 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. He 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 Institute: Will be handed over to police and a police case will be registered against them.
10	If the candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work. He 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 awarded suitable punishment.	

Note: Special squads may be formed to oversee the proper conduct of examinations.

19 OTHER MATTER

19.1 Scribe facility is extended to B Tech students strictly following the guidelines issued under F. No. 16-110/2003-DD.III Dt. 26-02-2013 by the Ministry of Social Justice and Empowerment, Department of Disability Affairs, Govt. of India.

19.2 Students who are suffering from contagious diseases are not allowed to appear either continuous internal assessment or semester end examinations

19.3 The students who participate in coaching/tournaments held at State/National/International levels through University/Indian Olympic Association during semester end examination

period will be promoted to subsequent semesters till the entire programme is completed as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated18-08-1994.

19.4 Based on the recommendations of HOD & Principal, exemption from attending the class work shall be given to those students who secure placement and intend to join as the employer in VIII semester of B.Tech. Special Continuous Internal Evaluation (Assignment Tests, Sessional, etc.,) will be arranged to such candidates separately if necessary. However, they shall appear for Semester End Examinations as per the Academic Calendar

19.5 The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the Heads of the Departments in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved in the Heads of the Departments Meetings, shall be reported to the academic council for ratification.

20 GENERAL

1 Wherever the words “he”, “him”, “his”, occur in the regulations, they may include “she”, “her”, “hers”.
2 The academic regulations should be read as a whole for the purpose of any interpretation.
3 In case of any doubt or ambiguity in the interpretation of above rules, the decision of the principal is final.

21 INSTITUTE RULES AND REGULATIONS

1 Use of **Mobile phones** is strictly prohibited inside the Institute academic area.

2 Students should come to Institute in **proper dress**.

3 All students should wear **Identity cards** in the Institute premises.

4 Students should be present in their respective classrooms **before the commencement of class sharply**.

5 Students should not leave the Institute premises without prior permission of their respective Heads of the departments during Institute working hours.

6 Students should maintain silence in the class rooms during working periods.

7 Sitting / wandering of the students at the stair cases, corridors, cycle stands or the areas within the Institute premises is strictly prohibited.

8 Usage of Vehicle horn inside the Institute premises is prohibited.

22 AMENDMENTS TO REGULATIONS

The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and/or syllabi.

Oratory

PRINCIPAL

B.Tech.
COURSE STRUCTURE

Prasad V. Potluri Siddhartha Institute of Technology
(Autonomous)
Approved by AICTE and Affiliated to JNTUK
Accredited by NAAC : A+
All UG programs accredited by NBA, ISO 9001-2015 Certified Institute
Vijayawada, Andhra Pradesh, India.

PVP20 COURSE STRUCTURE

I - SEMESTER

S.No.	Course Code	Course Title	L	T	P	C	Internals	Externals	Total
1	20HS1101	Communicative English I	3	0	0	3	30	70	100
2	20BS1101	Calculus and Linear Algebra	3	0	0	3	30	70	100
3	20BS1104	Applied Physics	3	0	0	3	30	70	100
4	20ES1101	Basic Electrical & Electronics Engineering	3	0	0	3	30	70	100
5	20HS1151	Communicative English I Lab	0	0	3	1.5	15	35	50
6	20BS1153	Applied Physics Lab	0	0	3	1.5	15	35	50
7	20ES1151	Basic Electrical & Electronics Engineering Lab	0	0	3	1.5	15	35	50
8	20ES1153	Basic Workshop	1	0	4	3	15	35	50
TOTAL			13	0	13	**19.5**	**180**	**420**	**600**

II- SEMESTER

S.No.	Course Code	Course Title	L	T	P	C	Internals	Externals	Total
1	20HS1201	Communicative English II	3	0	0	3	30	70	100
2	20BS1201	Differential Equations and Vector Calculus	3	0	0	3	30	70	100
3	20BS1206	Chemistry of Materials	3	0	0	3	30	70	100
4	20ES1203	Problem Solving & Programming with Python	3	0	0	3	30	70	100
5	20ES1204	Engineering Graphics	1	0	4	3	30	70	100
6	20HS1251	Communicative English II Lab	0	0	3	1.5	15	35	50
7	20BS1254	Chemistry of Materials Lab	0	0	3	1.5	15	35	50
8	20ES1254	Problem Solving & Programming with Python Lab	0	0	3	1.5	15	35	50
9	20MC1201	Life Sciences for Engineers	2	0	2	0	30	70	100
10	20MC1241A/20MC1241B	NSS/NCC	0	0	2	0	COMPLETED/NOT COMPLETED		
TOTAL			15	0	15	**19.5**	**225**	**525**	**750**

III - SEMESTER									
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**Internals**	**Externals**	**Total**
1	20BS1301	Numerical and Statistical Methods	3	0	0	3	30	70	100
2	20BS1304	Applied Mechanics	3	0	0	3	30	70	100
3	20ES1301	Construction Materials & Concrete Technology	3	0	0	3	30	70	100
4	20CE3301	Mechanics of Fluids	3	0	0	3	30	70	100
5	20CE3302	Surveying	3	0	0	3	30	70	100
6	20ES1351	Construction Materials & Concrete Technology Lab	0	0	3	1.5	15	35	50
7	20CE3351	Computer aided drawing	0	0	3	1.5	15	35	50
8	20CE3352	Surveying Lab	0	0	3	1.5	15	35	50
9	20SO8351	C Programming Lab	1	0	2	2	0	50	50
10	20MC1301	Environmental Science	2	0	0	0	30	70	100
11	20MC1341A/20MC1341B	NSS/NCC	0	0	2	0	COMPLETED/NOT COMPLETED		
TOTAL			**18**	**0**	**11**	**21.5**	**225**	**575**	**800**
IV - SEMESTER									
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**Internals**	**Externals**	**Total**
1	20CE3401	Environmental Engineering	3	0	0	3	30	70	100
2	20CE3402	Geotechnical Engineering	3	0	0	3	30	70	100
3	20CE3403	Hydraulics and Hydraulic machines	3	0	0	3	30	70	100
4	20CE3404	Mechanics of Solids	3	0	0	3	30	70	100
5	20CE3405	Water Resources Engineering	3	0	0	3	30	70	100
6	20CE3451	Geotechnical Engineering Lab	0	0	3	1.5	15	35	50
7	20CE3452	Mechanics of Fluids Lab	0	0	3	1.5	15	35	50
8	20CE3453	Mechanics of Solids Lab	0	0	3	1.5	15	35	50
9	20SO8451	Advanced Surveying using Total Station Lab	1	0	2	2	0	50	50
10	20MC1401	Universal Human values	2	0	0	0	30	70	100
TOTAL			**18**	**0**	**11**	**21.5**	**225**	**575**	**800**
Internship (6 Weeks duration) During Summer Vacation									
HONORS COURSE									
11	20CE6401A	Advanced Concrete Technology	3	1	0	4	30	70	100
	20CE6401B	Green and Smart Buildings	3	1	0	4	30	70	100
	20CE6401C	Industrial Waste management	3	1	0	4	30	70	100
	20CE6401D	Safety management in Construction	3	1	0	4	30	70	100
MINOR COURSE									
12	20CE5401A	Solid Mechanics	3	1	0	4	30	70	100
	20CE5401B	Soil Mechanics	3	1	0	4	30	70	100

V – SEMESTER									
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**Internals**	**Externals**	**Total**
1	20CE3501	Design of Reinforced Concrete Structures	3	0	0	3	30	70	100
PROFESSIONAL ELECTIVE – I									
2	20CE4501A	Repair and Rehabilitation of Structures	3	0	0	3	30	70	100
	20CE4501B	Foundation Engineering	3	0	0	3	30	70	100
	20CE4501C	Traffic Engineering	3	0	0	3	30	70	100
	20CE4501D	Pollution Prevention and Management	3	0	0	3	30	70	100
3	20CE3502	Highway Engineering	3	0	0	3	30	70	100
4	20CE3503	Structural Analysis	3	0	0	3	30	70	100
5	20MC1501	Constitution of India	3	0	0	0	30	70	100
OPEN ELECTIVE – I									
6	20CE2501A	Air Pollution and Control	3	0	0	3	30	70	100
	20CS2501A	Programming With C	3	0	0	3	30	70	100
	20EC2501A	Sensor Technology	3	0	0	3	30	70	100
	20EC2501B	Electronic Instrumentation	3	0	0	3	30	70	100
	20EE2501A	Electrical Safety	3	0	0	3	30	70	100
	20IT2501A	Cyber Laws	3	0	0	3	30	70	100
	20ME2501A	Design Thinking	3	0	0	3	30	70	100
	20ME2501B	Logistics and Supply chain Management	3	0	0	3	30	70	100
7	20CE3551	Environmental Engineering Lab	0	0	3	1.5	15	35	50
8	20CE3552	Highway Engineering Lab	0	0	3	1.5	15	35	50
9	20SA8551	Computer aided Building Drawing Using AUTO CAD	1	0	2	2	0	50	50
10	20CE3581A	Summer Internship	0	0	0	1.5	0	50	50
11	20CE3591	Community service Project which is to be carried out during 2 year(both the semesters for a minimum duration of 180 hours	0	0	0	4	0	50	50
TOTAL			**19**	**0**	**8**	**25.5**	**225**	**590**	**850**
HONORS COURSE									
11	20CE6501A	Environmental Geotechniques	3	1	0	4	30	70	100
	20CE6501B	Geosynthetics and Reinforced Soil Structure	3	1	0	4	30	70	100
	20CE6501C	Rock Mechanics	3	1	0	4	30	70	100
	20CE6501D	Soil Dynamics and Machine Foundations	3	1	0	4	30	70	100
MINOR COURSE									
12	20CE5501A	Analysis of Structures	3	1	0	4	30	70	100
	20CE5501B	Transportation Engineering	3	1	0	4	30	70	100

VI - SEMESTER

S.No.	Course Code	Course Title	L	T	P	C	Internals	Externals	Total
1	20ES1601	AI Tools	3	0	0	3	30	70	100
2	20CE3601	Design of Steel Structures	3	0	0	3	30	70	100
PROFESSIONAL ELECTIVE – II									
3	20CE4601A	Advanced Structural Analysis	3	0	0	3	30	70	100
	20CE4601B	Pavement Analysis and Design	3	0	0	3	30	70	100
	20CE4601C	Hydro power Engineering	3	0	0	3	30	70	100
	20CE4601D	Sanitary Engineering	3	0	0	3	30	70	100
4	20CE3602	Estimation and Costing	3	0	0	3	30	70	100
OPEN ELECTIVE – II									
5	20CE2601A	Ecology and Environment	3	0	0	3	30	70	100
	20CS2601A	Introduction to data structures	3	0	0	3	30	70	100
	20EC2601A	MAT LAB Programming	3	0	0	3	30	70	100
	20EC2601B	TV Engineering	3	0	0	3	30	70	100
	20EE2601A	Energy Management	3	0	0	3	30	70	100
	20IT2601A	Introduction to Data mining	3	0	0	3	30	70	100
	20ME2601A	Value Engineering	3	0	0	3	30	70	100
	20ME2601B	Human factors in Engineering	3	0	0	3	30	70	100
6	20ES1651	AI Tools Lab	0	0	3	1.5	15	35	50
7	20CE3651	Computer applications in Civil Engineering Lab	0	0	3	1.5	15	35	50
8	20SS8651	Soft Skills	1	0	2	2	25	50	75
9	20CE3662	Minor Project	0	0	3	1.5	15	35	50
TOTAL			16	0	11	21.5	220	505	725
Internship (6 Weeks duration) During Summer Vacation									
HONORS COURSE									
10	20CE6601A	Advanced Pavement Materials	3	1	0	4	30	70	100
	20CE6601B	Intelligent Transportation System	3	1	0	4	30	70	100
	20CE6601C	Sustainable transportation	3	1	0	4	30	70	100
	20CE6601D	Transport Economics and Project Appraisal	3	1	0	4	30	70	100
MINOR COURSE									
11	20CE5601A	Basic Mechanics of Fluids	3	1	0	4	30	70	100

VII - SEMESTER									
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**Internals**	**Externals**	**Total**
PROFESSIONAL ELECTIVE – III									
1	20CE4701A	Advanced Design of Reinforced Concrete Structures	3	0	0	3	30	70	100
	20CE4701B	Advanced Foundation Engineering	3	0	0	3	30	70	100
	20CE4701C	Remote Sensing and Geographic Information Systems	3	0	0	3	30	70	100
	20CE4701D	Open Channel Hydraulics	3	0	0	3	30	70	100
PROFESSIONAL ELECTIVE – IV									
2	20CE4702A	Advanced Design of Steel Structures	3	0	0	3	30	70	100
	20CE4702B	Railway and Harbor Engineering	3	0	0	3	30	70	100
	20CE4702C	Irrigation Management	3	0	0	3	30	70	100
	20CE4702D	Solid Waste Management	3	0	0	3	30	70	100
PROFESSIONAL ELECTIVE – V									
3	20CE4703A	Prestressed Concrete Structures	3	0	0	3	30	70	100
	20CE4703B	Ground Improvement Techniques	3	0	0	3	30	70	100
	20CE4703C	Urban Transportation Planning	3	0	0	3	30	70	100
	20CE4703D	Watershed Management	3	0	0	3	30	70	100
HUMANITIES AND SOCIAL SCIENCES ELECTIVE									
4	20HS7701A	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
	20HS7701B	Human Resources management	3	0	0	3	30	70	100
	20HS7701C	Entrepreneurship Management	3	0	0	3	30	70	100
	20HS7701D	Organizational Behaviour	3	0	0	3	30	70	100
	20HS7701E	Construction Management	3	0	0	3	30	70	100
	20HS7701F	Industrial Engineering Management	3	0	0	3	30	70	100
	20HS7701G	Project Management	3	0	0	3	30	70	100
OPEN ELECTIVE – III									
5	20CE2701A	Disaster Management and Preparedness	3	0	0	3	30	70	100
	20CS2701A	Java Programming	3	0	0	3	30	70	100
	20EC2701A	Embedded and Real time systems	3	0	0	3	30	70	100
	20EC2701B	E-Waste Management	3	0	0	3	30	70	100
	20EE2701A	Non-Conventional Energy Resources	3	0	0	3	30	70	100

	20IT2701A	Fundamentals of Data Science	3	0	0	3	30	70	100
	20ME2701A	Operations Research	3	0	0	3	30	70	100
	20ME2701B	Management Information Systems	3	0	0	3	30	70	100
OPEN ELECTIVE – IV									
6	20CE2702A	Environmental management and Audit	3	0	0	3	30	70	100
	20CS2702A	Data base Management Systems	3	0	0	3	30	70	100
	20EC2702A	Telecommunications	3	0	0	3	30	70	100
	20EC2702B	Sattelite Communications	3	0	0	3	30	70	100
	20EE2702A	Utilization of Electrical Power	3	0	0	3	30	70	100
	20IT2702A	Fundamentals of Artificial Intelligence	3	0	0	3	30	70	100
	20ME2702A	Mechatronics	3	0	0	3	30	70	100
	20ME2702B	Robotics	3	0	0	3	30	70	100
7	20SA8751	Computer aided Project Management Lab	1	0	2	2	25	50	75
8	20CE3781B/C	Industrial/Research Internship	0	0	0	3	0	50	50
TOTAL			**19**	**0**	**2**	**23**	**205**	**520**	**725**
HONORS COURSE									
9	20CE6701A	Bridge Engineering	3	1	0	4	30	70	100
	20CE6701B	Computational Structural Mechanics	3	1	0	4	30	70	100
	20CE6701C	Earthquake Engineering	3	1	0	4	30	70	100
	20CE6701D	Storage Structures	3	1	0	4	30	70	100
MINOR COURSE									
10	20CE5701A	Basic Surveying	3	1	0	4	30	70	100
IV B.TECH - II - SEMESTER									
S.No.	**Course Code**	**Course Title**	**L**	**T**	**P**	**C**	**Internals**	**Externals**	**Total**
1	20CE3861	Project Work	0	0	0	8	60	140	200
Total Credits for all semesters for Regular B.Tech = 160 Total Credits for all semesters for B.Tech(Honors) = 180 Total Credits for all semesters for B.Tech(Minor) = 180									

I – SEMESTER SYLLABUS

20HS1101- COMMUNICATIVE ENGLISH I

Offering Branches	CE	**Year : I**	**Sem: I**
Course Category:	Humanities and Social Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the concept of LSRW and basic grammar	K2
CO2	**Apply** grammar to various situations	K3
CO3	**Practice** different styles of Reading and Comprehending	K3
CO4	**Illustrate** the text to process the information for various purposes.	K4
CO5	**Reframe** the text for effective communication.	K4
CO6	**Understand** the concept of LSRW and basic grammar	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													2	
CO2										3		3	2	
CO3									3	3		3	2	
CO4										3		3	2	
CO5									3	3		3	2	
CO6													2	
Avg.									**3**	**3**		**3**	**2**	

Course Content

UNIT-1	**Reading:** Skimming to get the main idea of a text; Scanning to look for specific pieces of information. **Reading for Writing:** Beginnings and endings of paragraphs - Introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph. **Grammar and Vocabulary:** Content words and function words; Word forms: Verbs, Nouns, Adjectives and Adverbs; Nouns: countable and uncountable; singular and plural; Basic sentence structures; Simple Question form - wh-questions; Word order in sentences.	CO1, CO3, CO5
UNIT-2	**Reading:** Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. **Writing:** Paragraph writing (specific topics) using suitable cohesive devices; Mechanics of writing - punctuation, capital letters. **Grammar and Vocabulary:** Cohesive devices - linkers, sign posts and transition signals; Use of articles and zero article; prepositions **One word substitutes**	CO1, C02, CO5
UNIT-3	**Reading:** Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. **Writing:** Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. **Grammar and Vocabulary:** Verbs - Tenses; Subject-verb agreement; Direct And Indirect speech, Reporting verbs for academic purposes. **Idiomatic expressions**	CO1, CO3, CO4, CO5
UNIT-4	**Reading:** Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data. **Writing:** Information transfer; describe, compare, contrast,	CO1, CO2,

	identify significance/trends based on information provided in figures/charts/graphs/tables. **Grammar and Vocabulary:** Quantifying expressions - adjectives and adverbs; comparing and contrasting; Degrees of comparison; Use of antonyms **Correction of sentences**	CO4, CO5
UNIT-5	**Reading:** Reading for comprehension. **Writing:** Writing structured essays on specific topics using suitable claims and evidences **Grammar and Vocabulary:** Editing short texts – Identifying and correcting common errors in grammar and usage (Articles, Prepositions, Tenses, Subject-verb agreement) **Prefixes/suffixes**	CO1, CO3, CO5

Learning Resources

Text Books	1. Prabhavathy Y, M.Lalitha Sridevi, Ruth Z. Hauzel, "English all Round 1: Communication skills for Undergraduate students", Orient Black Swan, 2019
Reference Books	1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014. 2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
e-Resources& other digital material	**Grammar/Listening/Writing:** 1-language.com; http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Grammar/Vocabulary:** English Language Learning Online; http://www.bbc.co.uk/learningenglish/ http://www.better-english.com/; http://www.nonstopenglish.com/ https://www.vocabulary.com/; BBC Vocabulary Games Free Rice Vocabulary Game **Reading:** https://www.usingenglish.com/comprehension/; https://www.englishclub.com/reading/short-stories.htm; https://www.english-online.at/ **All Skills:** https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

20BS1101- CALCULUS AND LINEAR ALGEBRA

Offering Branches	CE	**Year : I**	**Sem : I**
Course Category:	Basic Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts of calculus and linear algebra.	K2
CO2	**Apply** the echelon form to obtain the solution of system of linear equations and eigen vectors of a matrix.	K3
CO3	**Apply** the concepts of calculus to find the series expansion and extremum of a given function ,area enclosed by plane curves and volume of the solids.	K3
CO4	**Analyse** the solution set of linear system of equations and nature of the quadratic forms.	K4
CO5	**Analyse** the behaviour of functions using mean value theorems, extremum of the given function and limits of integration.	K4
CO6	**Apply** the concepts of calculus and linear algebra to the given problem and **submit a report**	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													2	
CO2	3								2	2			2	
CO3	3								2	2			2	
CO4		3											2	
CO5		3											2	
CO6	3								2	2			2	
Avg.	**3**	**3**							**2**	**2**			**2**	

Course Content

UNIT-1	**Matrices-Linear System of Equations:** Rank of a matrix by Echelon form, Normal form, PAQ form, solving system of homogeneous and non-homogeneous linear equations.	CO1, CO2, CO4, CO6
UNIT-2	**Eigen values and Eigen Vectors:** Eigen values, Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalization of a matrix, quadratic forms and nature of the quadratic forms.	CO1, CO2, CO4, CO6
UNIT-3	**Mean Value Theorems:** Rolle‘s Theorem, Lagrange‘s mean value theorem, Cauchy‘s mean value theorem, Taylor‘s and Maclaurin‘s theorems with remainders (without proofs).	CO1, CO3, CO5, CO6
UNIT-4	**Multivariable Calculus:** Functions of several variables, Jacobian, Functional dependence, maxima and minima of functions of two variables, method of Lagrange’s multipliers.	CO1, CO3, CO5, CO6
UNIT-5	**Multiple Integrals:** Double integrals, change of order of integration, double integration in polar coordinates,	CO1,

	Triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, volume as triple integral. **Application-** Areas enclosed by plane curves.	CO3, CO5, CO6

Learning Resources

Text Books	1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2019. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006
Reference Books	1. N.P. Bali and Manish Goyal, A Text book of Engineering Mathematics, Laxmi Publications, 2008.
e-Resources& other digital material	1. https://nptel.ac.in/courses/111/108/111108157/ 2. https://www.nptel.ac.in/courses/111/104/111104125/ 3. https://youtu.be/xDSejIvZmg4 4. http://202.53.81.118/ -> PVPSIT FED-Moodle

20BS1104- APPLIED PHYSICS

Offering Branches	CE	Year : I	Sem : I
Course Category:	Basic Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the principles of Mechanics, Thermal, Optical and Acoustics in technical aspects.	K2
CO2	**Apply** the basic laws of Heat, Sound and mechanics for engineering applications**.**	K3
CO3	**Identify** the principles of forces and energy in mechanical system	K1
CO4	**Analyze** the mechanism of waves, thermal, acoustics and deduce different analytical parameters	K4
CO5	**Examine** the different mechanical properties and their applications	K4
CO6	**Study** the principles of Mechanics, Thermal energy, Acoustics, sensors and make a report	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3												3	2
CO3	3												3	2
CO4		3											3	2
CO5		3											3	2
CO6									2	2		2	3	2
Avg.	**3**	**3**							**2**	**2**		**2**	**3**	**2**

Course Content

UNIT-1	**Mechanics** :Basic laws of vectors and scalars, Resolution of vectors, parallelogram law of vectors; Conservative and non-conservative forces; F = - grad V; Inertial & Non-inertial frames of reference **Wave mechanics:** wave, Characteristics of waves, Simple harmonic oscillator; Damped harmonic motion; Forced oscillations and resonance. Degrees of freedom.	CO1, CO2, CO4
UNIT-2	**Elasticity:** Concepts of elasticity and plasticity, stress and strain, Hooke's law, different moduli of elasticity, Poisson's ratio, strain energy, stress-strain diagram, elastic behavior of a material, factors affecting elasticity.	CO1, CO3, CO5
UNIT-3	**Thermal Properties**: Thermal expansion of solids and liquids; Thermal conduction, convection and radiation and their fundamental laws; Heat conductions in solids; Thermal conductivity - Forbe's and Lee's disc method: theory and experiment; Applications (qualitative only): heat exchangers, ovens and solar water heaters.	CO1, CO2, CO4
UNIT-4	**Acoustics:** Characteristics of sound waves; Weber-Fechner Law; Absorption coefficient, determination of absorption coefficient; Reverberation time; Sabine's formula, Intensity of sound; Acoustics of Buildings, Acoustic requirements of a good auditorium.	CO1 CO2 CO4
UNIT-5	**Sensors:** Sensors (qualitative description only); Different types of sensors and applications; working and applications of Strain and pressure sensors magnetostrictive sensors, Fibre optic methods of pressure sensing; Temperature sensor - bimetallic strip, Hall-effect sensor	CO1, CO3, CO5

Learning Resources	
Text Books	1. D. Kleppner and Robert Kolenkow "An Introduction to Mechanics– II" Cambridge University Press, 2015 2. M.N.Avadhanulu & P.G.Kshirsagar" A Text book of Engineering Physics"-S.Chand Publications,2017 3. Ian R Sinclair, Sensor and Transducers 3rd edition, 2001, Elsevier (Newnes)
Reference Books	1. M K Varma "Introduction to Mechanics" Universities Press,2015 2. Prithwiraj Purkait, Budhaditya Biswas and Chiranjib Koley, Chapter 11, Sensors and Transducers, Electrical and Electronics Measurements and Instrumentation, First edition., Mc- Graw Hill Education (India) Private Limited, 2013
e-Resources& other digital material	1. http://physicsforidiots.com/physics/electromagnetism/ 2. https://www.arcelect.com/fibercable.htm 3. http://freevideolectures.com/Course/3048/Physics-of-Materials/36 4. https://www.iitk.ac.in/mse/electronic-materials-and-devices 5. https://link.springer.com/chapter/10.1007/978-3-319-48933-9_35

20ES1101- BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Offering Branches	CE	**Year : I**	**Sem: I**
Course Category:	Engineering Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts of DC circuits, Electrical Machines, Concepts of Electronic Devices and Circuits and realize the Applications of Electrical & Electronics in Interdisciplinary Engineering Domains	K2
CO2	**Apply** the basic knowledge of mathematics, science and electrical engineering to obtain the desired parameters of Electric circuits and Machines.	K3
CO3	**Analyse** the behaviour of Electric circuits, transformers and Electrical machines.	K4
CO4	**Apply** the basic principles of Electronics to solve Analog Circuits. (L3)	K3
CO5	**Analyse** the characteristics/ performance parameters of Electronic Circuits. (L4)	K4
CO6	Ability to **investigate** various problems in DC circuits, Electrical Machines and Electronic Devices and Circuits and **submit a report.**	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													1	1
CO2	3												1	1
CO3		3											1	1
CO4	3												1	1
CO5		3											1	1
CO6				3					2	2			1	1
Avg.	**3**	**3**		**3**					**2**	**2**			**1**	**1**

Course Content

UNIT-1	**Basic laws and Theorems-DC Circuits**: Ohms law, Kirchhoff's Laws, series and parallel resistive circuits, source transformations, delta-wye conversion. Mesh analysis, nodal analysis. Superposition theorem, Thevenin's theorem, Norton's theorem and maximum power transfer theoremwith simple examples (**independent sources only**).	CO1, CO2, CO3, CO6
UNIT-2	**DC Machines**: Construction, working principle, Voltage Build up, EMF equation, Torque expression, types of excitation, types of dc machines, necessity of Starter, losses and efficiency.	CO1, CO2, CO3, CO6
UNIT-3	**Transformers**: Construction, working principle, EMF equation, open and short-circuit tests, voltage regulation definition, losses and efficiency. **Three Phase Induction Motors:** Construction, working principle of three phase induction motor.	CO1, CO2, CO3, CO6
UNIT-4	**Semiconductor Devices**: P-N Junction diode - Basic operating principle, current-voltage characteristics, half-waverectifier, full-waverectifier,rectifiers with filter	CO1 CO4 CO5

	capacitor, Zener diode as Voltage Regulator.	CO6
UNIT-5	**Operational Amplifiers**: The Ideal Op Amp, The Inverting Configuration-The closed loop gain, Effect of Finite open-loop gain, The Non-inverting Configuration - The closed loop gain, Characteristics of Non Inverting Configuration, Effect of finite open loop gain, The voltage follower.	CO1 CO4 CO5 CO6

Learning Resources

Text Books	1. D.P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st Edition, McGraw Hill Education (India) Private Limited, 2017. 2. B.L.Theraja, Fundamentals of Electrical Engineering and Electronics, 1st Edition, S.Chand Publishing, New Delhi, 2006. 3. Millman Jacob, Halkias C Christos, Electronic Devices and Circuits, 2nd Edition, Tata Mcgrawhill Publications, 2007.
Reference Books	1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011. 2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2nd Edition, Pearson Education, 2008. 3. R.K.Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi, 2012.
e-Resources& other digital material	1. http://202.53.81.118/course/view.php?id=122 2. https://nptel.ac.in/courses/108105112/

20HS1151- COMMUNICATIVE ENGLISH I LAB

Offering Branches	CE	Year : I	Sem: I
Course Category:	Humanities and Social Sciences	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Acquire** communication skills through various language learning activities	K3
CO2	**Construct** meaningful sentences and Paragraphs	K3
CO3	**Analyze** the text to develop comprehensive ability	K4
CO4	**Preparation** of report based on the activity	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.	CO1, CO4
Experiment No.2	Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.	
Experiment No.3	Answering a series of questions about main idea and supporting ideas after listening to audio texts.	CO1, CO2, CO4
Experiment No.4	Discussion in pairs/ small groups on specific topics followed by short structured talks.	
Experiment No.5	Listening for global comprehension and summarizing what is listened to.	CO1, CO3, C04
Experiment No.6	Discussing specific topics in pairs or small groups and reporting what is discussed	
Experiment No.7	Making predictions while listening to conversations/transactional dialogues without video; listening with video	CO1, CO4
Experiment No.8	Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.	
Experiment No.9	Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.	CO1, CO4
Experiment No.10	Formal oral presentations on topics from academic contexts -without the use of PPT slides.	

Learning Resources	
Text Books	1. Prabhavathy Y, M.Lalitha Sridevi, Ruth Z. Hauzel, "English all Round 1: Communication skills for Undergraduate students", Orient Black Swan, 2019
Reference Books	1. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018. 2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012
e-Resources& other digital material	**Grammar/Listening/Writing**: 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Listening:** https://learningenglish.voanews.com/z/3613; http://www.englishmedialab.com/listening.html **Speaking:** https://www.talkenglish.com/BBC; Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises All Skills: https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

20BS1153- APPLIED PHYSICS LAB

Offering Branches	CE	Year : I	Sem: I
Course Category:	Basic Social Sciences	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Demonstrate** elastic limit and stress-strain relationship using Hooke's law	K3
CO2	**Apply** resonance to estimate the frequency of a tuning fork and examine the relation between frequency and volume of a cavity.	K3
CO3	**Determine** the rigidity modulus, and Poisson's ratio of a material.	K3
CO4	**Examine** the type of semiconductor and evaluate the acceptance angle, numerical Aperture an optical fiber.	K4
CO5	**Estimate** thermal conductivity of bad and good conductors. [L4]	K4
CO6	**Summarize** and tabulate the experimental observations and output.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2			2					2	3	2
CO2	3			2			2					2	3	2
CO3	3			2			2					2	3	2
CO4	3			2			2					2	3	2
CO5	3			2			2					2	3	2
CO6	3			2			2					2	3	2
Avg.	**3**			**2**			**2**					**3**	**3**	**2**

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	To Verify Hooke's Law.	CO1, CO6
Experiment No.2	To Verify the relation between Volume of the Air in the Resonator and Frequency of note.	CO2, CO6
Experiment No.3	To Study Resonance in an LCR Series & parallel Circuit.	
Experiment No.4	To verify the laws of transverse vibrations of a string using Sonometer.	
Experiment No.5	To Determine the Frequency of Electrically maintained Tuning Fork by Melde's method.	
Experiment No.6	To Determine The Rigidity Modulus of Material (Wire) -Dynamic Method (Torsional Pendulum)	CO3, CO6
Experiment No.7	To Determine The Poisson's Ratio of Rubber tube.	
Experiment No.8	To Determine the Hall Coefficient using Hall Effect Experiment..	CO4, CO6
Experiment No.9	To Determine the Numerical Aperture of a given Optical Fibre and hence to find its Acceptance Angle.	
Experiment No.10	To Determine The Thermal Conductivity of A Bad Conductor By Lee's Disc Method.	CO5, CO6

Learning Resources	
Text Books	1. RamaraoSri, Choudary Nityanand and Prasad Daruka, "Lab
Reference Books	1. Prithwiraj Purkait, Budhaditya Biswas and Chiranjib Koley, Chapter 11 Sensors and Transducers, Electrical and Electronics Measurements and Instrumentation, 1/e., 2013 McGraw Hill Education 2. (India) Private Limited, 2013
e-Resources& other digital material	1. https://nptel.ac.in/courses/115/105/115105120/ 2. https://nptel.ac.in/courses/115/107/115107095/ 3. https://nptel.ac.in/courses/115/104/115104109/ 4. http://www.physicsclassroom.com/The-Laboratory 5. https://www.vlab.co.in/broad-area-physical-sciences

20ES1151- BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

Offering Branches	CE	Year : I	Sem: I
Course Category:	Engineering Sciences	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Apply** techniques/procedures of Electrical & Electronics Engineering to solve problems	K3
CO2	**Conduct** experiments as a team / individual by using equipment available in the laboratory.	K3
CO3	**Examine** the network theorems and Kirchhoff's laws for DC electrical circuits	K4
CO4	**Analyse** the open circuit characteristic of DC shunt generator and efficiency of single phase transformer	K4
CO5	**Analyse** the characteristics/ performance parameters of Electronic and Analog Circuits.	K4
CO6	**Make** an effective report based on experiments	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			3										
CO2				3	3				3				1	1
CO3		3		3									1	
CO4		3		3									1	
CO5		3		3									1	
CO6				3						3			1	1
Avg.	**3**	**3**		**3**	**3**				**3**	**3**			**1**	**1**

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Verification of Kirchhoff's Laws KVL and KCL.	CO1,CO2,CO3,CO6
Experiment No.2	Verification of DC Superposition Theorem.	CO1,CO2,CO3,CO6
Experiment No.3	Verification of Thevenin's Theorem and Norton's Theorem.	CO1,CO2,CO3,CO6
Experiment No.4	Open circuit characteristics/magnetization characteristics of DC shunt generator.	CO1,CO2,CO4,CO6
Experiment No.5	OC and SC Tests on single phase transformer.	CO1,CO2,CO4,CO6
Experiment No.6	Voltage Current Characteristics of a p-n Junction Diode.	CO1,CO2,CO5,CO6
Experiment No.7	Half wave rectifier with and without filter.	CO1,CO2,CO5,CO6
Experiment No.8	Full wave rectifier with and without filter.	CO1,CO2,CO5,CO6
Experiment No.9	Voltage Regulation with Zener Diode.	CO1,CO2 CO5,CO6,
Experiment No.10	Inverting and Non-inverting Amplifier Design with Op-amp.	CO1,CO2,CO5,CO6
Experiment No.11	Verification of KCL and KVL using PSPICE.	CO1,CO2,CO3,CO6
Experiment No.12	Verification of Network Theorems using PSPICE.	CO1,CO2,CO3,CO6
Experiment No.13	Diode and Transistor Circuit Analysis using PSPICE.	CO1,CO2,CO5,CO6
Experiment No.14	Inverting and Non-inverting Amplifier Design with Op-ampusing PSPICE.	CO1,CO2,CO5,CO6

Learning Resources	
Text Books	1. .P.Kothari, I.J.Nagrath, Basic Electrical and Electronics Engineering, 1st Edition, McGraw Hill Education (India) Private Limited, 2017. 2. .L.Theraja, Fundamentals of Electrical Engineering and Electronics, 1st Edition, S.Chand Publishing, New Delhi, 2006. 3. illman Jacob, Halkias C Christos, Electronic Devices and Circuits, 2nd Edition,Tata Mcgrawhill Publications, 2007.
Reference Books	1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011. 2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2nd Edition, Pearson Education, 2008. 3. R.K.Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi, 2012.
e-Resources& other digital material	1. http://202.53.81.118/course/view.php?id=122 2. https://nptel.ac.in/courses/108105112/

20ES1153- BASIC WORKSHOP

Offering Branches	CE	Year : I	Sem: I
Course Category:	Engineering Sciences	Credits:	3
Course Type:	Laboratory	Lecture-Tutorial-Practical:	1-0-4
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Study** and practice on basic hand tools and their operations.	K3
CO2	**Practice** on manufacturing of components using workshop trades including Tin smithy, fitting and carpentry.	K3
CO3	**Apply** basic electrical engineering knowledge for house wiring and soldering practice.	K3
CO4	**Demonstrate** basic concepts of software installations, operating systems and networking.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	**Familiarity with different types of woods and tools used in wood working and make following joints** 1. Half – Lap joint. 2. Mortise and Tenon joint. Corner Dovetail joint or Bridle joint.	CO1, CO2
Experiment No.2	**Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets** 1. Tapered tray 2. Conical funnel Elbow pipe	CO1, CO2
Experiment No.3	**Familiarity with different types of tools used in fitting and do the following fitting exercises** 1. V-fit 2. Dovetail fit 3. Semi-circular fit Bicycle tire puncture and change of two wheeler tire	CO1, CO2
Experiment No.4	**Familiarities with different types of basic electrical circuits and make the following connections** 1. Preparation of a circuit for Parallel and series connection. 2. Preparation of a circuit for Go down lighting using Two-way switch to connect tube light. Soldering of wires	CO1, CO3

Experiment No.5	1. Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. 2. Installation of MS-Windows and Linux. Connection of LAN and access the Internet, Configuration of TCP/IP setting and access of websites and email. 3. Exploring MS-Word and sample tasks. Document creation and editing text documents in your web browser using Google docs.	CO4

Learning Resources

Text Books	Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers. Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition.

20HS1201- COMMUNICATIVE ENGLISH - II

Offering Branches	CE	Year : I	Sem: II
Course Category:	Humanities and Social Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** various Linguistic aspects	K2
CO2	**Apply** language to draft letters for various business purposes	K3
CO3	**Interpret** the text for information processing and effective communication.	K3
CO4	**Analyze** the data for report writing and précis writing.	K4
CO5	**Relate** advanced writing skills for better employability.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

Course Content

UNIT-1	**Reading:** Reading for presenting - strategies to select, compile and synthesize information for presentation-Comprehending a wide range of texts -Reading to recognize academic style **Reading for Writing:** Paraphrasing - using quotations and in-text references; using academic style - avoiding colloquial words and phrases - Writing an essay after researching a topic - Citing the sources used **Grammar and Vocabulary:** Academic verbs in context; formal words and phrases-Awareness about Root words	CO1, CO3, CO5
UNIT-2	**Reading:** Recognizing formal and informal styles -Recognizing the difference between facts and opinions - Identifying and understanding different perspectives **Writing:** Letter writing and e mail writing - Structure, Conventions and Etiquette – Informal, semi-formal and formal (enquiry, complaints, seeking permission, seeking internship - Re-draft a piece of text from a different perspective - Writing brief critical reviews of short texts. Communication skills-verbal / Nonverbal **Grammar and Vocabulary:** Agreement: Subject-verb, Noun-pronoun; Editing short texts - Phrasal verbs - Phrasal prepositions - Avoiding clichés	CO1, CO2, CO4, CO5
UNIT-3	**Reading:** Identifying claims, evidences, views/opinions, purpose, and stance/position -Understand the correlation between a talk and a reading text based on inferences made. **Writing:** Writing structured analytical and argumentative essays on general topics using suitable claims and evidences with the sources cited-Peer review of the essays written **Grammar and Vocabulary:** Language for different functions such as stating a point, expressing opinion, Agreeing/disagreeing, Adding information to what someone has stated, and asking for clarification - Modifiers and misplaced modifiers. Corporate grooming	CO1, CO3, CO5
UNIT-4	**Reading:** Reading varied text types - Structure and contents of a formal report -	

	Sections in a report and understanding the purpose of each section- Significance of references **Writing:** Writing reports **Grammar and Vocabulary:** Active and passive voice - Use of passive verbs in academic writing- **Precis writing**	CO1 CO3 CO4 CO5
UNIT-5	**Reading:** Reading for inferential comprehension **Writing:** Writing one's CV and cover letter - Applying for a job/internship **Grammar and Vocabulary:** Reinforcing learning - Edit one's writing to correct common errors in grammar and usage - Use appropriate vocabulary for speaking and writing – Various purposes, Jumbled sentences	CO1 CO2 CO5

Learning Resources

Text Books	1. Prabhavathy Y, M.Lalitha Sridevi "English all Round2: Communication skills for Undergraduate students", Orient Black Swan, 2020
Reference Books	1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014. 2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. 3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012(Student Book, Teacher Resource Book, CD & DVD)
e-Resources& other digital material	**Grammar/Listening/Writing:** 1-language.com; http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Grammar/Vocabulary:** English Language Learning Online; http://www.bbc.co.uk/learningenglish/ http://www.better-english.com/; http://www.nonstopenglish.com/ https://www.vocabulary.com/; BBC Vocabulary Games Free Rice Vocabulary Game **Reading:** https://www.usingenglish.com/comprehension/; https://www.englishclub.com/reading/short-stories.htm; https://www.english-online.at/ **All Skills:** https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

II – SEMESTER SYLLABUS

20BS1201- DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Offering Branches	CE	**Year : I**	**Sem: II**
Course Category:	Basic Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts of differential equations and vector calculus.	K2
CO2	**Apply** different methods to solve differential equations.	K3
CO3	**Apply** the differential operator to calculate the divergence and flux of vector point functions.	K3
CO4	**Analyse** the given differential equation to find the solution.	K4
CO5	**Calculate** work done and flux by applying vector integral theorems .	K4
CO6	**Apply** the concepts of differential equations and vector calculus to the given problem and submit a report.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													2	
CO2	3								2	2			2	
CO3	3								2	2			2	
CO4		3											2	
CO5		3											2	
CO6	3								2	2			2	
Avg.	**3**	**3**							**2**	**2**			**2**	

Course Content

UNIT-1	**Ordinary Differential Equations Of First order and First degree**: Exact differential equations, Equations reducible to exact equations, orthogonal trajectories in Cartesian and polar coordinates. **Applications**: Newton's Law of cooling, Law of Natural growth and decay.	CO1,CO2, CO4,CO6
UNIT-2	**Linear Differential Equations of Higher Order: O**perator D, rules for finding complementary function, inverse operator, rules for finding particular integral, method of variation of parameters.	CO1,CO2, CO4,CO6
UNIT-3	**Partial Differential Equations:** Formation of partial differential equations, Linear equations of first order, Non-Linear equations of first order, Charpit's method.	CO1,CO2, CO4,CO6
UNIT-4	**Vector Differentiation:** Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions- Divergence and Curl.	CO1,CO3, CO5,CO6
UNIT-5	**Vector Integration:** Line integral, surface integral, volume integral, Green's theorem in the plane, Stoke's theorem, Divergence theorem (All theorems without proof).	CO1,CO3, CO5,CO6

Learning Resources	
Text Books	1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2019. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.
Reference Books	1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 3/e, Alpha science International Ltd,2002
e-Resources& other digital material	1. https://nptel.ac.in/courses/111/105/111105121/ 2. https://nptel.ac.in/courses/111/105/111105122/ 3. https://nptel.ac.in/courses/111/107/111107108/ 4. http://202.53.81.118/ -> PVPSIT FED Moodle

20BS1206- CHEMISTRY OF MATERIALS

Offering Branches	CE	Year : I	Sem: II
Course Category:	Basic Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic principles related to water, energy sources, corrosion and engineering materials	K2
CO2	**Apply** the knowledge of water treatment methods, corrosion technology and electrochemical energy systems to describe the functioning of water purifiers, methods for corrosion control and cells .	K3
CO3	**Apply** suitable methods and techniques for the characterization and manufacturing of various materials	K3
CO4	**Analyse** the characteristics and performance of water, energy conversion systems, corrosion and materials in their respective applications.	K4
CO5	**Make** an effective report on various concepts and technologies related to chemistry of materials	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

Course Content

UNIT-1	**WATER TECHNOLOGY**: Introduction –Hard and Soft water, Estimation of hardness by EDTA Method - Boiler troubles- scale and sludge-priming and foaming, specifications for drinking water, Industrial water treatment – zeolite and ion- exchange processes- desalination of brackish water, reverse osmosis (RO) and electro dialysis.	CO1,CO2, CO4,CO5
UNIT-2	**ENERGY SOURCES AND APPLICATIONS**: Electrode potential, determination of single electrode potential –Nernst's equation, reference electrodes, hydrogen and calomel electrodes – electrochemical series and its applications – primary cell, dry or Leclanche cell – secondary cell, lead acid storage cell – lithium batteries (Lithium-MnO2) – fuel cell, hydrogen-oxygen fuel cell, Solar energy- photovoltaic cell and applications.	CO1,CO2, CO4,CO5
UNIT-3	**CORROSION ENGINEERING**: Corrosion: Definition – theories of corrosion, dry corrosion and electrochemical corrosion – factors affecting corrosion, nature of the metal and nature of the environment. **Corrosion controlling methods**: Sacrificial and Impressed current cathodic protection, Metalliccoatings, anodic coatings, cathodic coating, galvanizing and tinning, anodic inhibitors and cathodic inhibitors –organic coatings, paints and varnishes (constituents and their functions).	CO1,CO2, CO4,CO5
UNIT-4	**ENGINEERING MATERIALS AND POLYMERS** Steel – Types of Steel, chemical composition – applications of alloy steels Cement: Portland cement, constituents, Manufacture of Portland	CO1,CO3,

	Cement, chemistry of setting and hardening of cement (hydration, hydrolysis, equations). Polymers: Introduction, differences between thermoplastic and thermo setting resins, Preparation, properties and uses of polystyrene and poly phosphazines.	CO4,CO5
UNIT-5	**NANO AND SMART MATERIALS**: Introduction to Nano materials, chemical synthesis of nanomaterials: Sol-gel method, characterization of nano materials by TEM (includes basic principle of TEM), Applications of nanomaterials in waste water treatment, lubricants and engines. **Smart Materials:** Introduction -Types of smart materials- self healing materials , Shape memory alloys and Uses of smart materials	CO1,CO3, CO4,CO5

Learning Resources

Text Books	1. P.C. Jain and M. Jain, Engineering Chemistry, 15/e, DhanapatRai& Sons,(2014). 2. B.K. Sharma, Engineering Chemistry, Krishna Prakasham,(2014).
Reference Books	1. SashiChawla, A Textbook of Engineering Chemistry, Dhanapath Rai and sons,(2003) 2. B.S Murthy and P. Shankar, A Text Book of Nano Science and Nano Technology, University Press(2013). 3. S.S. Dara, A Textbook of Engineering Chemistry, S. Chand& Co,(2010) 4. V.Raghavan, A Material Science and Engineering, Prentice-Hall India Ltd,(2004). 5. N.KrishnaMurthy and Anuradha, A text book of Engineering Chemistry, Murthy Publications (2014). 6. K. Sesha Maheshwaramma and Mridula Chugh, Engineering Chemistry, Pearson India Edn services, (2016).
e-Resources& other digital material	1. https://nptel.ac.in/courses/105105178/ 2. http://202.53.81.118/course/view.php?id=82

20ES1203- PROBLEM SOLVING AND PROGRAMMING WITH PYTHON

Offering Branches	CE	Year : I	Sem: II
Course Category:	Engineering Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the principles of structured programming and C constructs for solving problems.	K2
CO2	Apply suitable control constructs and array concepts to solve problems.	K3
CO3	Apply the concept of pointers, user defined data types and files to solve problems.	K3
CO4	Analyze the given problem and use modular programming approach to develop solutions.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

Course Content

UNIT-1	**Computational Thinking and Visual Programming Concepts** Introduction to computational thinking. Visual programming concepts. Scratch environment: sprites -- appearance and motion, angles and directions, repetition and variation, changing costumes, adding background, Input/output, variables and operators. **Problems** - draw geometrical shapes such as Circle, Triangle, Square and Pentagon, Make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result, make a sprite to ask the user to enter a number to display even and odd numbers.	CO1, CO2
UNIT-2	**Algorithms and Flowchart design through Raptor** Introduction to the idea of an algorithm, Pseudo code and Flowcharts. Flowchart symbols, Input/output, Assignment, operators, conditional if, repetition, procedure and sub charts. **Problems** - Finding maximum of 3 numbers, Unit converters, Interest calculators, and multiplication tables, GCD of 2 numbers, Fibonacci number generation, and prime number generation. Minimum, Maximum and average of n numbers.	CO1, CO2
UNIT-3	**Introduction to Python** Features of Python, Writing and Executing First Python Program, Literal Constants, Variables and Identifiers, Reserved Words, Data	CO1, CO3

	Types, Input Operation, Operators and Expressions, Operations on Strings, Type Conversion, Conditional statements and iterative statements.	
UNIT-4	**Functions and Strings in Python** **Functions:** Introduction, Built-in Math Functions, User Defined Functions: Function Call, Variable Scope and Lifetime, The return statement, Lambda Functions, Packages in python. **Strings:** Introduction, Built-in String Functions, Slice Operation, Comparing Strings, Iterating String, Regular Expressions.	CO1CO3
UNIT-5	**Files and Data Structures in Python** **File Handling:** open, close, read and write operations. **Data Structures:** **Lists:** Accessing values in lists, Nested Lists, Basic List Operations. **Tuples:** Creating Tuple, Accessing values in a tuple, Basic Tuple Operations. **Dictionaries**: Creating and Accessing Dictionaries, Built-in Dictionary functions, List Vs Tuple Vs Dictionary.	CO1, CO3CO4

Learning Resources

Text Books	1. An introduction to programming and algorithmic reasoning using raptor, Weingart, Dr.Troy, Brown, Dr. Wayne, 2018, CreateSpace (an Amazon.com Company) 2. Core Python Programming, R. Nageswara Rao, 2018, Dreamtech press.
Reference Books	1. Python Programming: Using Problem Solving Approach, Reema Thareja, 2017, Oxford University Press. 2. Programming with python, T R Padmanabhan, 2017, Springer. 3. Python for Data Analysis, Wes McKinney, 2012, O.Reilly.
e-Resources& other digital material	1. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf 2. https://raptor.martincarlisle.com/ 3. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

20ES1204- ENGINEERING GRAPHICS

Offering Branches	CE	**Year : I**	**Sem: II**
Course Category:	Engineering Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	1-0-4
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Construct** conic sections and curves used in Engineering practice.	K3
CO2	**Construct** orthographic projections of an object when its position is defined with respect to the reference planes.	K3
CO3	**Develop** the isometric view for the given orthographic projections and vice versa.	K3
CO4	**Develop** the lateral surfaces of solids.	K3
CO5	**Identify** the appropriate commands that are used to prepare the given drawing in CAD environment.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

Course Content

UNIT-1	**Introduction to Engineering Graphics**: Principles of Engineering Graphics and their significance- Conventions in drawing, lettering, dimensioning, BIS conventions. a) **Conic sections**: Construction of ellipse, parabola and hyperbola (general method only) b) **Cycloidal curves**: Cycloid, Epicycloid and Hypocycloid **Involutes**: Involute of regular polygons and Circle.	CO1
UNIT-2	**Projection of points, lines and planes:** Projection of points in different quadrants, lines inclined to one and both the reference planes, finding true length and inclination made by the line. Projections of regular plane surfaces.	CO2
UNIT-3	**Projections of solids:** Projections of regular solids such as cube, prism, pyramid, cylinder and cone (Treatment limited to solids inclined to one of the reference planes). **Sections of solids**: Section planes and sectional view of right regular Solids- cube, prism, cylinder, pyramid and cone. True shape of the section. (Treatment limited to the solids perpendicular to one of the principal planes)	CO2
UNIT-4	**Orthographic Views**: Systems of projections, conversion of Isometric view to orthographic view. **Isometric Projections**: Principles of Isometric projection- Isometric scale; **Isometric views**: lines, planes and solids. (Treatment is limited to simple objects only)	CO3
UNIT-5	**Development of surfaces:** Development of lateral surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectional parts.	CO4

	(Treatment limited to solids perpendicular to one of the principal planes)	
	Introduction to CAD: Basic drawing, editing and dimensioning commands: line, polyline, circle, arc, polygon, ellipse, rectangle, erase, undo, redo, snap, move, copy, rotate, scale, mirror, offset, layer, trim, extend, fillet, chamfer, array, linear and angular dimension.	CO 5

Learning Resources

Text Books	1. N.D. Bhatt, Engineering Drawing, 53/e, Charotar Publishers,2016. 2. K.L.Narayana&P.Kannaiah,EngineeringDrawing,3/e,ScitechPublishers, 2012
Reference Books	1. Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill,2009. 2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education,2009. 3. K.Venugopal,EngineeringDrawingandGraphics,6/e,NewAge Publishers, 2011. 4. K.C. John, Engineering Graphics, 2/e, PHI,2013. 5. Basant Agarwal and C.M. Agarwal, Engineering Drawing, TataMcGrawHill,2008.
e-Resources& other digital material	1. http://www.youtube.com/watch?v=XCWJ XrkWco, Accessed on 01-06-2017. 2. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-tutorial.html#isodrawing, Accessed on 01-06-2017. 3. http://www.slideshare.net, Accessed on 01-06-2017. 4. http://edpstuff.blogspot.in, Accessed on 01-06-2017.

20HS1251 - COMMUNICATIVE ENGLISH II LAB

Course Code	20HS1251	Year	I	Semester	II
Course Category	Humanities	Branch	CE	Course Type	Lab
Credits	1.5	L-T-P	0-0-3	Prerequisites	Nil
Continuous Internal Evaluation	15	Semester End Evaluation	35	Total Marks	50

Course Outcomes

Upon successful completion of the course, the student will be able to

CO1	Hone employability skills (L3)
CO2	Develop an ability of making discussions, inferences and presentations (L3)
CO3	Refine communication skills through various strategies (L4)
CO4	Process the information in different contexts (L4)

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

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

Syllabus

Expt. No.	Syllabus	Mapped CO's
1	**Listening for presentation strategies and answering questions on the speaker, audience, and key points**	CO1, CO2, CO4
2	Formal presentations using PPT slides (individual)	
3	Relating a reading text to a talk/presentation – understanding different perspectives and drawing inferences	CO1, CO2, CO4
4	Formal team presentations using PPT slides/audio- visual aids	
5	Identifying views and opinions expressed by different speakers while listening to discussions	CO1, CO3, C04
6	Group discussion on general topics	
7	Processing of information using context clues while listening to talks/lectures	CO1, CO3, CO4
8	Role plays – people from various fields of work	
9	Processing of explicit information presented in the text and implicit information inferable from the text or from previous/background knowledge	CO1, CO3, CO4
10	Mock interviews for jobs/internships	

Learning Resources

Text Books

1. Prabhavathy Y, M.Lalitha Sridevi. "English all Round 2: Communication skills for Undergraduate Learners", Orient Black Swan, 2020

Reference Books

1. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
2. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
3. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012

e- Resources & other digital material
Grammar/Listening/Writing: 1-language.com http://www.5minuteenglish.com/ https://www.englishpractice.com/ **Listening:** https://learningenglish.voanews.com/z/3613; http://www.englishmedialab.com/listening.html **Speaking:** https://www.talkenglish.com/BBC; Learning English – Pronunciation tips Merriam-Webster – Perfect pronunciation Exercises **All Skills:** https://www.englishclub.com/; http://www.world-english.org/ http://learnenglish.britishcouncil.org/ **Online Dictionaries:** Cambridge dictionary online; MacMillan dictionary; Oxford learner's dictionaries

20BS1254- CHEMISTRY OF MATERIALS LAB

Offering Branches	CE	Year : I	Sem: II
Course Category:	Basic Sciences	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Apply** the acquired knowledge to estimate the amount of calcium, Chromium in a given sample (L3)	K3
CO2	**Analyze** the quality of ground water sample, and active chlorine in bleaching powder (L4)	K4
CO3	**Calculate** the strength of an acid in lead-acid storage cell.	K3
CO4	**Compare** the viscosities and surface tension of different liquids	K4
CO5	**Analyze** the compounds and examine the Preparation of a polymer	K4
CO6	**Make** an effective report based on experiments	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2				3					1		1
CO2	3		2				3					1		1
CO3	3		2				3					1		1
CO4	3		2				3					1	2	1
CO5	3		2				3					1		1
CO6	3		2				3			3		1		1
Avg.	**3**		**2**				**3**			**3**		**1**	**2**	**1**

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Estimation of calcium in Portland cement	CO1,CO6
Experiment No.2	Determination of chromium (VI) in potassium dichromate	CO1,CO6
Experiment No.3	Determination of viscosity of a liquid	CO4,CO6
Experiment No.4	Determination of surface tension of a liquid	CO4,CO6
Experiment No.5	Determination of sulphuric acid in lead-acid storage cell	CO3,CO6
Experiment No.6	Determination of strength of an acid by pH metric method	CO2,CO6
Experiment No.7	Determination of Hardness of a ground water sample	CO2,CO6
Experiment No.8	Estimation of active chlorine content in Bleaching powder	CO2,CO6
Experiment No.9	Thin layer chromatography (paper chromatography)	CO5,CO6
Experiment No.10	Preparation of Phenol-formaldehyde resin	CO5,CO6

Learning Resources

Text Books	1. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B Vogel's Quantitative Chemical Analysis 6/e, Pearson publishers(2000).
Reference Books	1. N.KBhasin and Sudha Rani Laboratory Manual on Engineering Chemistry 3/e, DhanpatRai Publishing Company(2007).
e-Resources& other digital material	1. https://nptel.ac.in/courses/105105178/ 2. http://202.53.81.118/course/view.php?id=82

20ES1254- PROBLEM SOLVING AND PROGRAMMING WITH PYTHON LAB

Offering Branches	CE	**Year : I**	**Sem: II**
Course Category:	Engineering Sciences	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Apply** visual programming concepts, flowchart design techniques and Python programming constructs for solving problems.	K3
CO2	**Conduct** experiments as an individual, or team member by using Scratch/Raptor tools and Python programming.	K3
CO3	**Develop** an effective report based on various programs implemented.	K3
CO4	**Apply** technical knowledge for a given problem and express with an effective oral communication.	K3
CO5	**Analyze** outputs generated through Scratch/Raptor tools and Python programming.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Apply Visual Programming Concepts using Scratch tool.	**CO1 CO2 CO3 CO4 CO5**
Experiment No.2	Solve various computational problems by designing flowcharts using Raptor tool.	
Experiment No.3	Python programs on usage of operators.	
Experiment No.4	Python Programs to demonstrate decision making and branching (Selection)	
Experiment No.5	Python programs to demonstrate iterative statements.	
Experiment No.6	Python programs to demonstrate functions	
Experiment No.7	Python programs to perform operations on strings, regular expressions with built – in functions.	
Experiment No.8	Python programs to handle file operations.	
Experiment No.9	Python programs to apply various data structures.	
Experiment No.10	Installing, importing and accessing numpy and pandas packages.	

Learning Resources	
Text Books	1. An introduction to programming and algorithmic reasoning using raptor, Weingart, 2. Dr. Troy, Brown, Dr. Wayne, 2018, CreateSpace (an Amazon.com Company) Core Python Programming, R. Nageswara Rao, 2018, Dreamtech press.
Reference Books	1. Python Programming: Using Problem Solving Approach, Reema Thareja, 2017, Oxford University Press. 2. Programming with python, T R Padmanabhan, 2017, Springer. 3. Python for Data Analysis, Wes McKinney, 2012, O.Reilly.
e-Resources& other digital material	1. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-3aa315888a1/scratchreferenceguide14.pdf 2. https://raptor.martincarlisle.com/ 3. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf

20MC1201- LIFE SCIENCES FOR ENGINEERS

Offering Branches	CE	**Year : I**	**Sem: II**
Course Category:	Mandatory Course	Credits:	0
Course Type:	Theory	Lecture-Tutorial-Practical:	2-0-2
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Apply** the concepts of biology to create tangible and economically viable engineering goods.	K3
CO2	**Analyse** new technologies in Genetics biotechnology, pharmaceutical, medical and agricultural fields from the knowledge gained from DNA technology.	K4
CO3	**Apply** the knowledge of biology to improve the living standards of societies.	K3
CO4	**Apply** the basic knowledge of genetics and DNA technology for disease diagnostics and therapy.	K3
CO5	**Analyse** new technologies in biotechnology, pharmaceutical, medical and agricultural fields from the knowledge gained from DNA technology.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

Course Content

UNIT-1	**Introduction to Biology** Comparison of Biological organisms with manmade systems :Eye and Camera ,Flying bird and Aircraft Ultra structure of cell: Prokaryotes and Eukaryotes	CO1
UNIT-2	**Bio-molecules** Structure and functions of proteins (antibodies) Structure and functions of nucleic acids Industrial applications- Enzymes and Fermentation	CO1 CO2
UNIT-3	**Bioenergetics and Cellular Respiration** Mechanism of photosynthesis Lycolysis, TCA cycle Electron transport chain and Oxidative phosphorylation.	CO3
UNIT-4	**Genetics** Mendel'slas, Gene mapping, Single gene disorders in humans	CO3 CO4
UNIT-5	**Recombinant DNA Technology** Recombinant vaccines, transgenic microbes, plants and animals. Animal cloning, biosensors, biochips.	CO2 CO5

Expt. No.	Name of the experiment	Mapped CO's
1	Dissect & mount different parts of plants using Microscope	CO1
2	Estimation of Proteins by using Biuret method	CO2
3	Estimation of enzyme activity.	CO2
4	Estimation of chlorophyll content in some selected plants.	CO3
5	Nitrogen Cycle: Estimation of Nitrates/Nitrites In soil by using Spectrophotometer	CO3
6	Mendal's laws and gene mapping	CO4, CO5

Learning Resources	
Text Books	1. Biology for Engineers-Wiley Editorial 2. N. A. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2018. 3. Biotechnology by U.Satyanarayana, Alliedand books Pvt. ltd. Kolkata
Reference Books	1. Alberts et al., The molecular biology of the cell, 6/e, Garland Science, 2014. 2. John Enderle and Joseph Bronzino Introduction to Biomedical Engineering, 3/e, 2012

III – SEMESTER SYLLABUS

20BS1301- NUMERICAL AND STATISTICAL METHODS

Offering Branches	CE, ME	**Year : II**	**Sem: I**
Course Category:	Basic Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts of Numerical and statistical Methods .	K2
CO2	**Apply** different Numerical methods to solve the problems of numerical differentiation, integration, ordinary differential equations.	K3
CO3	**Apply** concepts of probability and random variables to real life problems.	K3
CO4	**Estimate** the interpolated values, approximate roots, areas and derivatives.	K4
CO5	**Analyse** the data to test of hypothesis corresponding to mean, proportions for large and small samples.	K4
CO6	**Apply** different methods to solve Numerical and statistical problems and submit a report.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1													3	
CO2	3								2	2			3	
CO3	3								2	2			3	
CO4		3											3	
CO5		3											3	
CO6	3								2	2			3	
Avg.	3	3							2	2			3	

Course Content

UNIT-1	**Solution to Algebraic and Transcendental Equations** Solution of algebraic and transcendental equations: Bisection method, method of false position and Newton-Raphson's method. Finite differences, relation between operators, interpolation using Newton's forward and backward difference formulae. Interpolation with unequal intervals: Lagrange's formula. (All theorems/properties without proofs)	CO1, CO2, CO4, CO6
UNIT-2	**Numerical Differentiation and Integration** Numerical Differentiation- Newton's forward and backward difference formulae. Numerical integration- trapezoidal rule, Simpson's $\frac{1^{rd}}{3}$ and $\frac{3^{th}}{8}$ rules. Ordinary differential equations: Euler's, modified Euler's, Runge-Kutta method of fourth order for solving first order equations. (All theorems/properties without proofs)	CO1,CO2, CO4,CO6
UNIT-3	**Probability** Random variables (discrete and continuous), probability density functions, probability distribution: Binomial - Poisson - normal distribution and their properties (mathematical expectation and variance).	CO1,CO3, CO5,CO6

	(All theorems/properties without proofs)	
UNIT-4	**Testing of Hypothesis** Formulation of null hypothesis, critical regions, level of significance. Large sample tests: Test for single proportion, difference of proportions, test for single mean and difference of means.	CO1,CO3, CO5,CO6
UNIT-5	**Small Sample Tests** Student's t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test)	CO1,CO3, CO5,CO6
Learning Resources		
Text Books	1. B.S. Grewal, *Higher Engineering Mathematics,* Khanna Publishers, 44/e, 2019. 2. T.K.V.Iyenger, Krishna Gandhi and others, *Probability & Statistics*, S.Chand.	
Reference Books	1. Erwin Kreyszig, *Advanced Engineering Mathematics*, 9/e, John Wiley & Sons, 2006. 2. Miller and Freund's, *Probability and Statistics for Engineers* , Pearson.	
e-Resources& other digital material	1. https://www.nptel.ac.in/courses/111/107/111107105/ 2. https://www.nptel.ac.in/courses/111/105/111105041/ 3. https://www.nptel.ac.in/courses/111/106/111106112/ 4. https://www.nptel.ac.in/courses/111/105/111105090/ 5. FED Moodle	

20BS1304 - APPLIED MECHANICS

Offering Branches	CE	Year : II	Sem: I
Course Category:	Basic Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1201- Differential Equations and Vector Calculus	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Compute** the resultant of concurrent and non-concurrent system of forces	K3
CO2	**Solve** the equilibrium problems of concurrent and non-concurrent system of forces	K3
CO3	**Solve** the problems related to plane truss, Wedge, and ladder frictions	K3
CO4	**Calculate** centriodal distances and moment of inertia of compound lamina	K3
CO5	**Solve** the problems related to rectilinear motion, projectiles, curvilinear Motion	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Concurrent system of forces**: Introduction, definition of a force, classification of system of forces, principle of transmissibility, resolution of a force, composition of forces, resultant and equilibrant. Triangle law of forces, polygon law of forces. Analytical method of determination of the resultant of the system of forces Problems on the determination of resultant of concurrent coplanar system of forces. **Non-concurrent system of forces:** Moment of a force, Varignon's theorem of moments, couples and their characteristics. Determination of magnitude, direction and position of resultant of non-concurrent coplanar system of forces. Example problems	CO1
UNIT-2	**Equilibrium of system of forces**: Definition, conditions of equilibrium for concurrent coplanar system of forces, Lami's theorem. Example problems. Types of supports, loads and beams. Determination of support reactions for statically determinate beams and other simple structures.	CO2
UNIT-3	**Trusses**: Definition: Plane truss, space truss, determinate truss and indeterminate truss. Analysis of plane truss using method of joints and method of sections. Numerical examples. **Friction**: Introduction, angle of friction, coefficient of friction, cone friction, limiting friction, types of friction, laws of static friction, Example problems related to impending motion on horizontal and	CO3

	inclined planes, wedge friction.	
UNIT-4	**Centroid and Centre of Gravity**: Definition, derivation of expressions for centroidal distances of simple planar laminas like rectangle, triangle, quarter and semi-circle. Determination of centroidal distances of compound laminas. **Moment of Inertia**: Introduction, Definition, Theorems of perpendicular and parallel axis. Concept of axis of symmetry, derivations of expressions for moment of inertia of simple planar laminas like rectangle, triangle, quarter, and semi-circle and circle. Definitions of polar moment of inertia, radius of gyration, Determination of moment of inertia, polar moment of inertia, radius of gyration of compound laminas about centroidal axes and about any specified reference line.	CO4
UNIT-5	**Dynamics Of Particles:** Displacements, Velocity and acceleration, their relationship in rectilinear motion, Curvilinear motion in rectangular coordinates, normal and tangential coordinates, projectile motion, Newton's law, D'Alembert's Principle.	CO5

Learning Resources

Text Books	1. A. K. Tayal, Engineering Mechanics (Statics and Dynamics), Umesh Publications, 14th Edition, 2011. 2. N.H. Dubey, Engineering Mechanics(Statics and Dynamics), McGraw Hill Education (India) Private Limited, 2016.
Reference Books	1. S. Timoshenko & D. H. Young, and JV Rao, Engineering Mechanics, 4th Ed., TMH Education, 2006. 2. K. Vijay Kumar Reddy, J. Suresh Kumar, Singer's Engineering Mechanics Statics and Dynamics, BS Publications, 3rd Edition, 2011.
e-Resources& other digital material	1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/

20ES1301- CONSTRUCTION MATERIALS & CONCRETE TECHNOLOGY

Offering Branches	CE	**Year : II**	**Sem: I**
Course Category:	Engineering Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1206 – Chemistry of materials	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Describe** the basic Engineering Properties of the construction materials & Concrete ingredients	K2
CO2	**Describe** the various functional components of a building	K2
CO3	**Understand** and conduct the different qualitative and quantitative tests on materials of concrete & concrete itself.	K2
CO4	**Ascertain** the efficiency of different mixing, transporting, placing, compaction and curing techniques of concrete	K2
CO5	**Apply** basic requirements of the IS design specifications Can carry out the concrete mix design using IS guidelines.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Construction Materials:** Stones and Bricks - Properties of building stones, classification of stones, stone quarrying, Manufacturing of bricks various types of bricks and blocks used for construction, tests on bricks and blocks; Wood: Classification of various types of woods used in buildings; Timber – seasoning of timber, Defects in Timber Market forms – Industrial timber– Plywood – Veneer – panels of laminates; Bamboo- suitability as a building material	**CO1 CO3**
UNIT-2	**Construction Practices:** Types of Structural systems -load bearing structure- framed structure- load transfer mechanism; Foundations – Deep foundation and its types, Shallow foundations and its types; Masonry -Types of masonry, English and Flemish bonds, Rubble and Ashlar Masonry; Mortar: Importance, properties and types of mortar; Finishing- Damp Proofing, water proofing materials and their uses, Plastering, Paints, Ingredients, types, white washing and distempering.	**CO2**

UNIT-3	**Concrete Ingredients:** Cement: Portland cement – chemical composition – Manufacturing - Hydration, Setting of cement – Structure of hydrated cement – Field and Laboratory testing – Types of cement. Aggregates: Classification of aggregate Particle size, shape & texture, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Soundness of aggregate –Sieve analysis – Fineness modulus – Grading of fine & coarse Aggregates – Alternatives to river sand	**CO1 CO3**
UNIT-4	**Admixtures and Fresh Concrete:** Admixtures: Benefits of admixtures, Classification of admixtures, Fly ash , GGBS, Silica fume, accelerators, retarders , water- reducing admixtures, super plasticizer Fresh Concrete: Properties of fresh concrete, workability, factors affecting workability, measurement of workability, Segregation and Bleeding, Process of manufacture of concrete, quality of mixing water.	**CO1 CO3 CO4**
UNIT-5	**Hardened Properties and Mix Proportioning:** Strength & Durability of Concrete: Water/cement ratio, factor affecting strength of concrete, Tests on hardened concrete, Durability, Factors affecting durability; Sulfate attack, alkali aggregate reaction, Carbonation of concrete Mix proportioning:- Factors affecting the mix proportioning of Concrete, Proportioning of concrete mixes by– IS 10262- 2019 and IS 456.	**CO3 CO5**

Learning Resources

Text Books	1. S.C. Rangwala, Engineering Materials, 4/e, Charotar Publishing House, 2014. 2. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, Building Construction, Laxmi Publications, 2005 3. M.S. Shetty, Concrete Technology, 7/e, S.Chand and Company Ltd, 2015.
Reference Books	1. P.C. Varghese, A Text Book Building Materials, 1/e, Prentice-Hall, Publication, 2005. 2. A.M. Neville and J.J. Brooks, Concrete Technology, 2/e, Prentice Hall, 2010. 3. P.K.Mehta, Concrete: Microstructure, Properties and Materials, 4/e, McGraw-Hill Education, 2014. 4. A.R.Santha Kumar, Concrete Technology, 2/e, Oxford University Press India, 2018
e-Resources& other digital material	1. http://textofvideo.nptel.ac.in/105102012/lec41.pdf 2. https://nptel.ac.in/courses/105102088/

20CE3301 - MECHANICS OF FLUIDS

Offering Branches	CE	**Year : II**	**Sem: I**
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1201- Differential Equations and Vector Calculus 20BS1104-Applied Physics	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand, analyze** and **apply** various fluid properties to solve the fluid problems and use various devices for measuring fluid pressure.	K4
CO2	**Apply** hydrostatic law to find hydrostatic force on various submerged planes and use of law of conservation mass to fluid flow.	K3
CO3	**Apply** the concept of boundary layer theory to determine lift and drag forces on a submerged body.	K3
CO4	**Apply** appropriate flow equations and principles to **analyse** pipe flow problems.	K4
CO5	**Apply** Bernoulli's equation to fluid flow problems and use of different fluid flow measuring devices.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION:** Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion. Pressure at a point-Pascal's law, Hydrostatic law, Pressure and its Measurement: Atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential manometers.	**CO1**
UNIT-2	**HYDROSTATIC FORCES:** Hydrostatic forces on submerged, horizontal, vertical and inclined surfaces, Total pressure and centre of pressure derivations and problems. **FLUID KINEMATICS-** Description of fluid**,** stream line, path line and streak lines and stream tube. Classification of flows- steady, unsteady, uniform non-uniform, laminar, turbulent, rotational, irrotational flows, Equation of continuity for one, three dimensional flows.	**CO1 , CO2**
UNIT-3	**FLUID DYNAMICS:** Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Momentum equation and its application – forces on pipe bend.	**CO1 , CO3**

	Boundary layer – concept, characteristics of boundary layer along a thin flat plate, Separation of boundary layer, Flow around submerged objects-drag and lift**.**	
UNIT-4	**LAMINAR FLOW:** Reynold's experiment- Characteristics of laminar and turbulent flows. Flow between fixed parallel plates, Flow through horizontal pipes. **FLOW THROUGH PIPES –** Laws of fluid friction – Darcy's equation, minor losses Pipes in series- pipes in parallel-equivalent pipe, total energy line and hydraulic gradient line**.**	**CO1, CO4**
UNIT-5	**MEASUREMENT OF FLOW:** Pitot tube, Venturi meter and orifice meter. Classification of orifices, Flow over rectangular, triangular, trapezoidal notch, Broad crested weirs	**CO5**

Learning Resources

Text Books	1. P.N. Modi and S.M. Seth, Fluid Mechanics (18th edition) Standard Book House,2017. 2. A.K. Jain, Fluid Mechanics, Khanna publishers,2010
Reference Books	1. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, Tata McGraw Hill,1985. 2. M. Franck White, Fluid Mechanics, Tata McGraw Hill,2017. 3. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill,2001. 4. A text book of Fluid Mechanics and Hydraulic Machines by R. K. Rajput, S. chand Technical publishers
e-Resources& other digital material	1. Fluid Mechanics virtual labs. http://eerc03-iiith.vlabs.ac.in/ 2. https://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/fluid_mechanics/index.htm 3. https://nptel.ac.in/courses/105105119.

20CE3302 - SURVEYING

Offering Branches	CE	Year : II	Sem: I
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1104-Applied Physics	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Measure** the land area by chaining, compass and plane table.	K3
CO2	**Measure** the elevation of points using dumpy level and illustrate various methods of contouring	K3, K4
CO3	**Measure** the height and distance by theodolite and know about the application of tacheometric surveying (L3)	K3
CO4	**Illustrate** the various methods of curve setting in the field and evaluate areas, volumes (L4)	K4
CO5	**Know** the Principles of triangulation survey and precisely **measure** horizontal/vertical distances using advanced instrument	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Chain Surveying:** Surveying objectives, linear measurements, instruments for surveying, preparation of map and plan, measurement of distance, chain surveying principles, offsets, chain surveying instruments, traverses with a chain, problems on obstacles of chain surveying. **Compass Surveying:** Types of compass, meridians and bearings, local attraction, magnetic declination, measurement of directions and angles traversing with a compass, plotting of traverse, adjustment of closing error.	**CO1**
UNIT-2	**Plane Table Surveying:** Principle and instruments used in plane table surveying, working operations, methods of plane table surveying. **Levelling and Contouring:** Instruments for levelling, principle and classification of levelling, bench marks, height (level) computations, longitudinal and cross-sectional levelling, problems on levelling. Contours, characteristics of contours, contours of natural features, methods of contouring.	**CO1** **CO2**
UNIT-3	**Theodolite Surveying:**	**CO3**

	Theodolite component parts, classification, theodolite observations, principle of theodolite survey, traverse computations, practical problems. **Tacheometric Surveying:** Principle of tacheometry, methods of tacheometry, tacheometry as applied to subtense measurement, field work for tacheometric surveying, errors.	
UNIT-4	**Curve Setting:** Types of curves, elements of a curve, setting out a simple curve, setting out a compound curve, reverse curve, transition curves. **Construction Surveys:** Setting out of buildings, computation of areas, earthwork measurements: LS&CS, computation of volumes.	**CO4**
UNIT-5	**Triangulation Surveying:** Base of the object accessible, base of an inclined object accessible, reduced level of the elevated points with inaccessible bases, instrument axes at different levels, principle of triangulation, purpose and classification of triangulation surveys, layout of triangulation. **Total Station & GIS:** EDM instruments, Total Station, Global Positioning System, GIS	**CO5**

Learning Resources	
Text Books	1. B.C. Punmia, A.K. Jain, Arun Jain, Surveying I and II, 16/e, Lakshmi Publications, 2017. 2. R. Subramanian, Surveying and Levelling, 2/e, Oxford University Press,2014. 3 .D.G Charles, R.W. Paul, Elementary Surveying: An Introduction to Geomatics, 15/e, Prentice Hall,2018
Reference Books	1. S.K. Roy, Fundamentals of Surveying, 2/e, Prentice Hall of India, 2011. 2. T.P. Kanetkar, Surveying and Levelling, Part I and II, 4/e, New Central Book Agency2012.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105107122/ 2. http://jntuk-coeerd.in/

20MC1301- ENVIRONMENTAL SCIENCES

Offering Branches	CE,CSE,ECE,EEE,IT,ME	Year : II	Sem: I
Course Category:	Mandatory Course	Credits:	0
Course Type:	Theory	Lecture-Tutorial-Practical:	2-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Apply** advanced solutions to measure the threats and hazards in environment to link with human natural systems.	K3
CO2	**Analyze** the ethical, cultural and historical interactions between man and environment.	K4
CO3	**Analyze** various environmental assets and record for better management.	K4
CO4	**Analyze** global issues to design and evaluate policies.	K4
CO5	**Apply** system concepts to methodological social and environmental issues.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION TO ENVIRONMENT AND NATURAL RESOURCES** Introduction to environment: Definition scope importance need for public awareness. Natural resources: Renewable and non renewable resources, natural resources and associated problems. Forest resources: Uses, Reasons for over-exploitation, deforestation effects case studies. Water resources: Use and over – utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems. Mineral resources: Uses, environmental effects of extracting and using mineral resources, case studies. Food resources: World food problems, Impacts of overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Energy resources: Growing energy needs, use of renewable and non renewable energy sources, case studies.	CO1 CO2
UNIT-2	**ECOSYSTEMS AND BIODIVERSITY** Structure components of ecosystem: Biotic and Abiotic components. Functional components of an ecosystem: Food chains, Food webs, Ecological pyramids, Energy flow in the ecosystem, Ecological succession. Biogeochemical cycle: Nitrogen, carbon, Phosphorus cycle. Biodiversity: Definition, Levels of biodiversity: genetic, species and ecosystem diversity. Bio-geographical classification of India, Values of biodiversity: consumptive use, productive use, social, ethical, aesthetic and	CO1 CO2

	optional values. India as a mega – diversity nation. Hot-spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Conservation of biodiversity: In– situ and Ex-situ conservation of biodiversity.	
UNIT-3	**ENVIRONMENTAL POLLUTION AND CONTROL** Environmental Pollution: Definition, causes, effects and control measures: Air Pollution, Water pollution, Soil pollution, Marine pollution, Thermal pollution, Nuclear hazards, Solid waste Management, e-waste, Pollution case studies.	CO3
UNIT-4	**SOCIAL ISSUES AND GLOBAL ENVIRONMENT PROBLEMS AND EFFORTS** From Unsustainable to Sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management, Remote sensing and GIS methods. Environmental ethics: Issues and possible solutions. Green building concept, Environmental Impact Assessment Environmental Management Plan, Climate change: global warming, acid rain, ozone layer depletion.	CO4 CO5
UNIT-5	**HUMAN POPULATION AND ENVIRONMENT LEGISLATION** Population growth, Environment and human health. HIV/AIDS,. Value Education. Women and Child Welfare. Role of Information Technology in Environment and human health. Environment Legislation. Air (Prevention and Control of Pollution) Act. Water (Prevention and Control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Environmental Protection Act.	CO4 CO5

Learning Resources

Text Books	1. Anubha Kaushik and C.P. Kaushik, Text book of environmental studies New Age International Publisher (2014). 2. Erach Barucha, Text book of environmental studies for undergraduates courses, published by – University Grants Commission, University Press (2005) 3. Anindita Basak, Environmental Studies. Pearson (2009)
Reference Books	1. D.K. Asthana and Meera Asthana, A Text book of Environmental Studies, S. Chand (2010). 2. P.M Cherry Solid and Hazardous waste Management, CBS Publisher (2016). 3. Charles H. Ecclestion, Environmental Impact Assessment, CRC Press (2011)

20ES1351- CONSTRUCTION MATERIALS & CONCRETE TECHNOLOGY LAB

Offering Branches	CE	Year : II	Sem: I
Course Category:	Engineering Sciences	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Assess** the different properties of Cement.	K3
CO2	**Determine** the different properties of aggregates.	K3
CO3	**Design & describe** the preparation of green concrete and testing of concrete.	K4
CO4	**Determine** the properties of hardened concrete.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Determination of fineness and consistency of cement.	**CO1 CO2 CO3 CO4**
Experiment No.2	Determination of setting time of cement.	
Experiment No.3	Determination of specific gravity of cement	
Experiment No.4	Determination of compressive strength of cement.	
Experiment No.5	Determination of fineness modulus of fine aggregate and coarse aggregate	
Experiment No.6	Determination of specific gravity of fine aggregate and coarse aggregate.	
Experiment No.7	Determine the mix proportions of materials for a particular grade of concrete as per IS 10262.	
Experiment No.8	Conducting trials for M20, M30 and M40 grades of Concrete	
Experiment No.9	Determination of workability of concrete by slump cone test.	
Experiment No.10	Determination of workability of concrete by compaction factor apparatus	
Experiment No.11	Determination of compressive strength of concrete.	
Experiment No.12	Determination of split tensile strength of concrete.	
Experiment No.13	Determination of modulus of rupture of plain concrete beam.	
Experiment No.14	Demonstration of Rebound Hammer test and Ultrasonic Pulse Velocity Test	

Learning Resources

Text Books

1. Concrete Technology Lab Manual by Dept. of CE, PVPSIT
2. Determination of fineness and consistency of cement. IS 4031(Part 4) & IS 4031(Part 1)
3. Determination of setting time of cement. IS 4031(Part 5)
4. Determination of specific gravity of cement (IS:4031-PART 11)
5. Determination of compressive strength of cement. IS 4031(Part 6) & IS 4031(Part 7)
6. Determination of fineness modulus of fine aggregate and coarse aggregate

	IS:383 7. Determination of specific gravity of fine aggregate and coarse aggregate. IS:2386 (Part 3) 8. Determine the mix proportions of materials for a particular grade of concrete as per IS 10262. 9. Determination of workability of concrete by slump cone test. IS: 1199 10. Determination of workability of concrete by compaction factor apparatus. IS: 1199 11. Determination of compressive strength of concrete. IS 516. 12. Determination of split tensile strength of concrete. IS 5816. 13. Determination of modulus of rupture of plain concrete beam. IS 516. 14. M. S. Shetty, Concrete Technology, S Chand Publications.
Reference Books	1. M. L. Gambhir, Concrete Technology, Mcgraw Hill Education.
e-Resources& other digital material	1. http://eerc03-iiith.vlabs.ac.in/

20CE3351- COMPUTER AIDED DRAWING

Offering Branches	CE	Year : II	Sem: I
Course Category:	Professional core	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	Understand the advantages of using CAD in comparison with conventional method.	K2
CO2	**Draw and interpret** CAD drawings using drawing, editing and viewing in CAD software.	K4
CO3	**Create 2-D views and wire frame modelling**	K6
CO4	**Create 3-D views from 2-D views**	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Concept of AutoCAD, Tool bars in CAD software, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar), setting of units and layout.	**CO1 CO2 CO3 CO4**
Experiment No.2	Drawing commands – point, line, arc, circle, ellipse and Editing commands – scale, erase, copy, stretch, lengthen and explode.	
Experiment No.3	Develop drawings with Dimensioning, hatching and placing text in drawing area	
Experiment No.4	Create layers within a drawing	
Experiment No.5	Creating 2-D views	
Experiment No.6	Creating curves, extrude features, chamfer, fillet etc.,	
Experiment No.7	View point coordinates and view(s) displayed, examples to exercise different options like save restore and delete	
Experiment No.8	Prepare 3-D drawings using 3-D commands (Cylinder, cone, wedge, sphere etc…)	
Experiment No.9	Preparing 3-D view of existing 2-D views	
Experiment No.10	Performing rendering on 3-D drawing	

Learning Resources

Text Books	1. AutoCAD for Engineering Drawing Made Easy by P. NageswaraRao; Tata McGraw Hill, New Delhi.
Reference Books	1. Instruction Manual of the software used (AutoCAD)
e-Resources& other digital material	1. https://nptel.ac.in/courses 2. http://jntuk-coeerd.in/

20CE3352- SURVEYING LAB

Offering Branches	CE	Year : II	Sem: I
Course Category:	Professional core	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Demonstrate** accurate measurements, field booking, plotting of area using chain survey.	K4
CO2	**Impart** the knowledge in the field- measuring distances, directions, angles, heights using compass and theodolite.	K4
CO3	**Plotting** the accessible and inaccessible points in filed itself by using plane table.	K4
CO4	**Execute** the levelling works of various profiles and **Interpret** the survey data and prepare contour maps.	K5

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3		3	3	3		3	3	
CO2	3	3	3	3	3	3		3	3	3		3	3	
CO3	3	3	3	3	3	3		3	3	3		3	3	
CO4	3	3	3	3	3	3		3	3	3		3	3	
Avg.	3	3	3	3	3	3		3	3	3		3	3	

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Survey of an area by chain survey (closed traverse) & Plotting	**CO1 CO2 CO3 CO4**
Experiment No.2	Chaining across obstacles by chain and cross-staff survey	
Experiment No.3	Determination of distance between two inaccessible points with compass.	
Experiment No.4	Measurement of bearings of sides of a closed traverse with prismatic compass and computation of correct included angle using Bowditch's rule	
Experiment No.5	Radiation method by plane Table survey	
Experiment No.6	Finding distances of inaccessible points by plane table survey using intersection method	
Experiment No.7	To determine the elevation between two points using fly levelling technique and booking with arithmetical check using H.I. method	
Experiment No.8	Finding elevation difference of given points using differential levelling technique using Rise and Fall method.	
Experiment No.9	To conduct longitudinal and cross section levelling for road profile.	
Experiment No.10	Contouring of a given field and preparing map	
Experiment No.11	Finding horizontal and vertical angles by using theodolite	
Experiment No.12	Determination of heights and distances between two objects by using theodolite	

Learning Resources	
Text Books	1. B.C. Punmia, A.K. Jain, Arun Jain, Surveying I and II, 16/e, Laxmi Publications,2017. 2. R. Subramanian, Surveying and Levelling, 2/e, Oxford University Press,2014.
Reference Books	1. S.K. Roy, Fundamentals of Surveying, 2/e, Prentice Hall of India, 2011. 2. T.P. Kanetkar, Surveying and Levelling, Part I and II, 4/e, New Central Book Agency2012.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105/101/105101201/ 2. http://jntuk-coeerd.in/

20SO8351- C PROGRAMMING LAB

Offering Branches	CE	**Year : II**	**Sem: I**
Course Category:	Skill Oriented Course	Credits:	2
Course Type:	Theory + Laboratory	Lecture-Tutorial-Practical:	1-0-2
Prerequisites:	Nil	Continuous Evaluation:	0
		Semester End Evaluation:	50
		Total Marks:	50

Course Outcomes (Theory Component)

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

CO1	**Understand** the principles of structured programming and C constructs for solving problems.	K2
CO2	**Apply** suitable control constructs and array concepts to solve problems.	K3
CO3	**Apply** the concept of functions, pointers, and user defined data types to solve problems.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes(Theory Component)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
Avg.	**3**													

Course Outcomes (Laboratory Component)

CO1	**Apply** Structured Programming/C constructs for solving problems.	K3
CO2	**Implement** programs as an individual on different IDEs/ online platforms.	K3
CO3	**Develop** an effective report based on various programs implemented.	K6
CO4	**Apply** technical knowledge for a given problem and express with an effective oral communication.	K3
CO5	**Analyse** outputs using given constraints/test cases.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes (Laboratory Component)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											3		
CO2					3				3					
CO3										3				
CO4	3									3				
CO5		3												
Avg.	**3**	**3**			**3**				**3**	**3**		**3**		

1- Low **2-Medium** **3-High**

Course Content (Theory Component)

UNIT-1	**Introduction to C:** Introduction, Structure of C Program, A Simple C Program, C-Tokens, Basic Data types, Variables, Constants, Input / Output statements, Operators, Type conversion and Type casting	CO1
UNIT-2	**Conditional Branching Statements:** if, if-else, if-else-if Statements and Switch case **Iterative Statements:** while, do-while and for loops, break and continue statements.	CO1, CO2

UNIT-3	**Arrays:** Declaration, accessing array elements, Storing values, Operations on arrays **Strings:** Introduction, String manipulation functions	CO1, CO2
UNIT-4	**Functions:** Introduction, Using Functions, Function declaration, Function definition and Function call, Parameter passing, Recursion, Storage classes. **User defined data types**: introduction to enum, introduction to typedef, introduction to structures, and introduction to union Declaration and Initialization of pointer variables, Pointer arithmetic, Pointers and arrays	CO1, CO3
UNIT-5	**User defined data types:** introduction to enum, introduction to typedef, introduction to structures, and introduction to union	CO1, CO3
Course Content (Laboratory Component)		
Experiment No.1	1. Write a program to print sample strings like "hello world", "Welcome to C Programming" with different formats. 2. Write a Program to print different data types in 'C' and their ranges. 3. Write a Program to initialize, assignment & printing variables of different data types.	CO1, CO2, CO3, CO4, CO5
Experiment No.2	1. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%) 2. Write a Program to demonstrate logical operators.(logical AND, logical OR) 3. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation. 4. Write a Program to calculate simple interest. 5. Write a Program to convert temperature. (Fahrenheit – Centigrade and vice-versa)	CO1, CO2, CO3, CO4, CO5
Experiment No.3	1. Write a Program to read marks of a student in six subjects and print whether pass or fail (using if-else). 2. Write a Program to calculate roots of quadratic equation (using if-else). 3. Write a Program to perform arithmetic operations using switch case. 4. Write a Program to display vowels and consonants using switch case	CO1, CO2, CO3, CO4, CO5
Experiment No.4	Do the Following Programs Using for, while, do-while loops. 1. Write a program to calculate sum of individual digits of a given number. 2. Write a program to check whether given number is palindrome or not. 3. Write a program to print prime numbers in the given range. 4. Write a program to display multiplication tables from 1 to 10 except 3 and	CO1, CO2, CO3, CO4, CO5
Experiment No.5	1.Write a program to print the Fibonacci series for given 'N' value. 2.Write a program to check whether a given number is a Fibonacci number or not. 3.Write a program to read 2 numbers x and n then compute the sum of the Geometric Progression. 1+x+ x2 +x3 + - - - - - - - +x^n	CO1, CO2, CO3, CO4, CO5
Experiment No.6	1. Write a program to store 10 elements in the 1-D array and print sum of the array. 2. Write a program to print minimum and maximum elements in the 1-D array.	CO1, CO2, CO3, CO4,

	3. Write a program to count no. of positive numbers, negative numbers and zeros in the array	CO5
Experiment No.7	1.Write a program to perform various string manipulations using built-in functions. 2.Write a program to verify the given string is palindrome or not (without built-in functions, with using built-in functions). 3.Write a program to concatenate two strings using arrays.	CO1, CO2, CO3, CO4, CO5
Experiment No.8	1.Write a program to find sum of two numbers using functions. 2.Write a program to swap two numbers using Call By Value 3.Write a program to calculate factorial using recursion and non-recursion functions.	CO1, CO2, CO3, CO4, CO5
Experiment No.9	1.Write a program to swap two numbers using Call By Reference 2.Write program to perform arithmetic operations using pointer 3.Write a program matrix addition using pointers	CO1, CO2, CO3, CO4, CO5
Experiment No.10	1.Write a program to display a day associated with a number using enum(assume Sunday=0 to Saturday=6) 2.Write a program to create structure and union for an account holder in a bank with following Fields: name, account number, address, and balance and display the details of five account holders. 3.Write a program to alias int with integer, char with character, float with flt and double with dbl using typedef.	CO1, CO2, CO3, CO4, CO5

Learning Resources

Text Books	1. Programming in C, ReemaThareja, AICTE Edition, 2018, Oxford University Press.
Reference Books	1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R.F. Gilberg, Third Edition, 2007, Cengage Learning. 2. Programming in C, PradipDey, ManasGhosh, AICTE Edition, Oxford University Press. 3. Programming with C, B. Gottfried, Third Edition, 2017, Schaum's outlines, McGraw Hill. 4. Problem Solving & Program Design in C,Jeri R. Hanly,Ellot B. Koffman,5th Edition, Pearson.
e-Resources& other digital material	1. http://cprogramminglanguage.net/ 2. https://www.geeksforgeeks.org/c-programming-language/ 3. https://www.greatlearning.in/academy/learn-for-free/courses/c-programming 4. https://www.udemy.com/course/the-complete-c-programming/ 2. https://nptel.ac.in/courses/106/105/106105171/

IV – SEMESTER SYLLABUS

20CE3401-ENVIRONMENTAL ENGINEERING

Offering Branches	CE	**Year : II**	**Sem: II**
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1206 – Chemistry of materials 20MC1301 – Environmental Science	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Examine** the quantity & quality of the water	K4
CO2	**Design** of the different water treatment units & understand the water distribution	K3
CO3	**Analyze** the quantity, quality of wastewater & illustrate the sewer appurtenances	K4
CO4	**Apply** appropriate sewage treatment methods	K3
CO5	**Classify** different sewage disposal methods & Design of septic tank	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**QUALITY AND QUALITY OF WATER**: Objectives of water supply scheme, estimating requirements; Design period; Per capita consumption; Factors affecting per capita consumption; Fire demand; Fluctuations in demand; Population forecasting methods. water quality and testing, drinking water standards, water borne diseases	**CO1**
UNIT-2	**WATER TREATMENT:** Sedimentation- Theory of sedimentation; Stoke's law; Sedimentation tanks- Design aspects; Principle of coagulation; Chemicals used for coagulation; Optimum dose of coagulant; Filtration - working of slow and rapid gravity filters; disinfection - theory of chlorination, chlorine demand, and other disinfection practices **WATER DISTRIBUTION:** Distribution systems; Layout of distribution systems, Analysis of Pipe networks – Hardy Cross Method; Distribution reservoirs; Functions; Types; Capacity of balancing tank; Sluice valves; Check valve; Air valve; Drain valve; Meters, Fire Hydrants	**CO2**
UNIT-3	**QUANTITY OF WASTEWATER**: Introduction to Sanitary Engineering: Conservancy and water carriage system; Sewerage systems; Sanitary and storm water sewage; Estimation of their quantities; Design of sewers; Sewer Appurtenances-Types **QUALITY OF SEWAGE:** Characteristics of sewage-physical, chemical	**CO3**

	and biological; decomposition cycles; BOD and COD.	
UNIT-4	**PRIMARY TREATMENT OF SEWAGE** Primary treatment- theoretical concepts of Screens; Grit chamber; Skimming tanks; design aspects of Sedimentation tanks. **SECONDARY TREATMENT OF SEWAGE**: Trickling filters; high rate trickling filters; Recirculation; Operational problems and remedies; Activated sludge process- Principle of action; Sludge bulking; Sludge volume index	**CO4**
UNIT-5	**SEWAGE DISPOSAL & SEPTIC TANKS** Methods; Disposal by dilution; Self-purification process; Oxygen sag; Zones of pollution of river Disposal by irrigation; sewage sickness; Septic tank-Design; effluent disposal	**CO5**

Learning Resources	
Text Books	1. Environmental Engineering Vol. I& II - Water supply engineering by S. K. Garg; Khanna Publishers, New Delhi, 2017. 2. Elements of public health engineering by K. N. Duggal; S. Chand & Company Ltd., New Delhi, 2014.
Reference Books	1. B.C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi,2010. 2. Metcalf and Eddy, Waste water Engineering Collection, Treatment, Disposal and Reuse, McGraw Hill Pub. Co.,1995.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105104102/ 2. https://nptel.ac.in/courses/105105048/

20CE3402-GEOTECHNICAL ENGINEERING

Offering Branches	CE	Year : II	Sem: II
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1304-Applied Mechanics	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Identify** the soil and **decide** whether it is appropriate for construction or not	K2
CO2	**Design** the porous medium of any hydraulic structure	K6
CO3	**Determine** the long and short-term analyses to know the exact state of stress on the soil	K3
CO4	**Estimate** the settlement of the foundation by understanding the consolidation mechanism of clay	K4
CO5	**Estimate** the short-term and long-term analysis and understand how to prevent soil structures from catastrophic failure	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Soil Properties:** Physical properties of soil – void ratio, porosity, degree of saturation, water content, module weights, specific gravity – their functional relationships, relative density. Indian standard classification for fine grained and coarse grained soils for general engineering purposes. Soil Structure, Clay Minerals, introduction of Clay Chemistry, Determination and various indices – plasticity index, consistency index, liquidity index – uses and applications of consistency limits in soil engineering, activity ratio	**CO1**
UNIT-2	**Soil Hydraulics:** Bernoulli's Principle and Equation, Darcy's law and its limitations, determination of coefficient of permeability, laboratory methods-constant head and variable head permeameter tests, factors influencing coefficient of permeability, permeability of stratified soils, stress principle for saturated soils-total, neutral and effective stresses, no flow, downward flow and upward flow conditions, quick sand conditions, critical hydraulic gradient, piping failures in dams founded on permeable formations	**CO2**
UNIT-3	**Consolidation:** Oedometer Tests, e-p and e-log p curves – compression index, coefficient of compressibility and coefficient of volume change, Terzaghi's assumptions for one dimensional consolidation, equation and application, coefficient of consolidation, degree of consolidation vs time, initial compression, primary compression and secondary compression, normally consolidated, over consolidated and under consolidated clayey deposits, **Compaction:** Mechanism of compaction, factors affecting compaction, effect of compaction on engineering properties of soils, field compaction equipment and quality control.	**CO3**

UNIT-4	**Shear Strength of Soils:** Stress at a point, Mohr circle of stress, Mohr-coulomb's failure theory, shear tests – direct shear box, unconfined compression, tri-axial compression, and field vane shear tests, shear parameters, types of shear tests in the laboratory based on drainage conditions, shear strength of sands, critical void ratio, thixotropy and dilatancy of sands.	**CO4**
UNIT-5	**Stress-Strain and Elastic Deformation:** State of stress, Material failure theory, Material Responses to Normal Loading and Unloading, Plane Strain Condition, Axisymmetric Condition, Soderberg-Good Man model, Boussinesq theory for the determination of vertical stresses due to point loads	**CO5**

Learning Resources

Text Books	1. B.C. Punmia, Soil Mechanics and Foundations, (SI Modules), 16/e Laxmi Publications, Sixteenth edition (2017). 2. Gopala Ranjan and A.S.R, Rao, Basic and Applied Soil Mechanics, 2/e, New Age International Publishers, Third edition 2016. 3. Dr.K.R.Arora, Soil Mechanics and Foundation Engineering, Standard Publisher Dist, 2009.
Reference Books	1. C. Venkataramaiah, Geotechnical Engineering, New Age International, 2006. 2. M. Braja Das, Principles of Geotechnical Engineering,Cengage Learning, 2013. 3. P. Donald, Coduto, Geotechnical Engineering, Prentice-Hall India, 2010.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105/101/105101201/

20CE3403-HYDRAULICS & HYDRAULIC MACHINES

Offering Branches	CE	Year : II	Sem: II
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1201- Differential Equations and Vector Calculus 20BS1304-Applied Mechanics 20CE3301 - Mechanics of Fluids	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand**, and apply the Specific energy concepts to **analyse** the Open channel flow	K4
CO2	**Apply** uniform and non-uniform flow concepts and design the most Economical sections	K3
CO3	**Calculate** the force exerted by a jet of water on various plates using impulse momentum principle	K3
CO4	**Apply** the concept of impulse momentum principle on turbines to analyse and select turbines.	K3
CO5	**Apply** the concept of impulse momentum principle on pumps to analyse the performance of pumps	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**OPEN CHANNEL FLOW** Open channel flow – Types of flow – Velocity distribution in open channel – Kinetic and Energy Momentum correction factors – specific energy – Critical flow, Critical depth and its computation.	CO1
UNIT-2	**UNIFORM AND NON-UNIFORM FLOW** Uniform flow – Velocity measurement – Manning's and Chezy's formula – Most economical rectangular and trapezoidal sections-Rapidly varied flow-Hydraulic Jumps Energy dissipation. Gradually varied flow –dynamic equation of G.V.F	CO2
UNIT-3	**IMPULSE MOMENTUM PRINCIPLE** Application of momentum principle – Introduction to impact of jets on vanes – Stationary and moving, flat, inclined, curved vanes. velocity triangles.	CO3
UNIT-4	**HYDRAULIC TURBINES** Turbines – classification – Heads and efficiencies – Impulse and Reaction turbines – draft tube and cavitations – performance of turbines. Unit quantities, specific speed of turbines	CO4

UNIT-5	**CENTRIFUGAL PUMPS** Centrifugal pump Installation details-work done- manometric head-minimum starting speed, Multistage pumps-pumps in parallel-Specific speed of pumps.	CO5
Learning Resources		
Text Books	1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines,20/e, Standard Book House,2015. 2. A.K. Jain, Fluid Mechanics, 12/e, Khanna publishers,2014. 3. Dr.R.K.Bansal, A text of Fluid Mechanics and Hydraulic Machines	
Reference Books	1. K. Subramanya, Hydraulic Machines, Tata McGraw Hill,2017. 2. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, 9/e, Tata McGrawHill,2013. 3. M. Franck White, Fluid Mechanics, Tata McGraw Hill,2014.	
e-Resources& other digital material	1. https://nptel.ac.in/courses/112/104/112104117/ 2. https://nptel.ac.in/courses/112/103/112103249/	

20CE3404-MECHANICS OF SOLIDS

Offering Branches	CE	**Year : II**	**Sem: II**
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1304-Applied Mechanics	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Evaluate** the behavior when a solid material is subjected to various types of forces and **estimate** stresses, corresponding strain developed.	K3
CO2	**Estimate** the forces developed and draw schematic diagram for shear forces, bending moments for simple beams with different types of support and are subjected to various types of loads .	K3
CO3	**Analyze** various situations involving structural members subjected to combined Stresses analytically and by application of Mohr's circle of stress (L3)	K4
CO4	**Evaluate** the flexural stresses, section modulus for various sections and draw shear stress distribution for rectangular, circular, triangular, I, T and angle sections(L3)	K5
CO5	**Apply** the torsion equation, calculate power transmitted by the shaft and determine the deflections of closed coiled helical springs (L3)	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
CO1	2	2	2	2	2	3						3	2	3
CO2	2	2	2	2	2	3						3	2	3
CO3	3	3	3	3	3	3						3	3	3
CO4	2	2	2	2	2	3						3	2	3
CO5	2	2	2	2	2	2						2	2	2
Avg.	2	2	2	2	2	3						3	2	3

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**SIMPLE STRESSES AND ELASTIC CONSTANTS** Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity, types of stresses and strains, Hooke's law stress –strain diagram for mild steel working stress, factor of safety, Lateral strain, Poisson's ratio and volumetric strain –Elastic moduli and the relationship between them; Bars of varying section, composite bars, temperature stresses. Relationship between elastic constants. Strain Energy –Resilience, Gradual, sudden, impact and shock loadings, simple applications.	**CO1**
UNIT-2	**BENDING MOMENT AND SHEAR FORCE DIAGRAMS** Relationship between moment, shear and load. Bending Moment (BM) and Shear Force (SF) diagrams. BM and SF diagrams for cantilevers, simply supported with or without overhangs. Calculation of maximum BM and SF	**CO2**

	and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments	
UNIT-3	**COMPLEX STRESSES** Stresses on inclined plane on block subjected to normal stress and shear stress along two planes at right angles, principal plane and principal stresses, Mohr's circle for finding principal stresses, Directions of principal planes, Volumetric strain.	**CO3**
UNIT-4	**STRESSES IN BEAMS** Derivation of bending equation, Neutral axis, determination of bending stresses, section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections, Design of simple beam sections. Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.	**CO4**
UNIT-5	**TORSIONAL STRESSES IN SHAFTS** Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs.	**CO5**

Learning Resources

Text Books	1. V.N Vazirani and M.M Ratwani, Analysis Of Structures Vol-I, Khanna Publishers, 2003. 2. S.Timoshenko, Strength Of Materials: Elementary Theory and Problems-Vol.I, 2004. 3. R.Subrahmanian, Strength of Materials, 3/e, Oxford University Press, 2016.
Reference Books	1. 1 S.S. Rattan, Strength of Materials, 2/e, Tata McGraw Hill Education, 2011. 2. Gere and Timoshenko, Mechanics of Materials, 4/e, CBS Publishers, 2006. 3. Stephen Timoshenko, Strength of Materials, 3/e, CBS Publisher, 2002. 4. R.K. Rajput, Strength of Materials, S. Chand Publications, 2007
e-Resources& other digital material	1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/

20CE3405-WATER RESOURCES ENGINEERING

Offering Branches	CE	Year : II	Sem: II
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20CE3301 - Mechanics of Fluids	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Determine** and **analyse** various components of hydrological cycle and processing of the rainfall	K4
CO2	**Apply** hydrograph methods to estimate runoff	K3
CO3	**Analyse** and **evaluate** the ground water yield	K5
CO4	**Understand** and **apply** the various irrigation methods to the fields and apply the irrigation management practices	K3
CO5	**Analyse** and **Design** irrigation canals in alluvial soils and non-Alluvial soils	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Hydrology:** Hydrologic cycle, precipitation, forms and types of rainfall and its measurement, computation of mean depth of rainfall over an area, double mass curve; evaporation and evapo-transpiration, infiltration, infiltration indices W-index, ø - index.	CO1, CO2
UNIT-2	**Hydrograph Analysis:** Runoff, methods of determination of runoff, Total runoff hydrograph, base flow separation, Unit hydrograph theory, derivation, applications of unit hydrograph, hydrograph of different durations, S- curve hydrograph.	CO1, CO2
UNIT-3	**Ground Water Hydrology:** Types of aquifers, Aquifer parameters, Darcy's law, well hydraulics, steady radial flow to wells in un-confined and confined aquifers, Types of wells	CO1, CO3
UNIT-4	**Plant water relationships :** Introduction of irrigation, necessity of irrigation advantages and ill effects , methods of irrigation; soil moisture constants, depth and frequency of irrigation, water requirements of crops, duty, delta, base period and their relationship, crop seasons, factors affecting duty, consumptive use of water, irrigation efficiencies.	C03, CO4
UNIT-5	**Canal Systems:** Classification of irrigation canals, canal lining - advantages, design of unlined canals, Kennedy's and Lacey's theories for designing canals in alluvial soils, balancing depth of cutting.	CO5

Learning Resources	
Text Books	1. B.C.Punmia and Pande B.B.Lal, Irrigation and Water Power Engineering, Laxmi Publications Pvt. Ltd., NewDelhi 2. P.N.Modi, Irrigation, Water Resources and Water Power Engineering, Standard BookHouse, Delhi 3. Jayarami Reddy P., Engineering Hydrology, Laxmi Publications Pvt. Ltd., (2013), Delhi.
Reference Books	1. S.K.Garg, Irrigation Engineering, and Hydraulic Structures, Khanna Publishers,Delhi. 2. K.R. Arora, Irrigation, Water Power and Water Resources Engineering, StandardBook Publishing,Delhi 3. Subramanya K., Engineering Hydrology, Tata McGraw-Hill Education Pvt Ltd, (2013),Delhi 4. Chow V.T., D.R Maidment and L.W. Mays, Applied hydrology, Tata McGraw HillEducation Pvt Ltd, (2011),Delhi. 5. Mays L.W, Water Resources Engineering, Wiley India Pvt. Ltd, (2013).
e-Resources& other digital material	1. https://nptel.ac.in/courses/105105110/ 2. http://www.nptelvideos.in/2012/11/water-resources-engineering.html

20CE3451-GEOTECHNICAL ENGINEERING LAB

Offering Branches	CE	**Year : II**	**Sem: II**
Course Category:	Professional Core	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Determine** the index properties of soil.	K3
CO2	**Determine** in-situ density and compaction characteristics of soil.	K3
CO3	**Evaluate** the compressibility and permeability of the soil.	K3
CO4	**Evaluate** the shear strength of soil.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	**Determine Atterberg's limits** Liquid Limit Test, Plastic Limit Test, Shrinkage Limit Test	
Experiment No.2	**Investigate dry density of soil** Core cutter method Sand Replacement method	
Experiment No.3	**Conduct grain size analysis of coarse grade and fine grade soils** Dry Sieve Analysis, Wet Sieve Analysis, Hydrometer Analysis	
Experiment No.4	**Determine coefficient of permeability** Constant Head Test, Falling Head Test	**CO1**
Experiment No.5	**Measure compaction characteristics of soil** Standard Proctor Test	CO2 CO3
Experiment No.6	**Determine engineering properties of consolidation** Consolidation Test	CO4
Experiment No.7	**Determine shear strength of soil** Unconsolidated undrained triaxial test on saturated clay(UU) Laboratory demostration on CD and CU test **Strength-Index test** Unconfined compression test	
Experiment No.8	**Determine shear strength of soil** CD-Direct shear test on Clay CD-Direct shear test on Sand	

Learning Resources	
Text Books	1. Basic and Applied Soil Mechanics – Gopal Ranjan and A.S.R.Rao, New Age International Publishers 2. Soil Mechanics and Foundation Engg (7th edition) by Dr. Arora, K.R., Standard Publisher and Distributors, Delhi, 2010. 3. A Text book of Soil Mechanics and Foundation Engineering – B.C.PunmiaLaxmi Publications.
Reference Books	1. Foundation Analysis & Design by Bowles, J.E., McGraw- Hill Book Co. 2. A Text book of Soil Mechanics and Foundation Engineering – P.Purushotthama Raj, Pearson Education. 3. Introduction to Soil Mechanics- Braja M Das.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105/101/105101201/ 2. http://jntuk-coeerd.in/

20CE3452- MECHANICS OF FLUIDS LAB

Offering Branches	CE	Year : II	Sem: II
Course Category:	Professional Core	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Apply** the Bernoulli's principle to determine the discharge through pipes by using venturi meter, orifice meter, the discharge from tanks by using small orifice at constant head and mouth piece at varying head.	K3
CO2	**Apply** the Bernoulli's equation and energy dissipation in hydraulic jump.	K3
CO3	**Analyse** loss of head in pipes due to friction and minor energy losses.	K4
CO4	**Analyse** the efficiency of the turbines	K4
CO5	**Analyse** the efficiency of the pumps	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO2
CO1	3	3		3	3				2				3	2
CO2	3	3		3	3				2				3	2
CO3	3	3		3	3				3				3	3
CO4	3	3		3	3				3				3	3
CO5	3	3		3	3				3				3	3
Avg.	3	3		3	3				3				3	3

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Calibration of Venturi-meter & Orifice meter	**CO1**
Experiment No.2	Determination of Coefficient of discharge for a small orifice by a constant head method	
Experiment No.3	Determination of Coefficient of discharge for a mouth piece by variable head method	
Experiment No.4	Calibration of Triangular Notch /Rectangular Notch	CO2
Experiment No.5	Verification of Bernoulli's equation.	
Experiment No.6	Study of Hydraulic jump	
Experiment No.7	Determination of coefficient of discharge for Rectangular Weir	
Experiment No.8	Determination of Coefficient of loss of head in a sudden contraction and friction factor.	CO3
Experiment No.9	Demo on performance test on Pelton wheel turbine	CO4
Experiment No.10	Demo on performance test on Francis turbine.	
Experiment No.11	Study of efficiency test on centrifugal pump.	CO5
Experiment No.12	Study of efficiency test on reciprocating pump.	

Learning Resources	
Text Books	**Laboratory Manuals** 1. Laboratory Manuals available in FM Laboratory. 2. Sarbjit Singh, Experiments in Fluid Mechanics, Prentice Hall of India Pvt. Ltd, Learning Private Limited, Delhi, 2012. 3. V.P. Gupta J. Chadra and K.S. Gupta, Laboratory Manual of Fluid Mechanics and Machines, CBS Publishers and Distributors, New Delhi,2006.
Reference Books	1. To determine the coefficient of discharge of Venturi-meter and Orifice-meter. 2. (IS 14615 (Part 1) : 1999 (2004), IS0 5167-1 : 1991 – Measurement of Fluid Flow by Means of Pressure Differential Devices, Part 1: Orifice Plates, Nozzles and Venturi Tubes Inserted in Circular cross-section conduits running full) 3. To determine the coefficient of discharge of mouthpiece and small orifice by constant head and falling head methods. 4. (IS 14615 (Part 1): 1999 (2004), IS0 5167-1: 1991 – Measurement of Fluid Flow by Means of Pressure Differential Devices, Part 1: Orifice Plates, Nozzles and Venturi Tubes Inserted in Circular cross-section conduits running full) 5. To determine the coefficient of discharge of V-notch (triangular notch) & rectangular notch.(IS 9108 : 1979 (2003) – Liquid Flow Measurement in Open Channels using Thin Plate Weirs) 6. (IS 13083: 1991(2003), IS0 4377: 1990- Liquid Flow Measurement in Open Channels - Flat-V Weirs) 7. To compute the friction factor using Darcy-Weisbach Equation for pipes of different diameters. 8. (IS 2595 (Part I): 1965 (Reaffirmed 2003) – Head loss in Straight Pipes due to frictional resistance. 9. To study the performance characteristics of Pelton wheel turbine. 10. (IS 12800 (Part 3) : 1991 (2003) - Guidelines for Selection of Hydraulic Turbine, Preliminary Dimensioning and Layout of Surface Hydroelectric Powerhouses, Part 3 - Small, Mini And Micro Hydroelectric Power Houses) 11. To study the performance characteristics of the Francis turbine. 12. (IS 12800 (Part 3) : 1991 (2003) - Guidelines for Selection of Hydraulic Turbine, Preliminary Dimensioning and Layout of Surface Hydroelectric Powerhouses, Part 3 - Small, Mini And Micro Hydroelectric Power Houses) 13. To study the working principles of a centrifugal pump. 14. (IS 9137: 1978 (1993) – Code for Acceptance Tests for Centrifugal, Mixed Flow and Axial Pumps - Class C) 15. ISO 9905: 1994 - Technical specifications for centrifugal pumps — Class I 16. Other codes: IS 9118: 1979 (2001) – Method for Measurement of Pressure by means of Manometers
e-Resources & other digital material	1. http://fm-nitk.vlabs.ac.in/ 2. https://nptel.ac.in/courses/112/105/112105171/

20CE3453-MECHANICS OF SOLIDS LAB

Offering Branches	CE	**Year : II**	**Sem: II**
Course Category:	Professional Core	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	Nil	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Assess** the physical properties of materials used for civil engineering structures namely ferrous and non ferrous metals, building making materials.	K3
CO2	**Select** ferrous and non ferrous metals based on its properties.	K2
CO3	**Assess** basic properties of materials namely stress in compression, tension, shear, flexure and modulus of elasticity of materials as per relevant codes of practice.	K3
CO4	**Assess** and **select** good quality materials based on the specification requirements suitable for a particular type of construction.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Stress-strain characteristics of tension members using Universal Testing Machine.	**CO1** CO2 CO3 CO4
Experiment No.2	Determination of Shear strength using double shear test.	
Experiment No.3	Determination of Young's modulus by conducting load deflection test on simply supported beam	
Experiment No.4	Determination of Young's modulus by conducting load deflection test on cantilever beam	
Experiment No.5	Determination of Young's modulus by conducting load deflection test on continuous beam	
Experiment No.6	Verification of Maxwell's reciprocal theorem on simply supported beam	
Experiment No.7	Verification of Maxwell's reciprocal theorem on cantilever beam	
Experiment No.8	Determination of hardness of metals using Rockwell's hardness test.	
Experiment No.9	Impact test by using Izod's method	
Experiment No.10	Impact test by using Charpy test method	
Experiment No.11	Determination of Modulus of rigidity by conducting torsion test on rods.	
Experiment No.12	Modulus of rigidity by conducting compression test on springs	

Learning Resources	
Text Books	1. Mechanics of Soids Lab Manual by Dept. of CE, PVPSIT 2. IS 1608 (2005): Mechanical testing of metals - Tensile Testing [MTD 3: Mechanical Testing of Metals] 3. IS 1500 (2005): Method for Brinell Hardness Test for Metallic Materials [MTD 3: Mechanical Testing of Metals] 4. IS 1501: Method For Vickers Hardness Test for Metallic Materials 5. BIS IS 1598 : 1977(R2015): method for izod impact test of metals 6. BIS IS 1757 : 1988(R2009): Method for Charpy impact test (v-notch) for metallic material 7. IS 1717: Metallic Materials - Wire - Simple Torsion Test 8. S. Timoshenko, Strength Of Materials: Elementary Theory and Problems- Vol.I, 2004.
Reference Books	1. R. Subrahmanian, Strength of Materials, 3/e, Oxford University Press, 2016.
e-Resources& other digital material	1. sm-nitk.vlabs.ac.in 2. http://jntuk-coeerd.in/

20SO8451-ADVANCED SURVEYING LAB USING TOTAL STATION

Offering Branches	CE	Year : II	Sem: II
Course Category:	Skill Oriented Course	Credits:	2
Course Type:	Laboratory	Lecture-Tutorial-Practical:	1-0-2
Prerequisites:	Nil	Continuous Evaluation:	0
		Semester EndEvaluation:	50
		Total Marks:	50

Course Outcomes

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

CO1	**Use** the Total Station for field surveying and **determine** the distances, directions, elevations, height of the objects**.**	K3
CO2	**Interpret** the data and **calculate** the area of a given field**.**	K3
CO3	**Apply** the Knowledge of Tacheometry and find distances**.**	K3
CO4	**Set** out and **develop** the simple curves**.**	K6
CO5	**Develop** the plan and execute plan in field for building or any structures**.**	K6
CO6	**Apply** the knowledge of Total station in preparing map/plans and profiling practically**.**	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO2
CO1	3		3		3			2	2				3	2
CO2	3		3		3			2	2				3	2
CO3	3		3		3			2	2				3	2
CO4	3		3		3			3	3				3	3
CO5	3		3	3	3			3	3				3	3
CO6	3		3	3	3			2	2				3	2
Avg.	3		3	3	**3**			2	2				3	2

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Creating file in Total Station and measurement of distances, Horizontal and vertical angles.	**CO1**
Experiment No.2	Determination of Heights of objects using Total station	
Experiment No.3	Determination of Boundaries of a Field and computation of area using Total station	CO2
Experiment No.4	Determine the horizontal distance between two points on plane ground using Tacheometry	CO3
Experiment No.5	Lay out a simple circular curve by Rankine's method using Theodolite	CO4
Experiment No.6	Setting out of Simple curve using Total Station	
Experiment No.7	Setting out for Building using Total station	CO5
Experiment No.8	Survey Camp using Total station(minimum 5 days) • Preparation of a contour Plan/ Map • Marking of sewer line or profiling of road • Setting out of Plans Areas of irregular fields	CO6

Learning Resources

Text Books	1. B.C. Punmia, A.K. Jain, Arun Jain, Surveying II, 16/e, Laxmi Publications,2017. 2. R. Subramanian, Surveying and Levelling, 2/e, Oxford University Press,2014.
Reference Books	1. S.K. Roy, Fundamentals of Surveying, 2/e, Prentice Hall of India, 2011. 2. T.P. Kanetkar, Surveying and Levelling, Part I and II, 4/e, New Central Book Agency2012.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105/101/105101201/ 2. http://jntuk-coeerd.in/

20MC1401- UNIVERSAL HUMAN VALUES

Offering Branches	CE,CSE,ECE,EEE,IT,ME	Year : II	Sem: II
Course Category:	Mandatory Course	Credits:	0
Course Type:	Theory	Lecture-Tutorial-Practical:	2-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Describe** more aware of themselves, and their surroundings (family, society, nature)	K2
CO2	**Illustrate** more responsibility in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	K2
CO3	**Show** better critical ability	K3
CO4	**Exhibit** sensitivity to their commitment towards what they have understood (human values, human relationship and human society)	K3
CO5	**Apply** what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction - Need, Basic Guidelines, Content and Process for Value Education** Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations: understanding and living in harmony at various levels.	**CO1**
UNIT-2	**Understanding Harmony in the Human Being - Harmony in Myself!** Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer),Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health.	**CO2**

UNIT-3	**Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship** Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship. Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.	**CO3**
UNIT-4	**Understanding Harmony in the Nature and Existence - Whole existence as Coexistence** Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence.	**CO4**
UNIT-5	**Implications of the above Holistic Understanding of Harmony on Professional Ethics** Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.	**CO5**

Learning Resources	
Text Books	1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
Reference Books	1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999. 2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004. 3. The Story of Stuff (Book). 4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

V – SEMESTER SYLLABUS

20CE3501 – DESIGN OF REINFORCED CONCRETE STRUCTURES

Offering Branches	CE	Year : III	Sem: I
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3404-Mechanics of Solids	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Demonstrate** the knowledge of concrete design philosophies, by working and limit state methodology	K2
CO2	**Apply** the principles, procedures and current code requirements to the analysis and design of reinforced concrete beams under flexure by limit state method.	K3
CO3	**Identify** the behavior of reinforced concrete members in bond, anchorage, shear and torsion and **design** the sections for shear and Torsion	K6
CO4	**Analyze** and **design** reinforced concrete One way and Two way slabs.	K6
CO5	**Analyze** and **design** reinforced concrete compression members.	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	Loading standards as per IS 875, grades of steel and concrete, introduction to working stress, ultimate load and limit state methods. Working stress method: Assumptions, flexure of RCC beams of rectangular section, under reinforced, balanced and over-reinforced sections, analysis and design of singly reinforced beams of rectangular sections using working stress method.	CO1
UNIT-2	Limit State Method: RCC beams of rectangular sections under flexure, under reinforced, balanced and over-reinforced sections, analysis and design of singly and doubly reinforced beams of rectangular sections; Design of T beams: effective flange width, analysis and design of T-beams.	CO2
UNIT-3	Shear and Torsion: Limit state of collapse in shear, types of shear failures, truss analogy, shear, span/depth ratio, calculation of shear stress, types of shear reinforcement, design for shear in beams, analysis for torsional moment in a member, torsion shear stress in rectangular sections, reinforcement for torsion in RCC beams.	CO3
UNIT-4	Design of one-way and two-way slabs (using IS 456), method of analysis, classification of slabs, design of one way simply supported slab, behavior of two way slab, types of two way slabs, analysis of two way slabs, design of two way slabs with different edge conditions.	CO4
UNIT-5	Columns: Short columns, minimum eccentricity, column under axial compression, analysis and design of short columns subjected to uniaxial moment, analysis and design of short columns subjected to bi- axial moments. Footings: Design of isolated footings for a column subjected to axial loading.	CO5

Learning Resources

Text Books	1. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2017. 2. A.K. Jain, Reinforced Concrete – Limit State Design, 7/e, Standard book house, 2012.

Reference Books	1. P.C. Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India, 2013. 2. N. Subramanian, Design of Reinforced Concrete Structures, Oxford University, 2014.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105105105/1 2. https://nptel.ac.in/downloads/105105104/

20CE4501A– REPAIR AND REHABILITATION OFSTRUCTURES

Offering Branches	CE	Year : III	Sem: I
Course Category:	Program Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20ES1301- Construction Materials and Concrete Technology	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Examine** the physical causes for deterioration of concrete and damages due to corrosion	K4
CO2	**Asses** the damage through semi destructive and Non-destructive testing methods	K2
CO3	**Apply** the suitable repair materials.	K3
CO4	**Analyse** various cracks and its repair techniques.	K4
CO5	**Identify** the various rehabilitation and strengthening techniques	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Durability and Deterioration of Concrete** **Physical causes:** Durability of concrete, causes of distress in concrete structures, Shrinkage in concrete, honeycombing in concrete, creep of concrete, Temperature changes – Internally generated temperature differences, externally generated temperature differences, Fire on concrete, Thermal movement in concrete, **Corrosion:** Corrosion process, Damages due to corrosion	**CO1**
UNIT-2	**Damage Assessment** Investigation of Damage- Observation, Assessment Procedure Non-Destructive Testing Methods: Introduction, Non-Destructive Testing Methods, Surface Hardness Test, Ultrasonic Pulse velocity test, Semi-Destructive Testing Systems: Core Sampling and Testing, Half -Cell potential survey	**CO2**
UNIT-3	**Repair Materials** Polymeric repair materials, Polymeric coatings, Polymer concrete/mortar composites, Fibre reinforced concrete, Glass fibre reinforced concrete, Polypropene fibre, Carbon fibres, fibre reinforced polymer composites, Concrete made with industrial wastes, Bacterial concrete.	**CO3**
UNIT-4	**Evaluation and Repair Techniques:** Symptoms and Diagnosis of Distress, Evaluation of cracks, Selection of Repair Procedure, Repair of cracks-Preparation of Surface, Repair Techniques, Common types of repairs: Sealing of cracks, Flexible sealing, providing additional steel, Stitching of cracks, Repair by jacketing, Autogenous Healing.	**CO4**
UNIT-5	**Rehabilitation and Strengthening Techniques** **Rehabilitation Techniques:**	**CO5**

	Replacement Mortar- Epoxy bonded epoxy mortar, Replacement Concrete- Epoxy-bonded Replacement concrete, Application, Shotcrete or Gunite, Grouting- Portland Cement Grouts, Polymer Grouts, Epoxy Grouting, Resin injection, Sprayed concrete, Slab jacking technique, Cathodic Protection **Strengthening methods:** Introduction-Need for strengthening, Structural Concrete Strengthening, Column Strengthening, Strengthening with external reinforcement, External Post-tensioning, Section Enlargement, Guidelines for Seismic rehabilitation of existing buildings.	

Learning Resources

Text Books	1. B.Vidivelli, Rehabilitation of Concrete Structures, 1/e, Standard Publishers Distributors, 2018. 2. M.L.Gambhir, Concrete Technology: Theory and Practice, 4/e, Tata McGraw Hill Education Private Limited, 2013. .
Reference Books	1. Peter.H.Emmons and Gajanan.M.Sabnis, Concrete Repair and Maintainence, 2/e, Galgotia Publications Pvt Ltd, 1992. 2. S.Mahaboob Basha, A textbook of Concrete Technology, 1/e, Anuradha Publications, 2011. 3. J.Bhattacharjee, Concrete Structures Repair Rehabilitation and Retrofitting, 1/e, CBS, 2017. 4. P.C.Varghese, Maintenance Repair and Rehabilitation and Minor works of Buildings, 1/e, Prentice Hall India Learning Private Limited, 2014.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105/106/105106202/ - 2. https://freevideolectures.com/course/3489/ocean-structures-and-materials/16 3. https://www.rilem.net/agenda/repair-and-rehabilitation-of-concrete-structures-1242

20CE4501B - FOUNDATION ENGINEERING

Offering branches	CE	Year : III	Sem: I
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3402- Geotechnical Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Show** the sampling procedure for subsequent testing in the lab	K2
CO2	**Determine** the depth of the foundation and construct the shallow foundations under eccentric stress under the complex ground surface conditions	K3
CO3	**Decide** which pile foundation is needed and construct the deep foundation for problematic soil	K5
CO4	**Design** the retaining walls based on the soil-structure interaction response, using force equilibrium analysis	K6
CO5	**Calculate** the governing forces for slope failure and safeguard the soil structure from catastrophic slope failure.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Subsoil Exploration** Methods of subsoil exploration, direct, indirect methods, Dynamic cone and static cone penetration tests. Boring & Sampling: Types of boring, types of samples, criteria for undisturbed samples, transport and preservation of samples, report writing.	**CO1**
UNIT-2	**Shallow Foundations**, **Bearing Capacity Criteria** Types of foundations and factors to be considered in their location, General requirements for the foundation, Analytical Methods of Determining the Bearing Capacity; Theory of elasticity, the classical earth pressure theory, Theory of plasticity, IS Methods **Settlement Criteria:** Safe bearing pressure based on N- value, allowable bearing pressure; safe bearing capacity and settlement from plate load test, Types of foundation settlements and their determination, allowable settlements of structures.	**CO2**
UNIT-3	**Pile Foundations** Classification, load carrying capacity of single pile, dynamic formula, static formula, pile load, cyclic pile load tests, load capacity of pile groups, negative skin friction on plies, under reamed pile foundations in expansive sub-soils.	**CO3**
UNIT-4	**Earth Pressure**: Types of earth pressures, Rankine's active and passive earth pressures,	**CO4**

	Sheet pile structures: Cantilever sheet pile, Anchored bulkheads, Braced sheeting in cuts, Cellular cofferdams	
UNIT-5	**Stability of Slopes** Infinite and finite earth slopes in sand and clay, types of failures, factors influencing slope stability. Stability Analysis: Swedish slip circle – ø = 0 analysis, c-ø analysis, Fellinius method of locating critical slip centre, friction circle methods, Taylor's stability number, Bishop's method of stability analysis.	**CO5**

Learning Resources

Text Books	1. Gopala Ranjan and A.S.R. Rao, Basic and Applied Soil Mechanics, New age Publishers, 2000. 2. C. Venkataramaiah, Geotechnical Engineering, New Age Publishers, 2006.
Reference Books	1. V.N.S. Murthy, Soil Mechanics, Foundation Engineering, UBS Publishers, 2011. 2. J.E. Bowles, Foundation Analysis and Design, McGraw Hill, Publishers, 2001. 3. M.D. Braja, Principles of Geotechnical Engineering, 7/e, Cengage Learning: 2013. 4. P.C. Donald, Geotechnical Engineering, Prentice-Hall India, 2010. 5. Rodrigo Salgado, The Engineering of Foundations, Mcgraw Hill, 2006. 6. Iqbal H, Khan, Textbook of Geotechnical Engineering, Prentice Hall of India,2005.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105105176/

20CE4501C - TRAFFIC ENGINEERING

Offering Branches	CE	Year : III	Sem: I
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3306 – Surveying 20CE3502 – Highway Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Compute** the characteristics of traffic and measurement	K3
CO2	**Explain** the importance of Level of Service and Capacity	K4
CO3	**Appraise** in details about the parking standards and traffic control	K4
CO4	**Prioritize** the importance of traffic environment and signs	K4
CO5	**Examine** about road marking and highway safety	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**TRAFFIC CHARACTERISTICS** Basic characteristics of Traffic- Volume, Speed and Density- Relationship among Traffic parameters. **TRAFFIC MEASUREMENT** Traffic Volume Studies- Types of Volume Studies –Concept of PCU- Data Collection and Presentation – Speed Studies – Types of Speeds- Methods of Conducting speed studies	**CO1**
UNIT-2	**HIGHWAY CAPACITY** Definition of Capacity – Importance of capacity – Factors affecting Capacity- Concept of Level of Service- Different Levels of Service **TRAFFIC REGULATION** Traffic laws, Regulation of speed, Regulation of vehicles, Regulation concerning driver, Regulation concerning traffic.	**CO2**
UNIT-3	**PARKING STUDIES** Types of parking facilities – On street and Off Street Parking Facilities- Analysis of Parking Data and parking characteristics-Multi Story Car Parking Facility **TRAFFIC CONTROL** Traffic Problems in Urban areas- Importance of Traffic Control and regulation.	**CO3**
UNIT-4	**TRAFFIC & ENVIRONMENT** Air Pollution – Measures to reduce Air Pollution due to Traffic- Noise Pollution – Measures to reduce Noise Pollution. **TRAFFIC SIGNS** Types of Traffic Signs- cautionary, Regulatory and Informative Signs- Specifications	**CO4**

UNIT-5	**ROAD MARKINGS** Pavement markings- Types of Markings – Lane markings and Object markings **HIGHWAY SAFETY** Problem of Highway Safety – Types of Road accidents- Causes – Engineering Measures to reduce Accidents- Enforcement Measures – Educational Measures- Road Safety Audit	**CO5**

Learning Resources

Text Books	1. Traffic Engineering and Transportation planning, (2nd edition) by Kadiyali, L.K., Khanna publishers, 1983. 2. Highway Engineering and Traffic Analysis, (3rdedition) by Mannering and Kilareski, John wiley Publications, 2007.
Reference Books	1. Transportation Engineering by Khisty, C. J., Prentice Hall 1986. 2. Principles of Transportation Engineering by Partha Chakroborthy, Animesh Das.Prentice Hall, India, 2004. 3. Fundamentals of Transportation Engineering by Papacostas, C.S.,Prentice Hall, India, 1987.
e- Resources & other digital material	1. https://nptel.ac.in/courses/ 105/101/105101008 2. https://nptel.ac.in/courses/ 105/105/105105215

20CE4501 D–POLLUTION PREVENTION & MANAGEMENT

Offering Branches	CE	**Year : III**	**Sem: I**
Course Category:	Professional Elective course	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3501 - Environmental Engineering 20MC1301 – Environmental Science	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the treatment and disposal methods of rural sanitation	K2
CO2	**Demonstrate** the handling of biomedical waste and its disposal	K2
CO3	**Categorize** the E-waste sources, problems, control measures and E-waste rules	K4
CO4	**Analyse** the characteristics and disposal methods for Hazardous waste	K4
CO5	**Identify** the sources of noise pollution and suggest methods for mitigating the problem.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12	PSO1	PSO2
CO1	2	2	2			2	2						2	2
CO2	2	2	2			2	2						2	2
CO3	3	3	3			3	3						3	3
CO4	2	2	2			3	3						2	3
CO5	2	2	2			2	2						2	2
Avg.	**2**	**2**	**2**			**2**	**2**						**2**	**2**

1- Low **2-Medium** **3-High**

Course Content

I	**Rural Sanitation**-Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas- stabilization ponds - septic tanks - soak pits- low cost excreta disposal systems- Effluent disposal.	**CO1**
II	**Biomedical Waste Management**-Definition-Sources-Classification of biomedical waste – Objectives of Biomedical waste management-segregation-containers for biomedical waste-Labeling Collection- Transport-Disposal methods.	**CO2**
III	**E-Waste management** -Sources- Types- components; Collection process- Segregation-Disposal methods; Effect on air, water and soil; Health hazards; Role of individual for E-waste management. Current E-waste Management Rules	**CO3**
IV	**Hazardous Waste Management:** Hazardous wastes definition, Characteristics, sources of hazardous waste, transportation, treatment and disposal methods and processes	**CO4**
V	**Noise Pollution -** Sources of noise pollution, impacts of noise, measurement of noise and permissible limits of noise. Control methods of noise pollution, The Noise Pollution (Regulation and Control) Rules, 2000 as per CPCB.	**CO5**

Learning Resources	
Text Books	1. Juuti,P., Tapio S. K. and Vuorinen H., Environmental History of Water: Global Views on Community Water Supply and Sanitation, IWA Publishing (Intl Water Assoc), 2007 2. Rittmann, B.E., and McCarty, P.L., Environmental Biotechnology: Principles and Applications, McGraw Hill, 2001.
Reference Books	1. Reddy, L.N. and Inyang. H. I., Geoenvironmental Engineering –Principles and Applications, Marcel Dekker, Inc., New York., 2000An Introduction to Air pollution by Trivedy, R.K., B.S.Publications, 2005. 2. Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing
e- Resources & other digital material	http://www.nptelvideos.in/2012/12/fundamentals-of-environmental-pollution.html

20CE3502 – HIGHWAY ENGINEERING

Offering Branches	CE	Year : III	Sem: I
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101 – Engineering Mathematics – I 20CE3306 – Surveying	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Choose** the highway development and planning in India	K3
CO2	**Analyze** geometric design of highway alignment and management of traffic	K4
CO3	**Demonstrate** traffic intersection and choose material for highway	K3
CO4	**Discriminate** with the design procedures of flexible and rigid pavements	K4
CO5	**Focus** on the construction and maintenance issues related to highways	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**HIGHWAY DEVELOPMENT** Highway development in India–Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports. **HIGHWAY PLANNING** Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Planning Surveys.	**CO1**
UNIT-2	**HIGHWAY GEOMETIC DESIGN** Importance of Geometric Design- Highway Cross Section Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Super elevation and Extra widening- Design of Vertical alignment- Gradients- Vertical curves. **TRAFFIC ENGINEERING AND MANAGEMENT** Traffic Volume Studies- Speed studies- Parking Studies - Road Accidents-Causes and Preventive measures - Road Traffic Signs – Types – Road markings-Types of Road Markings	**CO2**
UNIT-3	**INTERSECTION DESIGN** Types of Intersections –Traffic Islands - Design of Traffic Signals –Webster Method –IRC Method. Types of Grade Separated Intersections- Rotary Intersection –Advantages and Disadvantages of Rotary Intersection. **HIGHWAY MATERIALS** Subgrade soil: California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Tests for Road Aggregates – Bituminous Materials: Tests on Bitumen – Marshall Method of Mix Design.	**CO3**
UNIT-4	**DESIGN OF FLEXIBLE PAVEMENTS** Objects & Requirements of pavements – Types – Functions of pavement components – Design factors – Flexible Pavement Design Methods – CBR	**CO4**

	method – IRC method **DESIGN OF RIGID PAVEMENTS** Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of Joints – IRC method	
UNIT-5	**HIGHWAY CONSTRUCTION** Types of Highway Construction – Construction of Gravel Roads – Construction of Water Bound Macadam Roads – Construction of Bituminous Pavements – Construction of Cement Concrete Pavements. **ADVANCES IN HIGHWAY CONSTRUCTION** Soil stabilisation, Soil-Cement Stabilisation, Soil-Lime Stabilisation	**CO5**

Learning Resources

Text Books	1. Highway Engineering, (9th edition) by Khanna, S.K. and Justo ,C.E.G., Nem Chand Bros, Roorkee, 2010. 2. Traffic Engineering and Transportation Planning, (7th edition) by Kadiyali, L.R., Khanna Publishers, New Delhi, 2010. 3. Specifications for Roads and Bridges - Manual for Maintenance of roads, Most publications, 1976.
Reference Books	1. Fundamentals of Transportation Engineering, (3rd edition) by Papacostas, C.S., Prentice Hall of India Pvt.Ltd, New Delhi, 2009. 2. Principles of Highway Engineering by Kadiyali, L.R., Khanna Publishers, New Delhi, 2012. 3. Traffic Planning and Design by Saxena, Dhanpat Rai Publishers, New Delhi, 2010. 4. Transportation Engineering - An Introduction, (3rd edition) by Jotin Khisty. C, Prentice Hall, Englewood Cliffs, New Jersey, 2012. 5. IRC Code for flexible pavement – IRC – 37 -2001. 6. IRC Code for Rigid pavement – IRC – 58 – 2002.
e- Resources & other digital material	1. https://nptel.ac.in/courses/ 105/101/105101087 2. https://nptel.ac.in/courses/ 105/104/105104098

20CE3503 - STRUCTURAL ANALYSIS

Offering Branches	CE	Year : III	Sem: I
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3404-Mechanics of Solids	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Evaluate** the slopes and deflection in beams and pin jointed frames.	K5
CO2	**Evaluate** the fixed end moments in fixed beams and can analyze two span continuous beams by slope deflection method	K5
CO3	**Analyze** the two span continuous beams by Moment distribution Method and Kani's method	K4
CO4	**Evaluate** the stresses for both concentrically loaded and eccentrically loaded Columns.	K5
CO5	**Evaluate** the stress strain behavior of both the thin and thick cylinders.	K5

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Deflection of Statically Determinate Structures:** Introduction, Pure bending, Relation between curvature, slope and deflection, Deflection curves, Maculay's Method, Moment area method, Slopes and deflection for cantilevers and simply supported beams. **Deflection Of pin jointed frames:** Deflection of trusses by Unit load method (having 9 members or less)	CO1
UNIT-2	**Analysis of Indeterminate Beams** **Fixed beams**: Shear force and bending moment diagrams for Fixed beams subjected to U.D.load, central point load, eccentric point load. Number of point loads, uniformly varying load, couple and combination of loads, effect of sinking of support, effect of rotation of a support. **Two span continuous beams**: Shear force and bending moment diagrams for two span continuous beams with and without sinking of supports using Slope deflection method.	CO2.
UNIT-3	**Analysis of two span continuous beams** **Moment distribution method**: Shear force and bending moment diagrams for two span continuous beams with and without sinking of supports using Moment Distribution Method. **Kani's method**: Shear force and bending moment diagrams for two span continuous beams with and without sinking of supports using Kani's Method.	CO3
UNIT-4	**Columns and Struts**: Introduction, Column with one end free and other fixed, Column with both ends hinged, column with both ends fixed, column with one end fixed and the other hinged, Limitation of Euler's formula, column carrying	CO4

	eccentric load, Rankine-Gordon formula, Perry's formula **Combined bending and direct stresses**–Introduction, Limit of eccentricity for no tension in the section, kernel of a section for rectangular, circular sections.	
UNIT-5	**Thin Cylinders -** Introduction, Stresses and strains in thin cylinders, volumetric change in cylinder. **Thick cylinders: T**hick cylinders subjected to internal pressure and external pressure, compound cylinders.	CO5

Learning Resources

Text Books	1. Pandit.G , Gupta.S and Gupta.R, Theory of Structures Vol.I & II, McGraw Hill Education, 2017. 2. V.N Vazirani and M.M Ratwani, Analysis of Structures Vol-II, Khanna Publishers, 2012
Reference Books	1. C.K.Wang, Statically Indeterminate Structures, TataMcGrawHill, 2010. 2. R.C. Hibbeler, Structural Analysis, 6/e, Pearson, 2011.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105101085/25-31 2. https://onlinecourses.nptel.ac.in/noc17_ce25/preview 3. https://www.edx.org/learn/structural-engineering

20MC1501 - CONSTITUTION OF INDIA

Offering Branches	CE,CSE,ECE,EEE,IT,ME	Year : III	Sem: I
Course Category:	Mandatory Course	Credits:	0
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Enable** the student to **understand** the importance of constitution	K2
CO2	**Understand** philosophy of fundamental rights and duties	K2
CO3	**Understand** the structure of Union government and central and state relation, with respect to financial and administrative, executive, legislature and judiciary	K2
CO4	**Understand** the structure of State and local government with respect to financial and administrative, executive, legislature and judiciary	K2
CO5	**Understand** the autonomous nature of constitutional bodies like Supreme Court and high court, comptroller and auditor general of India and election commission of India, UPSC, SPSCs and NHRC etc.,	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION TO INDIAN CONSTITUTION** Constitutional history, constituent assembly, salient features of the constitution, significance of preamble, amending process of the constitution.	**CO1**
UNIT-2	**RIGHTS AND DUTIES** Citizenship, fundamental rights and directive principles, fundamental duties	**CO2**
UNIT-3	**UNION GOVERNMENT** President and vice president, election, removal and powers, prime minister and council of ministers, parliament, supreme court, union, state relations, emergency provisions.	**CO3**
UNIT-4	**STATE AND LOCAL GOVERNMENTS** Governor, state legislature, assembly and council, chief minister and council of ministers, high court, rural and urban local governments with special reference to 73rd and 74th constitutional amendment acts.	**CO4**
UNIT-5	**OTHER CONSTITUTIONAL AND STATUTORY BODIES** Comptroller and auditor general, election commission, finance commission, attorney general and advocate general, union public service commission (UPSC), state public service commissions (SPSCs), tribunals, national human rights commission (NHRC).	**CO5**

Learning Resources

Text Books	1. J. C. Johari, Indian Government and Politics, Vishal Publications, Delhi, 2009. 2. M. V. Pylee, Introduction to the Constitution of India, 5/e, Vikas Publishing

	House, Mumbai, 2007.
Reference Books	1. D.D. Basu, Introduction to the Indian Constitution, 21/e, Lexis Nexis, Gurgaon, India, 2011. 2. Subhas C. Kashyap, Our Constitution, 2/e, National Book Trust India, New Delhi, 2013
e-Resources& other digital material	1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/

20CE 2501A - AIR POLLUTION & CONTROL

Offering Branches	CE	Year : III	Sem: I
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20MC1301 - Environmental Science	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the various types of air pollutants and their effects.	K2
CO2	**Examine** the behavior of air pollutants with reference to meteorological parameters	K3
CO3	**Analyze** the samples, pollutants from atmosphere	K4
CO4	**Identify and Understand** the different methods to control the particulate matter	K4
CO5	**Categorize and understand** the methods for the control of pollutants from gaseous emissions	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**AIR POLLUTION & EFFECTS** Air pollution - definitions-scope, significance -air pollutants -classification – natural and artificial-primary and secondary air pollutants. Effect of air pollutants on man-material and vegetation-global effects of air pollution greenhouse effect, acid rains and ozone layer threat.	**CO1**
UNIT-2	**METEROLOGY AND PLUME DISPERSION** Properties of atmosphere-heat, pressure, wind forces, moisture and relative humidity influence of meteorological phenomenon on air quality- wind rose diagram, inversions and Plume behavior, Gaussian model for plume dispersion.	**CO2**
UNIT-3	**SAMPLING OF AIR POLLUTION**: Stack sampler; Sampling Procedure- Sampling point – size – Isokinetic Conditions – Sampling of Particulate matter and Gases. Sampling methods–Indian standard methods of analysis of SO_2 and NO_x gases- Air Quality and Emission standards.	**CO3**
UNIT-4	**METHODS OF CONTROLLING AIR POLLUTION** Different means of control of effluent discharges into the atmosphere. Control of Particulate matter by equipment -Settling chamber, inertial separators, fabric filters, wet scrubbers, Electrostatic Precipitators	**CO4**
UNIT-5	**CONTROL OF GASEOUS POLLUTANTS:** Controlling methods of Gaseous Emissions- combustion, adsorption, absorption, closed collections and recovery systems- Control of SO_2 and NO_x gases.	**CO5**

Learning Resources

Text Books	1. Air Pollution and Control by Rao M.N and Rao, H.N., Tata McGraw Hill, New Delhi 2007. 2. Environmental Engineering and Management, (2nd Edition) by Suresh, S. K. Kartarai & Sons, 2005.

Reference Books	1. An Introduction to Air pollution by Trivedy, R.K., B. S. Publications, 2005. 2. Air pollution by Wark and Warner, Addison-Wesley Publications, 1998.
E-Resources & other digital material	https://nptel.ac.in/courses/105102089/8

20CS2501A - PROGRAMMING WITH C

Offering Branch	CSE	**Year : III**	**Sem: I**
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the principles of structured programming and C constructs	**K2**
CO2	**Apply** suitable control constructs and array concepts to solve problems.	**K3**
CO3	**Apply** the concept of pointers, user defined data types and files to solve problems.	**K3**
CO4	**Analyze** the given problem and use modular programming approach to develop solutions.	**K4**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		3							3	3				
Avg.	**3**	**3**							**3**	**3**				

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to C Programming Language**: variables, Data types, Constants, Identifiers, Syntax and Logical Errors in compilation, object and executable code, Structure of a C program: expressions and precedence, Expression evaluation, type conversion, Operators(**Bitwise Operators**: Logical Bitwise Operators, Shift Operators.), Storage classes (auto, extern, static and register),	**CO1 CO2**
UNIT-2	**Conditional Branching:** Writing and evaluation of conditional statements and branching with if, if-else, switch-case, ternary operator, go to statements. **Iterative Statements:** while, do-while and for loops, Nested loops, breakand continue statements, Other Statements Related to Looping, Looping Applications, and Programming Examples.	**CO1 CO2 CO4**
UNIT-3	**Arrays:** Declaration, Accessing array elements, Storing values, Operations on arrays. Programming Examples-Calculate Averages. **Strings:** Introduction, String Input/output functions, String manipulation functions, String conversions, Programming Examples**.**	**CO1 CO2 CO3**
UNIT-4	**Functions:** Functions in C, Declaring a function, Parameters and return type of a function, passing parameters to functions, call by value, call by reference, User-Defined Functions, Programming Examples	**CO1 CO2 CO3 CO4**
UNIT-5	**Pointers:** Introduction, Declaration and Initialization of pointer variables, Pointerarithmetic and Arrays, Examples on Pointers. **Files in C:** Using Files in C, Read data from files, Writing data to files, Random access to files of records, Copying the Data . **Structures**- Introduction, Declaration and Initialization, Unions.	**CO1 CO2 CO3 CO4**

Learning Resources

Text books:	**1.** Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE, 2019
Reference	1. Programming in C, Reema Thareja, AICTE Edition, 2018, Oxford

books	University Press. 2. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R.F.Gilberg, Third Edition, 2007, Cengage Learning. 3. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition) 4. Programming in C, PradipDey, Manas Ghosh, AICTE Edition, Oxford University Press. 5. Programming with C, B. Gottfried, Third Edition, 2017, Schaum's outlines, McGraw Hill. 6. Problem Solving & Program Design in C,Jeri R. Hanly,Ellot B. Koffman,5th Edition, Pearson.
e- Resources & other digital material	1. http://cprogramminglanguage.net/ 2. https://www.geeksforgeeks.org/c-programming-language/ 3. https://www.greatlearning.in/academy/learn-for-free/courses/c-programming 4. https://www.udemy.com/course/the-complete-c-programming/ 5. https://nptel.ac.in/courses/106/105/106105171/

20EC 2501A - SENSOR TECHNOLOGY

Offering Branch	ECE	**Year : III**	**Sem: I**
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the concept of sensors and its characteristics.	K2
CO2	**Select** the physical principles of sensing based on sensor signals and systems	K3
CO3	**Identify** the sensor interfacing with various electronics circuits	K3
CO4	**Utilize** the practical approach in design of technology based on different sensors.	K3
CO5	**List** various sensor materials and technology used in designing sensors.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Sensors Fundamentals and Characteristics** Sensors, Signals and Systems; Sensor Classification; Units of Measurements; Sensor Characteristics	CO1, CO2
UNIT-2	**Physical Principles of Sensing** Electric Charges, Fields, and Potentials; Capacitance; Magnetism; Induction; Resistance; Piezoelectric Effect; Hall Effect; Temperature and Thermal Properties of Material; Heat Transfer; Light; Dynamic Models of Sensor Elements	CO1, CO2
UNIT-3	**Interface Electronic Circuits** Input Characteristics of Interface Circuits, Amplifiers, Excitation Circuits, Analog to Digital Converters, Direct Digitization and Processing, Bridge Circuits, Data Transmission, Batteries for Low Power Sensors	CO1, CO3
UNIT-4	**Sensors in Different Application Area** Occupancy and Motion Detectors; Position, Displacement, and Level; Velocity and Acceleration; Force, Strain, and Tactile Sensors; Pressure Sensors, Temperature Sensors	CO1, CO4
UNIT-5	**Sensor Materials and Technologies** Materials, Surface Processing, Nano-Technology	CO1, CO5

Learning Resources

Text books:	**1.** J. Fraden, Handbook of Modern Sensors:Physical, Designs, and Applications, AIP Press, Springer**.** **2.** D. Patranabis, Sensors and Transducers, PHI Publication, New Delhi
Reference books	1. Mechatronics- Ganesh S. Hegde, Published by University Science Press (An imprint of Laxmi Publication Private Limited).
e- Resources & other digital	1. http://www.infocobuild.com/education/audio-video-courses/electronics/IndustrialInstrumentation-IIT-Kharagpur/lecture-34.html

material	

20EC2501B - ELECTRONIC INSTRUMENTATION

Offering Branch	ECE	**Year : III**	**Sem: I**
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Comprehend** the concepts of Electronic instrumentation	K2
CO2	**Identify** the Performance characteristics of instruments	K3
CO3	**Illustrate** the different types of Signal Generator, Wave Analyzers& Bridges	K3
CO4	**Analyze** the various types of Oscilloscopes	K4
CO5	**Illustrate** the concept of various types of Transducers.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Performance characteristics of instruments:** Static characteristics, Errors in Measurement, Dynamic Characteristics, DC Voltmeters- Multi range, Range extension, Thermo couple type RF ammeter, Ohmmeters series type, shunt type, Miltimeteres for Voltage, Current and resistance measurements.	CO1, CO2
UNIT-2	**Signal Generator& Wave Analyzers :** Fixed and variable signal generators, AF oscillators, Standard signal generator, AF sine and square wave signal generators, Function Generators, Basic wave analyzers, Frequency selective wave analyzers, Hetero- dyne wave analyzer, Harmonic Distortion Analyzers, Spectrum Analyzers.	CO1, CO3
UNIT-3	**Oscilloscopes:** Dual trace oscilloscope, Measurement of amplitude, period and frequency, Sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope.	CO1, CO4
UNIT-4	**Bridges:** Wheatstone Bridge, AC Bridges Measurement of inductance- Maxwell's bridge, Measurement of capacitance - Schearing Bridge. Wien Bridge, Q-meter.	CO1, CO3
UNIT-5	**Transducers:** Resistance, Capacitance, inductance, Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors, force, pressure, velocity, humidity, moisture, speed, Data acquisition system.	CO1, CO5

Learning Resources

Text books:	1. Electronic instrumentation, - H.S.Kalsi, Tata McGraw Hill, 2nd edition 2004. 2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
Reference books	1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition,2003.

	2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.twitter, Pearson Education, 2nd Edition ,2004

20EE2501A - ELECTRICAL SAFETY

Offering Branch	EEE	**Year : III**	**Sem: I**
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the Indian power sector organization and Electricity rules, electrical safety in residential, commercial, agriculture, hazardous areas and use of fire extinguishers.	**K2**
CO2	**Assess** the Electrical Safety measures in operation and maintenance.	**K3**
CO3	**Apply** the **s**afety measures during installation, testing and commissioning.	**K3**
CO4	**Analyze** the Electrical Safety, Electric Shocks and Their Prevention.	**K4**
CO5	**Examine** the hazardous areas and the fire extinguishers.	**K4**
CO6	**Submit** a report on safety measures.	**K2**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					1		1				1		
CO3	2		–					1				1		
CO4		3				1								
CO5		3												
CO6	3	3						3	3	3				
Avg.	**3**	**3**				**1**		**3**	**3**	**3**		**1**		

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction To Electrical Safety, Shocks And Their Prevention:** Terms and definitions, objectives of safety and security measures, Hazards associated with electric current and voltage, principles of electrical safety, Approaches to prevent Accidents. Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shop.	CO1, CO2 CO3, CO4, CO6
UNIT-2	**Electrical Safety in Residential, Commercial and Agricultural Installations**: Wiring and fitting –Domestic appliances –water tap giving shock –shock from wet wall –fan firing shock –multi-storied building – Temporary installations – Agricultural pump installation –Do's and Don'ts for safety in the use of domestic electrical appliances.	CO1, CO2 CO4, CO6
UNIT-3	**Electrical Safety during Installation, Testing and Commissioning, Operation and Maintenance**: Preliminary preparations –safe sequence – risk ofplant and equipment –safety documentation –field quality and safety - personal protective equipment –safety clearance notice –safety precautions – safeguards for operators –safety.	CO1, CO3 CO4, CO6
UNIT-4	**Electrical Safety in Hazardous Areas**: Hazardous zones –class 0,1 and 2 –	

	spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipment's for hazardous locations **Equipment Earthing**: Introduction, Equipment earthing, Functional requirements of Earthing system, Neutral grounding, Protection against energized Metal parts.	CO1, CO2, CO5, CO6
UNIT-5	**Fire Extinguishers**: Fundamentals of fire-initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system; CO_2, Halogen gas and foam schemes.	CO1, CO5, CO6

Learning Resources

Text Books	1. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 4th edition, 2020 2. John Codick, "Electrical safety hand book", McGraw Hill Inc., 3rd edition, 2006
Reference Books	1. Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth Company, 3rd edition, 1998. 2. Kothari, D.P and Nagrath, I.J., "Power System Engineering", McGraw Hill, 3rd edition, 2019. 3. Wadhwa, C.L., "Electric Power Systems", New Age International, 8th edition, 2004.

20IT2501A - CYBER LAWS

Offering Branch	IT	**Year : III**	**Sem: I**
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts of Section 80 of IT Act 2000, Cyber Crime, Computer Crime, Internet Theft/Fraud, Goods and Services.	**K2**
CO2	**Demonstrate** the basic concepts of Cognizable and Non-Cognizable Offences, Hacking, Teenage Web Vandals, Prevalence and Victimology, Consumer Protection Act.	**K3**
CO3	**Analyze** the concepts of Arrest for "About to Commit" an Offence Under the IT Act, A tribute to Draco, Cyber Fraud, Computer as Commodities, Consumer Complaint.	**K4**
CO4	**Explain** the concepts of Arrest, But No Punishment, Cyber Cheating, Theft of Intellectual Property, Restrictive and Unfair Trade practices	**K4**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						3	3	3					3	3
CO2						3	3	3					3	3
CO3						3	3	3					3	3
CO4						3	3	3					3	3
Avg.						3	3	3					3	3

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**The IT Act, 2000:A Critique:** Crimes in Millennium, Section 80 of the IT Act, 2000-AWeapon or a Farce?, Forgetting the Line between Cognizable and Non-Cognizable Offences, Arrest for "About to Commit" an Offence Under the IT Act, A tribute to Draco, Arrest, But No Punishment	**CO1, CO2, CO3, CO4**
UNIT-2	**Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000:** Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cyber Cheating.	**CO1, CO2, CO3, CO4**
UNIT-3	**Traditional Computer Crime: Early Hacker and Theft of Components:** Traditional Problems, Recognizing and Defining Computer Crime, Phreakers: Yesterday's Hackers, Hacking, Computer as Commodities, Theft of Intellectual Property.	**CO1, CO2, CO3, CO4**
UNIT-4	**Identity Theft and Identity Fraud:** Typologies of Internet Theft/Fraud, Prevalence and Victimology, Physical Methods of Identity Theft.	**CO1, CO2, CO3, CO4**
UNIT-5	**Protection of Cyber consumers in India:** Are Cyber consumers Covered under the Consumer Protection Act?, Goods and Services, Consumer Complaint, Restrictive and Unfair Trade practices	**CO1, CO2, CO3, CO4**

Learning Resources	
Text Books	1. Vivek Sood, “Cyber Law Simplified”, Tata McGraw Hill. 2. Marjie T. Britz, “Computer Forensics and Cyber Crime”, Person. 3. Ferrera, “Cyber Laws Texts and Cases”, Cengage.
Reference Books	1. Vakul Sharma, "Handbook Of Cyber Laws" Macmillan India Ltd, 2 nd Edition,PHI,2003. 2. Justice Yatindra Singh, " Cyber Laws", Universal Law Publishing, 1 st Edition,New Delhi, 2003. 3. Sharma, S.R., “Dimensions Of Cyber Crime”, Annual Publications Pvt. Ltd., 1st Edition, 2004. 4. Augastine, Paul T.,” Cyber Crimes And Legal Issues”, Crecent Publishing Corporation, 2007
E-Resources & other digital material	1. https://www.coursera.org/lecture/cyber-conflicts/introduction-to-cybercrime-and-fundamental-issues-xndSq 2. https://www.youtube.com/watch?v=F7mH5vz1qEI&list=PLf8YqCm9HoI6fb4LdoY2tFgJfM0PrgInS&ab_channel=ComputingforAll 3. https://www.youtube.com/watch?v=F7mH5vz1qEI&t=41s&ab_channel=ComputingforAll

20ME2501A - DESIGN THINKING

Offering Branch	ME	**Year : III**	**Sem: I**
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the principles of design thinking and its approaches	K2
CO2	**Apply** the empathy, the Define phase and develop an idea through ideation Techniques in human-centered design problems.	K3
CO3	**Apply** the design thinking techniques for innovation processes	K3
CO4	**Analyze** the prototype and test in a design thinking context.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			3			2	2		3	3	2	2	2	3
CO2			3			2	2		3	3	2	2	1	3
CO3			3			2	2		3	3	3	2	1	3
CO4			3			2	2		3	3	2	2	1	3
Avg.			**3**			**2**	**2**		**3**	**3**	**2**	**2**	**1**	**3**

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Design Thinking** An insight into Design, Design Methodology, the origin of Design thinking, Design thinking Vs Engineering thinking, the importance of Design Thinking, Design Vs Design thinking, understanding Design thinking and its various process models or frameworks, Stanford process models and its five stages, features of design thinking, application of Design thinking	**CO1**
UNIT-2	**Empathize in Design Thinking:** Human-Centered Design (HCD) process, explanation of HCD design thinking with examples, Role of Empathy in design thinking, persona creation and its importance, tools of empathy: Empathy maps, advantages and disadvantages of empathy maps, Customer journey map and its advantages & disadvantages, Mind Maps, and its uses, understanding empathy tools.	**CO1 CO2**
UNIT-3	**Define Phase and Ideation:** Explore define phase in Design Thinking, Methods of Define phase. Introduction to ideation Methods, convention methods for ideation, intuitive methods: Brainstorming, storyboard telling, select ideas from ideation Methods: Bingo Selection, Six Thinking Hats.	**CO1 CO2**
UNIT-4	**Prototyping and Testing**: Prototyping and methods of prototyping, Difference between low fidelity and high-fidelity prototypes, paper prototyping, techniques for implementing paper prototyping, Digital prototyping, user testing methods, Advantages, and disadvantages of user Testing/ Validation	**CO1 CO3**
UNIT-5	**Design Thinking for Innovation**: Innovation in Design Thinking, Definition of innovation, the art of innovation, types of innovations, product innovation, process innovation, and organizational innovation, characteristics of innovation, levels of innovation, Innovation towards	**CO1 CO3**

	design, Case studies	

Learning Resources

Text books:	1. Changebydesign,Tim Brown,2009,HarperCollins 2. Engineering design, George E Dieter,4th Revisededition,2009 McGraw Hill.
Reference books	1. Design Thinking for Strategic Innovation, Idris Mootee,2013, JohnWiley&Sons 2. DesignThinking-TheGuidebook–FacilitatedbytheRoyalCivil serviceCommission, Bhutan 3. Design Methods: A Structured Approach for DrivingInnovation in Your Organization, Vijay Kumar, FirstEdition, 2012, Wiley 4. Human-Centered Design Toolkit: An Open-SourceToolkittoInspireNewSolutionsintheDeveloping 4. World,IDEO,SecondEdition,2011, IDEO
e- Resources & other digital material	1. https://www.interaction-desiqn.ora/literature/topics/desiqn-thinkinq 2. https://www.interaction-desiqn.prq/literature/article/how-tq-<eve'op-an empath\capproach-in-design-thinking

20ME2501B - LOGISTICS & SUPPLY CHAIN MANAGEMENT

Offering Branch	ME	**Year : III**	**Sem: I**
Course Category:	Open Elective -I	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Identify the importance of Supply Chain Management	K2
CO2	Explain different Inventory control techniques	K1
CO3	Design various Supply Chain Networks suitable for various market conditions	K3
CO4	Discuss supply chain strategies and procurement strategies	K1
CO5	Identify various issues in Supply Chain Management	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Supply Chain Management (SCM):** Concept of supply management and SCM, importance of supply chain flows, core competency, value chain, elements of supply chain efficiency, key issues in SCM, decision phases, supply chain integration, process view of a supply chain, competitive strategy and supply chain strategies, uncertainties in supply chain, supply chain drivers.	**CO1**
UNIT-2	**Inventory Management**: Introduction, selective control techniques, cost involved in inventory system, single stage inventory control, economic lot size models, application to economic production quantity, effect of demand uncertainty, single period models, initial inventory, multiple order opportunities, deterministic models, quantity discounts. periodic and quantity review policies, mathematical modeling under known stock out costs and service levels, joint replenishment for multiple items, inventory system constraints, working capital restrictions, and storage space restrictions.	**CO2**
UNIT-3	**Designing Supply Chain Network:** Introduction, network design, factors influencing network design, data collection, data aggregation, transportation rates, warehouse costs, capacities and locations, models and data validation, key features of a network configuration, impact of uncertainty on network design, network design in uncertain environment, value of information: Bullwhip effect, information sharing, information and supply chain trade-offs, distribution strategies, direct shipment distribution strategies, transshipment and selecting appropriate strategies.	**CO3**
UNIT-4	**Supply Chain Integration:** Introduction, push-pull supply chains, identifying appropriate supply chain strategy, Sourcing and procurement, outsourcing benefits, importance of suppliers, evaluating a potential supplier,	**CO4**

	supply contracts, competitive bidding and negotiation. Purchasing, objectives of purchasing, relations with other departments, centralized and decentralized purchasing, purchasing procedure, types of orders, e-procurement, tender buying, role of business in supply chains.	
UNIT-5	**Issues in Supply Chain Management:** Introduction, risk management, managing global risk, issues in international supply chain, regional differences in logistics. Local issues in supply chain, issues in natural disaster and other calamities, issues for SMEs, organized retail in India, reverse logistics.	**CO5**

Learning Resources

Text books:	1. Simchi-Levi, D. Kaminsky, P.Simchi-Levi, E. and Ravi Shankar, Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies, 3/e, Tata McGraw-Hill, 2008. 2. Chopra, S. and Meindl, Supply Chain Management: Strategy, Planning and Operations, 2/e, Pearson Education, 2004.
Reference books	1. Doebler, D.W. and Burt, D.N, Purchasing and Supply Management-Text and Cases, 6/e, McGraw- Hill, 1996. 2. Tersine, R.J, Principles of Inventory and Materials Management, 4/e, Prentice Hall, 1994.
e- Resources & other digital material	1. ttps://ocw.mit.edu/courses/engineering-systems-division/esd-273j-logistics-and-supply-chain-management-fall-2009/lecture-notes/ 2. https://nptel.ac.in/courses/110/108/110108056/

20CE3551- ENVIRONMENTAL ENGINEERING LAB

Offering Branches	CE	**Year : III**	**Sem: I**
Course Category:	Professional core course	Credits:	1.5
Course Type:	Theory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	20CE3401 - Environmental Engineering 20BS1254 - Chemistry of Materials lab	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	Conduct the experimental testing of pH, turbidity, conductivity, total dissolved solids and alkalinity or acidity tests and understand their significance and application	K3
CO2	Conduct the experimental testing of Hardness, chlorides, total organic and inorganic solids tests in water and understand their significance and application	K3
CO3	Conduct the experimental testing of iron, nitrogen and optimum dosage of coagulant tests in water and understand their significance and application	K3
CO4	Test various waste water quality parameters DO, BOD & COD and understand their significance and application.	K3
CO5	Determine the chlorine demand and Understand the MPN Calculation.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Determination of pH and Turbidity.	CO1
Experiment No.2	Determination of Conductivity and Total dissolved solids.	
Experiment No.3	Determination of Alkalinity/Acidity	
Experiment No.4	Determination of Hardness	**CO2**
Experiment No.5	Determination of Chlorides	
Experiment No.6	Determination and Estimation of total solids, organic solids and inorganic solids	
Experiment No.7	Determination of Iron.	CO3
Experiment No.8	Determination of Nitrogen	
Experiment No.9	Determination of Optimum coagulant dose.	
Experiment No.10	Determination of DO	CO4
Experiment No.11	Determination of B.O.D	
Experiment No.12	Determination of C.O.D	
Experiment No.13	Determination of Chlorine demand	CO5
Experiment No.14	MPN Test Calculation (Demo)	

Learning Resources

Text Books & Reference Manuals	1. Chemistry for Environmental Engineering by (4th edition) by Sawyer and Mc. Carty, McGraw - Hill International Book Company, 1994. 2. IS codes (testing) & (standard values) for water Standard Methods for

	Analysis of water and Waste Water – APHA
Reference Books	1. NME-ICT, MHRD, NITTTR Chennai
e- Resources & other digital material	1. https://nptel.ac.in/courses/105104102/ 2. https://nptel.ac.in/courses/105105048/

20CE3552 – HIGHWAY ENGINEERING LAB

Offering Branches	CE	**Year : III**	**Sem: I**
Course Category:	Program Core	Credits:	1.5
Course Type:	Practical	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	19BS1101 – Engineering Mathematics – I 19CE3306 – Surveying	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Demonstrate** road aggregate suitability in pavement construction.	K3
CO2	**Examine** bituminous material suitability in pavement construction.	K3
CO3	**Calculate** the mix proportions of the Bituminous mixes and subgrade properties.	K3
CO4	**Analyze** the volume, speed studies, traffic surveys at mid block, intersection and parking study.	K4
CO5	**Interpret** the air pollution and noise pollution.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			3	3									3	3
CO2			3	3									3	3
CO3			3	3									3	3
CO4			3	3									3	3
Avg.			3	3									3	3

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Aggregate Crushing value test	CO1
Experiment No.2	Aggregate Impact value test	
Experiment No.3	Specific Gravity and Water Absorption tests	
Experiment No.4	Deval's Attrition value test	
Experiment No.5	Los Angeles Abrasion value test	
Experiment No.6	Shape tests	
Experiment No.7	Penetration Test	CO2
Experiment No.8	Ductility Test	
Experiment No.9	Softening Point Test	
Experiment No.10	Flash and Fire point tests	
Experiment No.11	Viscosity test	
Experiment No.12	Marshall method	CO3
Experiment No.13	North Dakota cone test	
Experiment No.14	Swell test	
Experiment No.15	Traffic volume study at mid blocks	CO4
Experiment No.16	Studies at intersection	
Experiment No.17	Turning movement	
Experiment No.18	Spot speed studies	
Experiment No.19	Parking study	
Experiment No.20	Air pollution measurement	CO5
Experiment No.21	Noise Pollution measurement	

Learning Resources

Text Books &	1.TE Lab Manual, Dept. of Civil Engg., PVPSIT.

Reference Manuals	2. Highway Engineering, (9th edition) by Khanna, S.K. and Justo ,C.E.G., Nem Chand Bros, Roorkee, 2010. 3. Traffic Engineering and Transportation Planning, (7th edition) by Kadiyali, L.R., Khanna Publishers, New Delhi, 2010. 4. Specifications for Roads and Bridges - Manual for Maintenance of roads, Most Publications,1976.
Reference Books	1. Fundamentals of Transportation Engineering, (3rd edition) by Papacostas, C.S., Prentice Hall of India Pvt.Ltd, New Delhi, 2009. 2. Principles of Highway Engineering by Kadiyali, L.R., Khanna Publishers, New Delhi, 2012. 3. Traffic Planning and Design by Saxena, Dhanpat Rai Publishers, New Delhi, 2010. 4. Transportation Engineering - An Introduction, (3rd edition) by Jotin Khisty. C, Prentice Hall, Englewood Cliffs, New Jersey, 2012.
e- Resources & other digital material	http://nptel.ac.in/courses.php http://jntuk-coeerd.in/

20SA8551 – COMPUTER AIDED BUILDING DRAWING USING AUTO CAD

Offering Branches	CE	**Year : III**	**Sem: I**
Course Category:	Skill oriented Course	Credits:	2
Course Type:	Laboratory	Lecture-Tutorial-Practical:	1-0-2
Prerequisites:	20ES1351 – Construction materials and Concrete Technology	Continuous Evaluation:	-
		Semester End Evaluation:	50
		Total Marks:	50

Course Outcomes

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

CO1	**Develop** the ability to draft civil engineering drawing using CAD software	K4
CO2	**Demonstrate** the knowledge of local bylaws and will be able to design the building in accordance with local regulations**.**	K3
CO3	**Design** the different types of building in accordance with climatic conditions, with environmentally responsibility and as per the requirements of the owner**.**	K4
CO4	**Create** working drawings for construction**.**	K6
CO5	**Create** detailed drawing of utilities including water supply, sanitary and electrical layout as layers**.**	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	**PRINCIPLES OF CIVIL ENGINEERING** drawing and introduction to AutoCAD, Concept of setbacks, carpet area, plinth area, floor area ratio, and floor space index, super built-up area, bubble diagram and coverage. Introduction to urban and municipal bylaws as per national building codes.	CO1, CO2
Experiment No.2	**Foundations**: Plan and sectional elevation of Stepped wall footing, isolated R.C.C stepped and sloped footing (with Reinforcement details)	CO1
Experiment No.3	**Openings**: a. Plan and sectional elevation of Doors (Fully panelled, half panelled, flush) b. Plan and sectional elevation of Windows (Fully panelled, half panelled, glazed)	CO3
Experiment No.4	Concept of plan, elevation, cross section, schedule of opening and site plan of a single bed residential building	CO3
Experiment No.5	Concept of plan, elevation, cross section, schedule of opening and site plan of a single bed residential building	CO3
Experiment No.6	Development of plan, elevation and section of building from single line diagram.	CO3
Experiment No.7	Space design of a apartment building using circulation diagram satisfying the given requirement.	CO3
Experiment No.8	Space design of a primary health Centre.	CO3
Experiment No.9	Space design of a educational building.	CO3
Experiment No.10	Space design office building.	CO3
Experiment	Space design of post office and bank building.	CO3

No.11		
Experiment No.12	Development of water supply, sanitary and electrical drawing for a given residential building as a layer.	CO5
Experiment No.13	Development of center line drawing for a storied building- footing, column, beam locations.	CO4
	Learning Resources	
Text Books & Reference Manuals	1. Shah M.H and Kale C.M,"Building Drawing", Tata Mc Graw Hill Publishing co. Ltd., New Delhi 2. Gurucharan Singh and Subash Chander, "Civil Engineering Drawing". (2014), English Standard Publishers and Dist., Delhi. N. Chakraborti, "Civil Engineering Drawing", 2004, Bhaktivedanta Book Trust, Kolkata.	
Reference Books	1. Shah M H and Kale C M, "Building drawing", Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi. 2. 2. Gurucharan Singh, "Building Construction", Standard publishers and distributors, NewDelhi. 3. National Building Code, BIS, New Delhi. 4. Sham Tickoo, "Understanding AUTOCAD 2004 A beginner's Guide", Wiley Dreamtech India Pvt Ltd. Jayaram M A., Rajendra Prasad D S., "A referral on CAD Laboratory", Sapna Publications.Pvt. Ltd	
e- Resources & other digital material	http://nptel.ac.in/courses.php http://jntuk-coeerd.in/	

20CE3581A – SUMMER INTERNSHIP

Offering Branches	CE	Year : III	Sem: I
Course Category:	Internship	Credits:	1.5
Course Type:	Practical	Lecture-Tutorial-Practical:	0-0-0
Prerequisites:	NIL	Continuous Evaluation:	-
		Semester End Evaluation:	50
		Total Marks:	50

Course Outcomes

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

CO1	**Enhance** capability to acquire and **apply** fundamental principles of engineering	K3
CO2	**Become** master in one's specialized technology	K3
CO3	**Become** updated with all the latest changes in technological world	K3
CO4	**Demonstrate** hands on practice within a real job situation	K2
CO5	**Inculcate** self-improvement through continuous professional development and life-long learning	K5
CO6	**Be** a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO2	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO3	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO4	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO5	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO6	3	2	2	3	3	3	1	3	3	3	3	3	3	2
Avg.	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

1- Low **2-Medium** **3-High**

Course Content

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.

CO1 CO2 CO3 CO4 CO5

• Expose students to the engineer's responsibilities and ethics. • Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control. • Promote academic, professional and/or personal development. • Expose the students to future employers. • Understand the social, economic and administrative considerations that influence the working environment of industrial organizations Understand the psychology of the workers and their habits, attitudes and approach to problem solving.	

Guidelines:

1. The student has to complete the internship for a period of 4 to 6 weeks during summer vacation between IV Semester & V Semesters.
2. The internship can be carried out in any industry / R&D Organization / Research Institute / Premier Educational Institutes like IITs, NITs and IIITs etc.
3. The registration process of internship should be completed before the commencement of IV-semester end examinations.
4. The registration process for internship involves:
    a) Students have to approach respective course coordinator with name of proposed company / organization in which they wish to carry out internship.
    b) The Department shall nominate guide to supervise the interns.
    c) Student has to obtain a no objection certificate (NOC) in the prescribed format from the department and submit the same to the respective organization.
    d) Student has to submit acceptance letter issued by the respective organization to the course coordinator.
5. The internal guide has to visit place of internship at least once during student's internship.
6. The students shall report the progress of the internship to the guide in regular intervals and seek advice.
7. After the completion of Internship, students shall submit a final report along with internship and attendance certificates to the course coordinator with the approval of internal guide.
8. The evaluation of internship shall be done during VII-Semester.
9. The student has to give a PPT presentation for duration of 10 to15 minutes in the presence of departmental evaluation committee consists of Head of the Department, External Examiner and One Senior Faculty from the respective departments.
10. After the successful presentation by the student, the evaluation committee recommends the result as satisfactory for the internship.
11. In case of students who have not registered for internship / not submitted the internship certificate and report, the V-Semester result will not be declared till completion for that student.

20CE3591 – COMMUNITY SERVICE PROJECT

Offering Branches	CE	**Year : III**	**Sem: I**
Course Category:	Community Service project	**Credits:**	4
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-0
Prerequisites:	NIL	**Continuous Evaluation:**	-
		Semester End Evaluation:	50
		Total Marks:	50

Course Outcomes

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

CO1	**Enhance** Positive impact on students' academic learning in view of the classroom to field and vice versa experience	K3
CO2	Improves students' ability to **apply** what they have learned in "the real world"	K3
CO3	**Enhance** Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development	K3
CO4	**Demonstrate** Improved ability to understand complexity and ambiguity	K2
CO5	**Inculcate** Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills	K5
CO6	**Improve** Connections with professionals and community members for learning and career opportunities	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO2	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO3	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO4	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO5	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO6	3	2	2	3	3	3	1	3	3	3	3	3	3	2
Avg.	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

1- Low **2-Medium** **3-High**

Course Content

Introduction

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development
- Community Service Project involves students in community development and service activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

CO1 CO2 CO3 CO4 CO5

Objective

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On the Job Training, whenever there is an exigency when students cannot pursue their summer internships. The specific objectives are;

- To sensitize the students to the living conditions of the people who are around them,
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability
- To make students aware of their inner strength and help them to find new /out of box

solutions to the social problems.

- To make students socially responsible citizens who are sensitive to the needs of the disadvantaged sections.
- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project

- Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- The log book has to be countersigned by the concerned mentor/faculty incharge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- The Community Service Project should be different from the regular programmes of NSS/NCC/Green Corps/Red Ribbon Club, etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Internship/apprentice/ on the job training

Procedure

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one–
  - First, the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the Village or Ward volunteers; rather, it could be another primary source of data.
  - Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like–
    - Agriculture
    - Health
    - Marketing and Cooperation
    - Animal Husbandry
    - Horticulture
    - Fisheries
    - Sericulture
    - Revenue and Survey
    - Natural Disaster Management
    - Irrigation
    - Law &Order

- Excise and Prohibition
- Mines and Geology
- Energy
- Internet
- Free Electricity
- Drinking Water

EXPECTED OUTCOMES

BENEFITS OF COMMUNITY SERVICE PROJECT TO STUDENTS

Learning Outcomes

- Positive impact on students' academic learning
- Improves students' ability to apply what they have learned in "the real world"
- Positive impact on academic outcomes such as demonstrated complexity of understanding, problem analysis, problem-solving, critical thinking, and cognitive development
- Improved ability to understand complexity and ambiguity

Personal Outcomes

- Greater sense of personal efficacy, personal identity, spiritual growth, and moral development
- Greater interpersonal development, particularly the ability to work well with others, and build leadership and communication skills

Social Outcomes

- Reduced stereotypes and greater inter-cultural understanding
- Improved social responsibility and citizenship skills
- Greater involvement in community service after graduation

Career Development

- Connections with professionals and community members for learning and career opportunities
- Greater academic learning, leadership skills, and personal efficacy can lead to greater opportunity

Relationship with the Institution

- Stronger relationships with faculty
- Greater satisfaction with college
- Improved graduation rates

BENEFITS OF COMMUNITY SERVICE PROJECT TO FACULTY MEMBERS

- Satisfaction with the quality of student learning
- New avenues for research and publication via new relationships between faculty and community
- Providing networking opportunities with engaged faculty in other disciplines or institutions
- A stronger commitment to one's research

BENEFITS OF COMMUNITY SERVICE PROJECT TO COLLEGES AND UNIVERSITIES

- Improved institutional commitment
- Improved student retention
- Enhanced community relations

BENEFITS OF COMMUNITY SERVICE PROJECT TO COMMUNITY

- Satisfaction with student participation

- Valuable human resources needed to achieve community goals
- New energy, enthusiasm and perspectives applied to community work
- Enhanced community-university relations.

SUGGESTIVE LIST OF PROGRAMMES UNDER COMMUNITY SERVICE PROJECT

The following is the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise the objectives and benefits of this kind of projects. The project reports shall be placed in the college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

1. Water facilities and drinking water availability
2. Health and hygiene
3. Stress levels and coping mechanisms
4. Health intervention programmes
5. Horticulture
6. Herbal plants
7. Botanical survey
8. Zoological survey
9. Marine products
10. Aquaculture
11. Inland fisheries
12. Animals and species
13. Nutrition
14. Traditional health care methods
15. Food habits
16. Air pollution
17. Water pollution
18. Plantation
19. Soil protection
20. Renewable energy
21. Plant diseases
22. Yoga awareness and practice
23. Health care awareness programmes and their impact
24. Use of chemicals on fruits and vegetables
25. Organic farming
26. Corporation
27. Floury culture
28. Access to safe drinking water
29. Geographical survey
30. Geological survey
31. Sericulture
32. Study of species
33. Food adulteration

34. Incidence of Diabetes and other chronic diseases
35. Human genetics
36. Blood groups and blood levels
37. Internet Usage in Villages
38. Android Phone usage by different people
39. Utilisation of free electricity to farmers and related issues
40. Gender ration in schooling level-observation.

Complementing the community service project the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children

1. Reading Skill Programme (Reading Competition)
2. Preparation of Study Materials for the next class.
3. Personality / Leadership Development
4. Career Guidance for X class students
5. Screening Documentary and other educational films
6. Awareness Programme on Good Touch and Bad Touch (Sexual abuse)
7. Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment

1. Government Guidelines and Policy Guidelines
2. Womens' Rights
3. Domestic Violence
4. Prevention and Control of Cancer
5. Promotion of Social Entrepreneurship

General Camps

1. General Medical camps
2. Eye Camps
3. Dental Camps
4. Importance of protected drinking water
5. ODF awareness camp
6. Swatch Bharath
7. AIDS awareness camp
8. Anti Plastic Awareness
9. Programmes on Environment
10. Health and Hygiene
11. Hand wash programmes
12. Commemoration and Celebration of important days

Programmes for Youth Empowerment

1. Leadership
2. Anti-alcoholism and Drug addiction
3. Anti-tobacco
4. Awareness on Competitive Examinations
5. Personality Development

Common Programmes

1. Awareness on RTI
2. Health intervention programmes
3. Yoga
4. Tree plantation
5. Programmes in consonance with the Govt. Departments like–
    i. Agriculture
    ii. Health
    iii. Marketing and Cooperation
    iv. Animal Husbandry
    v. Horticulture
    vi. Fisheries
    vii. Sericulture
    viii. Revenue and Survey
    ix. Natural Disaster Management
    x. Irrigation
    xi. Law &Order
    xii. Excise and Prohibition
    xiii. Mines and Geology
    xiv. Energy

Role of Students:

- Students may not have the expertise to conduct all the programmes on their own. The students then can play a facilitator role.
- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- As and when required the College faculty themselves act as Resource Persons.
- Students can work in close association with Non-Governmental Organizations like Lions Club, Rotary Club, etc or with any NGO actively working in that habitation.
- And also with the Governmental Departments. If the programme is rolled out, the District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity

Duration: 8 weeks

1. Preliminary Survey (One Week)

- A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- Asurveyformbasedonthetypeofhabitationtobepreparedbeforevisitingthehabitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (Two Weeks)

- Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3. Community Immersion Programme (Four Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4. Community Exit Report (One Week)

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher-mentor will be evaluated by the mentor and suitable marks are awarded for onward submission to the University.

Throughout the Community Service Project, a daily log-book need to be maintained by the students batch, which should be countersigned by the governmental agency representative and the teacher-mentor, who is required to periodically visit the students and guide them.

20CE6501A - ENVIRONMENTAL GEOTECHNIQUES

Offering branch:	CE	Year : III	Sem: I
Course Category:	Honours	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	20CE3402- Geotechnical Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Examine** clay behavior concerning clay chemistry and reaction dynamics	K3
CO2	**Analyze** clay's hydraulic, mechanical behaviour	K4
CO3	**Evaluate** the engineering landfill design considerations	K5
CO4	**Justify** the monitoring parameter of landfill and determine the stability of liner slope	K6
CO5	**Determine** the landfill's dynamic factor and use various remedial processes to change the soil.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to geo-environmental engineering** Introduction to geo environmental, clay chemistry, clay minerals, Reaction dynamics, Engineering, Soil-water-environment interaction relating to geotechnical problems	**CO1**
UNIT-2	**Hydraulic-properties of clay:** Hydraulic conductivity, gas conductivity, ion diffusion capacity, swelling potential, compressibility, and rheological properties. Terzaghi theory of one dimensional consolidation,3-D consolidation equation **Mechanical properties;** Shear strength of Clay: Triaxial test (UU,CU,CD),Derivation skempton pore pressure equation, Different failure criteria for clay, Introduction of critical state soil mechanics	**CO2**
UNIT-3	**Landfills:** Chemical and geotechnical characterization of municipal solid waste, Landfill layout and capacity, components of landfill and its functions. Types and functions of liner and cover systems	**CO3**
UNIT-4	**Leachate, gas management and geosynthetics** Management of Leachate and gas. Various components of leachate collection and removal system and its design., gas disposal/utilization. Closure and post closure monitoring system. Compacted clay liner, selection of soil for liner, slope stability analysis of liner slope, methodology of construction.	**CO4**
UNIT-5	**Landfill Design:** Design criteria of the landfill, Dynamic analysis **Remediation:** Bio remediation, thermal remediation, pump and treat method, phyto remediation and electro-kinetic remediation	**CO5**

Learning Resources

Text Books	1. Donald L. Wise, Debra J. Trantolo, Hilary I. Inyang, Edward J. Cichon (2000) Remediation Engineering of Contaminated Soils, Publisher: Marcel Dekker Inc. 2. Koerner, R.M. (2005). Designing with Geosynthetics. Fifth Edition. Prentice Hall, New Jersey 3. Dr. G V Rao and Dr. R S Sasidhar (2009) Solid waste Management and Engineered Landfills, Saimaster Geoenvironmental Services Pvt. Ltd. Publication.
Reference Books	1. Hari D. Sharma, Krishna R. Reddy (2004) Geoenvironmental Engineering: Site

		Remediation, Waste Containment, and Emerging Waste Management Technologies, Publisher: John Wiley & Sons Inc.
e-Resources& other digital material	1. 2.	https://www.elsevier.com/books/geoenvironmental-engineering https://nptel.ac.in/courses/105/103/105103025/

20CE6501B - GEOSYNTHETICS AND REINFORCED SOIL STRUCTURE

Offering branch:	CE	**Year : III**	**Sem: I**
Course Category:	Honours	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	20CE3402- Geotechnical Engineering 20CE4703B - Ground improvement techniques	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Explain** how the polymeric composite manufactured, and what factors were used to increase the tensile strength	K3
CO2	**Analyze** the hydraulic and mechanical characteristics of polymeric composites	K4
CO3	**Explain** the engineering use of polymeric composite in the context of soil-structure interaction	K2
CO4	**Design** retaining structures/slopes/cuts using soil nailing technique.	K6
CO5	**Explain** the concepts of using Geosysthetics as filter, drainage and materials and design landfill as per standard guidelines.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction**: Definition, Historical Background, Advantages and Disadvantage of reinforced earth Construction. **Formation of geosynthetic composite:** Chemical synthesis, Physical properties, viscosity of polymer, Raw materials–polypropylene (polyolefin), Polyethylene (Polyoefin), Polyester, Polyvinyl chloride, Classification based on materials type– Metallic and Non-metallic, Natural and synthetic materials.	**CO1**
UNIT-2	**Hydraulic and Mechanical Properties:** Physical, Chemical, Mechanical, Hydraulic, Endurance and Degradation requirements, Testing & Evaluation of properties	**CO2**
UNIT-3	**Design of reinforced earth foundations and embankments**: Foundations – Modes of failure of foundation, Determination of force induced in reinforcement ties–Location of failure surface, tension failure and pull out resistance **Embankments**– Concept of Reinforced Embankments, Internal and external stability, Selection of materials, typical design problems, slope stability related problem	**CO3**
UNIT-4	**Soil nailing techniques**: Concept, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, Construction sequence, Components of system, Design aspects, Precautions to be taken in the applications of soil nailing techniques.	**CO4**
UNIT-5	**Filter, drain and landfills**: Filter & Drain– Conventional granular filter design criteria, Geosynthetic filter design requirements, Drain and filter properties, Design criteria – soil retention, Geosynthetic permeability, anticlogging, survivability and durability, **Landfills**–Typical design of Landfills, Landfill liner & cover, EPA Guidelines,	**CO5**

Learning Resources

Text Books	1. Swami Saran, Reinforced soil and its Engineering Applications, I.K. International Pvt. Ltd., 2005. Edition 2nd 2010. 2. Shiva Kumar Babu G L, An Introduction to Soil Reinforcement and geosynthetics –Universities Press, 2005.
Reference Books	1. Jones CJEP, Earth reinforcement and Soil structure, Butterworths, 1996 London, 1996

	2. Hidetoshi Octial, Shigenori Hayshi & Jen Otani, Earth Reinforcement Practices, Vol. I, A.A. Balkema, Rotterdam, 1992. 3. Ingold, T.S., Reinforced Earth, Thomas, Telford, London. 4. Koerner. R.M.,Design with geosynthetics, 4th Edition, Prince Hall Publication, 1994. Edition 6th 2012.
e-Resources& other digital material	https://nptel.ac.in/courses/105106055/

20CE6501C - ROCK MECHANICS

Offering branch:	CE	**Year : III**	**Sem: I**
Course Category:	HONORS	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	20CE3402- Geotechnical Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Assess** the mechanical characteristics of rock and the outcrop strength of rock and some understanding of bedrock strength	K5
CO2	**Calculate** the stress concentration required to prevent the rock mass from fracturing	K4
CO3	**Calculate** the state of stress in a rock under restricted and unconfined conditions, as well as the stress concentration required to prevent the rock mass from fracturing	K4
CO4	**Calculate** the bearing capacity, settlement limit, various modes of failure, and stability analysis of rock	K4
CO5	**Explain** how to alter the mechanical behavior of fractured rock by employing several types of modification procedures	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	Classification of Intact rock and Rock masses, Strength and modulus from classifications. Physio mechanical properties, Laboratory tests for various physical and mechanical properties. Field shear test, Deformability tests in rock mass, State of stress in the ground.	**CO1**
UNIT-2	Insitu stress, various methods of stress measurement, Hydrofracturing technique, Flat jack technique, Overcoring technique. Underground opening in infinite medium, Elastic and elasto-plastic approach. Stress concentration for different shapes of opening, Zone of influence.	**CO2**
UNIT-3	Failure criteria for rock and rock masses, Mohr-Coulomb Yield Criterion, Drucker-Prager Criterion, Hoek-Brown Criterion, Tensile Yield Criterion. Strength and deformability of jointed rock mass, Fracture strength of jointed rock mass. Shear strength of Rock joints, Deformability of Rock joints, Concept of joint compliance.	**CO3**
UNIT-4	Stability of rock slopes, Modes of failure, Plane failure, Circular failure, Toppling failure. Foundation on rocks, Estimation of bearing capacity, Stress distribution in rocks, Settlement in rocks, Pile foundation in rocks.	**CO4**
UNIT-5	Methods to improve rock mass responses, Grouting in Rocks, Rock bolting, and Rock Anchors.	**CO5**

Learning Resources

Text Books	1. Introduction to Rock Mechanics by R.E.Goodman, John Wiley & Sons. 2. Engineering in Rocks for Slopes, Foundation and Tunnels, Editor T.Ramamurthy, Prentice Hall India Pvt. Ltd.
Reference Books	1. Fundamentals of Rock Mechanics, Fourth Edition, by Jaeger, Cook and Zimmerman, Blackwell Publishing. 2. Rock mechanics and the design of structures in rock, L. Obert and Wilbur I. Duvall, John Wiley & Sons, Inc

e-Resources& other digital material	1. https://nptel.ac.in/courses/105106055/

20CE6501D -SOIL DYNAMICS AND MACHINE FOUNDATIONS

Offering branch:	CE	**Year : III**	**Sem: I**
Course Category:	HONORS	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	20CE3402- Geotechnical Engineering 20CE4601B – Foundation Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Calculate** the dynamic characteristics of the soil	K3
CO2	**Design** a foundation that can sustain various dynamic reactions	K6
CO3	**Modify** the foundation by developing an interactive design under the complicated dynamic response	K3
CO4	**Design** the best suitable machine foundation	K6
CO5	**Assess** the load transfer mechanism for various dynamic response scenarios	K5

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Types of motion, SHM, Fundamental definitions, SDOF systems, Free and forced vibration with and without damping, Constant force and rotating mass type excitation. **Damping:** Types of damping, Equivalent stiffness of springs in series and parallel, Resonance and its effect, magnification-logarithmic decrement, Transmissibility.	**CO1**
UNIT-2	**Vibration Analysis:** Theories of Vibration Analysis, EHS Theory and lumped parameter model, Different modes of vibration, Natural frequency of foundation soil system, Barkan and IS methods. Pressure bulb concept, Reisner Theory, Limitations of Reisner theory, Sung's solutions, Pauw's Analogy, Heigh's Theory.	**CO2**
UNIT-3	**Dynamic properties:** Determination of E, G and Poisons ratio from field and laboratory tests, recommendations of Indian codes, Stress waves in bounded elastic medium. **Wave theory:** Use of wave theory in the determination of elastic properties, Elastic coefficients of soils and their determination- damping factor from free and forced vibration tests, Block vibration test, and Determination of Damping factor.	**CO3**
UNIT-4	**Machine foundations:** Types of machine foundations, general requirements design, criteria for machine foundations, permissible amplitudes and bearing pressure Design data. **Design:** Design criteria, IS code provisions for the design foundations of reciprocating machines.	**CO4**
UNIT-5	**Vibration Isolation:** Transmissibility, Principles of isolation, Methods of isolation Vibration isolators, Types and their characterizes. **Special Topics:** Liquefaction of soils, CSR, CRR, Factor of safety against liquefaction, Dynamic bearing capacity, Earth retaining structures under dynamic loads.	**CO5**

Learning Resources

Text Books	1. Soil Mechanics and Machine foundations, Swami Saran, Galgotia Publications. 2. Fundamentals of Soil Dynamics, B M Das, Centage Learning

Reference Books	1. Vibrations of Soils and Foundations, Richart Hall and Woods 2. Vibration Analysis and Foundation Dynamics, NSV Kameswara Rao, Wheeler Publishing, New Delhi. 3. Foundations of Machines- Analysis and Design, Prakash and Puri 4. Analysis and design of Foundations for Vibrations, P J Moore 5. Dynamics of bases and Foundations, D Dbarkar
e-Resources& other digital material	1. https://nptel.ac.in/courses/ 105101005/

20CE5501A - ANALYSIS OF STRUCTURES

Offering Branches	CE	Year : III	Sem: I
Course Category:	MINORS	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	20CE3404-Mechanics of Solids	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Evaluate** the slopes and deflection in beams and pin jointed frames.	K5
CO2	**Evaluate** the fixed end moments in fixed beams and can analyze two span continuous beams by slope deflection method	K5
CO3	**Analyze** the two span continuous beams by Moment distribution Method and Kani's method	K4
CO4	**Evaluate** the stresses for both concentrically loaded and eccentrically loaded Columns.	K5
CO5	**Evaluate** the stress strain behavior of both the thin and thick cylinders.	K5

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Deflection of Statically Determinate Structures:** Introduction, Pure bending, Relation between curvature, slope and deflection, Deflection curves, Maculay's Method, Moment area method, Slopes and deflection for cantilevers and simply supported beams. **Deflection Of pin jointed frames:** Deflection of trusses by Unit load method (having 9 members or less)	CO1
UNIT-2	**Analysis of Indeterminate Beams** **Fixed beams**: Shear force and bending moment diagrams for Fixed beams subjected to U.D.load, central point load, eccentric point load. Number of point loads, uniformly varying load, couple and combination of loads, effect of sinking of support, effect of rotation of a support. **Two span continuous beams**: Shear force and bending moment diagrams for two span continuous beams with and without sinking of supports using Slope deflection method.	CO2.
UNIT-3	**Analysis of two span continuous beams** **Moment distribution method**: Shear force and bending moment diagrams for two span continuous beams with and without sinking of supports using Moment Distribution Method. **Kani's method**: Shear force and bending moment diagrams for two span continuous beams with and without sinking of supports using Kani's Method.	CO3

UNIT-4	**Columns and Struts**: Introduction, Column with one end free and other fixed, Column with both ends hinged, column with both ends fixed, column with one end fixed and the other hinged, Limitation of Euler's formula, column carrying eccentric load, Rankine-Gordon formula, Perry's formula **Combined bending and direct stresses**–Introduction, Limit of eccentricity for no tension in the section, kernel of a section for rectangular, circular sections.	CO4
UNIT-5	**Thin Cylinders -** Introduction, Stresses and strains in thin cylinders, volumetric change in cylinder. **Thick cylinders: T**hick cylinders subjected to internal pressure and external pressure, compound cylinders.	CO5

Learning Resources

Text Books	1. Pandit.G , Gupta.S and Gupta.R, Theory of Structures Vol.I & II, McGraw Hill Education, 2017. 2. V.N Vazirani and M.M Ratwani, Analysis of Structures Vol-II, Khanna Publishers, 2012
Reference Books	1. C.K.Wang, Statically Indeterminate Structures, TataMcGrawHill, 2010. 2. R.C. Hibbeler, Structural Analysis, 6/e, Pearson, 2011.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105101085/25-31 2. https://onlinecourses.nptel.ac.in/noc17_ce25/preview 3. https://www.edx.org/learn/structural-engineering

20CE5501B -TRANSPORTATION ENGINEERING

Offering Branches	CE	Year : III	Sem: I
Course Category:	MINOR	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	20BS1101 – Engineering Mathematics – I	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Choose** the highway development and planning in India	K3
CO2	**Analyze** geometric design of highway alignment and management of traffic	K4
CO3	**Demonstrate** traffic intersection and choose material for highway	K3
CO4	**Discriminate** with the design procedures of flexible and rigid pavements	K4
CO5	**Focus** on the construction and maintenance issues related to highways	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**HIGHWAY DEVELOPMENT** Highway development in India–Highway Alignment- Factors affecting Alignment- Engineering Surveys – Drawings and Reports. **HIGHWAY PLANNING** Necessity for Highway Planning- Different Road Development Plans- Classification of Roads- Road Network Patterns – Planning Surveys.	**CO1**
UNIT-2	**HIGHWAY GEOMETIC DESIGN** Importance of Geometric Design- Highway Cross Section Elements- Stopping sight Distance, Overtaking Sight Distance and Intermediate Sight Distance- Design of Super elevation and Extra widening- Design of Vertical alignment-Gradients- Vertical curves. **TRAFFIC ENGINEERING AND MANAGEMENT** Traffic Volume Studies- Speed studies- Parking Studies - Road Accidents-Causes and Preventive measures - Road Traffic Signs – Types – Road markings-Types of Road Markings	**CO2**
UNIT-3	**INTERSECTION DESIGN** Types of Intersections –Traffic Islands - Design of Traffic Signals –Webster Method –IRC Method. Types of Grade Separated Intersections- Rotary Intersection –Advantages and Disadvantages of Rotary Intersection. **HIGHWAY MATERIALS** Subgrade soil: California Bearing Ratio – Modulus of Subgrade Reaction. Stone aggregates: Tests for Road Aggregates – Bituminous Materials: Tests on Bitumen – Marshall Method of Mix Design.	**CO3**
UNIT-4	**DESIGN OF FLEXIBLE PAVEMENTS** Objects & Requirements of pavements – Types – Functions of pavement components – Design factors – Flexible Pavement Design Methods – CBR method – IRC method **DESIGN OF RIGID PAVEMENTS** Design Considerations – wheel load stresses – Temperature stresses – Frictional stresses – Combination of stresses – Design of Joints – IRC method	**CO4**
UNIT-5	**HIGHWAY CONSTRUCTION** Types of Highway Construction – Construction of Gravel Roads – Construction of Water Bound Macadam Roads – Construction of Bituminous Pavements – Construction of	**CO5**

	Cement Concrete Pavements. **ADVANCES IN HIGHWAY CONSTRUCTION** Soil stabilisation, Soil-Cement Stabilisation, Soil-Lime Stabilisation	

Learning Resources

Text Books	1. Highway Engineering, (9th edition) by Khanna, S.K. and Justo ,C.E.G., Nem Chand Bros, Roorkee, 2010. 2. Traffic Engineering and Transportation Planning, (7th edition) by Kadiyali, L.R., Khanna Publishers, New Delhi, 2010. 1. Specifications for Roads and Bridges - Manual for Maintenance of roads, Most publications, 1976.
Reference Books	1. Fundamentals of Transportation Engineering, (3rd edition) by Papacostas, C.S., Prentice Hall of India Pvt.Ltd, New Delhi, 2009. 2. Principles of Highway Engineering by Kadiyali, L.R., Khanna Publishers, New Delhi, 2012. 3. Traffic Planning and Design by Saxena, Dhanpat Rai Publishers, New Delhi, 2010. 4. Transportation Engineering - An Introduction, (3rd edition) by Jotin Khisty. C, Prentice Hall, Englewood Cliffs, New Jersey, 2012. 5. IRC Code for flexible pavement – IRC – 37 -2001. 6. IRC Code for Rigid pavement – IRC – 58 – 2002.
e- Resources & other digital material	1. https://nptel.ac.in/courses/ 105/101/105101087 2. https://nptel.ac.in/courses/ 105/104/105104098

VI– SEMESTER SYLLABUS

20ES1601 - AI TOOLS

Offering Branches	CE	Year : III	Sem: II
Course Category:	Engineering Sciences	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the Fundamentals of Artificial Intelligence and its Applications**.**	K2
CO2	**Summarize** various machine learning methods.	K4
CO3	**Identify** different machine learning applications.	K1
CO4	**Compare** Machine Learning & Deep Learning and **Outline** basic Deep Learning Algorithm.	K4
CO5	**Make use of** Deep Learning Concepts for various Applications.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Artificial Intelligence:** What is AI, Foundations of AI, Goals of AI, and Applications of AI.	**CO1**
UNIT-2	**Machine Learning: Definition, Learning Methods:** Supervised Learning, Unsupervised Learning, Semi-Supervised Learning, Reinforcement Learning.	**CO2**
UNIT-3	**Machine Learning Applications:** Computer vision, Speech Recognition, Natural Language Processing, Decision Making process.	**CO3**
UNIT-4	**Deep Learning:** Basics of Deep Learning, Machine Learning Vs Deep Learning, Fundamental Deep Learning Algorithm-Convolution Neural Network (CNN).	**CO4**
UNIT-5	**Deep Learning Applications:** Computer vision, Speech Recognition, Natural Language Processing, Decision Making process.	**CO5**

Learning Resources

Text Books	1. Artificial Intelligence: A Modern Approach Stuart Russell and Norvig, Pearson, 3rd Edition. **(Unit-1)** 2. Machine Learning A Probabilistic Perspective, Kevin P. Murphy, The MIT Press **(Unit-2&3)** 3. Deep Learning (Adaptive Computation and Machine Learning series), MIT Press, 2017. **(Unit-4&5)**
e-Resources& other digital material	**1.** https://swayam.gov.in/nd1_noc19_cs52/preview **2.** https://swayam.gov.in/nd1_noc19_cs85/preview **3.** https://emerj.com/ai-sector-overviews/machine-learning-healthcare-applications/

20CE3601 – DESIGN OF STEEL STRUCTURES

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	Professional Core	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3404-Mechanics of Solids 20CE3503-Structural Analysis	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Demonstrate** the knowledge of steel design philosophies, by working and limit state methodology and design bolted connections by limit state method	K2
CO2	**Analyze** and **design** both concentric and eccentric welded connections by limit state method.	K6
CO3	**Analyze** and **design** tension members inclusive of lug angle by limit state method.	K6
CO4	**Analyze** and **design** both concentric and eccentrically loaded compression members by limit state method.	K6
CO5	**Analyze** and **design** both laterally supported & unsupported beams by limit state method.	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**General**: Fundamental concepts of design of structures, Types of structural steel – Mechanical properties of structural steel, Indian standard rolled steel sections, Design process, Steel Structural systems, Loads & load combinations, Concept of Working stress and limit state method of design. **Bolted Connections**: Types of fasteners, Bolts & Bolted Connection, Failure of a joint, strength and efficiency of a joint, Design of lap joint, butt joint and eccentric connections.	CO1
UNIT-2	**Welded Connections**: Types of welds, stresses in welds, design of butt welded and Fillet welded joints subjected to axial load, eccentric welded connections.	CO2
UNIT-3	**Tension Members**: Types of tension members and sections, behaviour of tension members, Modes of failures, net effective sectional area for plates and angle sections, design of tension members using plates, single angles and double angles, lug angles.	CO3
UNIT-4	**Compression Members**: Types of compression members and sections, Behavior and failures of Compression members, Effective length, radius of gyration and slenderness of compression members, design compressive stresses in compression, design of struts, design of axially loaded compression members, built up compression members (I section and two channels) laced and battened columns, design of eccentrically loaded columns.	CO4
UNIT-5	**Beams**: Introduction, Types of steel beam sections, Classifications of sections, lateral stability of beams, factors affecting lateral stability, behavior of simple beams in bending, design strength of laterally supported & unsupported beams, design of laterally supported and unsupported beams.	CO5

Learning Resources	
Text Books	1. S.K. Duggal, Limit state Design of steel structures, 2/e, Tata McGraw Hill, 2017. 2. N. Subramanyam, Design of Steel Structures, 2/e, Oxford University Press, 2016.
Reference Books	1. V.L. Shah and Veena Gore, Limit State Design of steel structures IS:800-2007, Structures Publications, 3/e, 2012. 2. M.L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education, 2013. 3. Ramachandra and V. Gehlot, Design of Steel Structures, 2/e, Scientific Publishers, 2015. 4. Shiyekar M R, Limit State Design in Structural Steel, 3/e, Prentice Hall of India Pvt Ltd, 2017.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105106112/3 2. https://lecturenotes.in/subject/161/design-of-steel-structure-dss 3. https://nptel.ac.in/courses/105/105/105105162/ 4. http://www.nptelvideos.in/2012/11/design-of-steel-structures.html 5. https://freevideolectures.com/course/2679/design-of-steel-structures

20CE4602A – ADVANCED STRUCTURAL ANALYSIS

Offering Branches	CE	Year : III	Sem: II
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3503-Structural Analysis	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Analyze** the three hinged and two hinged arches for concentrated and uniformly distributed loads	K4
CO2	**Analyze** the statically indeterminate frames using Moment distribution method and Kani's method	K4
CO3	**Develop** Influence line diagrams for all stress resultants in determinate beams and evaluate absolute SF,BM in the beams for moving loads.	K6
CO4	**Analyze** cables and suspension bridges	K4
CO5	**Analyze** the fixed and continuous beams using plastic analysis.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Arches** **Three hinged Arch**: Introduction, Analysis of three hinged arch, B.M, S.F and normal thrust in three-hinged arches, three hinged parabolic arch subjected to concentrated loads and uniformly distributed loads **Two hinged Arch**: Introduction, Analysis of two hinged arch, B.M, S.F and normal thrust in two-hinged arches, two hinged parabolic arch subjected to concentrated loads and uniformly distributed loads.	CO1
UNIT-2	**Analysis of statically indeterminate frames** **Moment distribution method**: Analysis of single-storey, single bay portal frames under gravity and lateral loads. **Kani's method**: Analysis of single-storey, single bay portal frames under gravity and lateral load	CO2.
UNIT-3	**Influence Lines and Moving Loads** **Influence Lines**: Definition of influence line for SF, Influence line for BM-load position for maximum SF at a section-Load position for maximum BM at a section single point load, uniformly distributed load longer than the span, uniformly distributed load shorter than the span **Moving Loads**: Introduction, maximum SF and BM at a given section and absolute maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads.	CO3

UNIT-4	**Cables and Suspension Bridges** Introduction, Analysis of Cables Under Concentrated Loads and Uniformly distributed Loads, Shape of Cable under Self-Weight, Stresses in suspended Wires due to Self-Weight, Anchorage of Suspension Cables, Stiffened Bridges, Bending moment and shear force for Three Hinged Stiffened Girders, Influence Lines for B.M and S.F in Three-Hinged Stiffening Girders, Suspension Bridges with Two-hinged Stiffening Girders.	CO4
UNIT-5	**Plastic Analysis** Introduction, Shape factor, Plastic Hinge, Collapse Mechanisms, Static and Kinetic Theorems, Methods of analysis, Application to Fixed and Continuous Beams.	CO5

Learning Resources

Text Books	1. Pandit.G , Gupta.S and Gupta.R, Theory of Structures Vol.I & II, McGraw Hill Education, 2017. 2. V.N Vazirani and M.M Ratwani, Analysis of Structures Vol-II, Khanna Publishers, 2012
Reference Books	1. C.K.Wang, Statically Indeterminate Structures, TataMcGrawHill, 2010. 2. R.C. Hibbeler, Structural Analysis, 6/e, Pearson, 2011.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105101085/25-31 2. https://onlinecourses.nptel.ac.in/noc17_ce25/preview 3. https://www.edx.org/learn/structural-engineering

20CE4602B – PAVEMENT ANALYSIS AND DESIGN

Offering Branches	CE	Year : III	Sem: II
Course Category:	Professional core course	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Engineering Mathematics I 20CE3502 - Highway Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Compute** the material specifications and design factors of pavements	K3
CO2	**Analyze** stresses in flexible and rigid pavements	K4
CO3	**Calculate** the Design of flexible and rigid pavements	K4
CO4	**Examine** the constructional operations and equipment's	K3
CO5	**Explain** the concept of strengthening of existing pavements and pavement management system	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**DESIGN FACTORS** Types of pavement – Factors affecting design of pavements – wheel loads –ESWL Concept- tyre pressure – contact pressure, Material characteristics – Environmental and other factors. **MATERIAL CHARACTERISTICS** Highway Materials – Soil, Aggregate, Bitumen and Tar- Tests on aggregates - Tests on Bitumen -Marshall's Method of Bituminous Mix design.	CO1
UNIT-2	**STRESSES IN FLEXIBLE PAVEMENT** Stresses in flexible pavement – layered systems concept – one layer system – Boussinesq Two layer system – Burmister Theory for Pavement Design **STRESSES IN RIGID PAVEMENT** Stresses in rigid pavements – stresses due to warping, stresses due to loads, stresses due to friction.	CO2
UNIT-3	**FLEXIBLE PAVEMENT DESIGN** CBR Method of Flexible Pavement Design- IRC method of flexible pavement design.-AASTHO Method of Flexible Pavement design **RIGID PAVEMENT DESIGN** IRC method of Rigid pavement design - Types of Joints – Use of Tie Bars and Dowell Bars. Design of RCC pavements	CO3
UNIT-4	**HIGHWAY CONSTRUCTION** Introduction – Construction of Earth Roads- Gravel Roads – WBM Roads- Bituminous Pavements- Cement Concrete Roads **ADVANCES IN HIGHWAY CONSTRUCTION AND CONSTRUCTION EQUIPMENTS**	CO4

	Steps in Construction- Reinforced Concrete Pavements – Soil Stabilization – Methods and Objectives- Soil-cement Stabilization and Soil-lime Stabilization, Specific equipments for bituminous roads and for concrete roads construction	
UNIT-5	**PAVEMENT MANAGEMENT SYSTEM** Need for Highway Maintenance- Failures in Flexible Pavements-Rigid Pavement Failures- Pavement Evaluation-Benkleman Beam method- Overlays Design **STRENGTHING OF EXISTING PAVEMENT** Over lay design – Types of Overlays - Methods of Overlay – Importance of Highway Drainage – Design of Surface Drainage - Design of Sub Surface Drainage	**CO5**

Learning Resources

Text Books	1. Highway Engineering, (7th Edition) by Khanna S., Kand Justo C.J., Nemchand & Bros, NewDelhi, 2000. 2. Principles and Practices of Highway Engineering by Kadiyali L.R and Dr.Lal N.B., Khanna Publishers, New Delhi, 2003. 3. Principles of pavement design Yoder, Jhon Willey & Sons, New Delhi, 2012.
Reference Books	1. IRC Code for flexible pavement – IRC – 37 -2001. 2. IRC Code for Rigid pavement – IRC – 58 – 2002. 3. Pavement Analysis and Design, (2nd edition) by Yang H. Huang, Pearson Education, Delhi, 2008. 4. Principles of Highway Engineering And Traffic Analysis, (4th edition) by Fred L. Mannering, Wiley student publication, India, New Delhi, 1990. 5. Construction planning, equipment and measures by Peurifoy R.L., Tata McGraw-Hill Publications, New Delhi, 2006
e- Resources & other digital material	1. https://nptel.ac.in/courses/ 105/105/105105165 2. https://nptel.ac.in/courses/ 105/101/105101087

20CE4602C- HYDROPOWER ENGINEERING

Offering Branches	CE	Year : III	Sem: II
Course Category:	Professional Elective course	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3301 - Mechanics of Fluids 20CE3301 - Applied mechanics 20CE3403 - Hydraualics &Hydraulic machines 20BS1104 - Applied physics	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Differentiate various power plants	K2
CO2	Calculate the efficiency of hydro power plants	K3
CO3	Understand the requirements and components of power plants	K2
CO4	Understand the problems involved in the water supply to the plants	K2
CO5	Know the advantages and components of the power house	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	Pumped Storage Power Plant: Classification of Hydropower Plants – Advantages of Pumped storage plants – Reversible Pump turbines – Power duration curves – Problems of operation – Numerical Problems.	**CO1**
UNIT-2	Electrical Load on Hydraulic Turbines: Load curve – Load factor – Power factor – Capacity factor– Utilization factor - Load duration curve – Firm power and Secondary power – Numerical Problems.	**CO2**
UNIT-3	Penstocks and Accessories: Classification of Penstocks – Design criteria for Penstocks – Economical Diameter of Penstocks – Anchor Blocks – Conduit Valves.	**CO3**
UNIT-4	Water Hammer and Surge: Water Hammer – Resonance in Penstocks – Channel Surges – Surge Tanks.	**CO4**
UNIT-5	Planning of Power Houses: Power house Structure – Types of Underground Power Stations – Advantages and Components of Underground Power house – Types of Layout.	**CO5**

Learning Resources

Text Books	1. M.M.Dandekar and K.N.Sharma, Water Power Engineering, Vikas Publications, New Delhi. 2. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines, Standard Book House, Delhi
Reference Books	1. A.K. Jain, Fluid Mechanics, 12/e, Khanna publishers, Delhi 2. Rajput .R.K, "Fluid Mechanics and Hydraulic Machines", S.Chand and Company Ltd

	3. M. Franck White, Fluid Mechanics, Tata McGraw Hill, 2017. 4. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill, 2001.
e- Resources & other digital material	1. http://www.digimat.in/nptel/courses/video/108105058/L10.html 2. https://nptel.ac.in/content/storage2/courses/108108078/pdf/chap5/teach_slides05.pdf

20CE4602 D - SANITARY ENGINEERING

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	Professional Elective course	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3501 –Environmental Engineering 20MC1301 – Environmental Science	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Asses** the quantity of sewage and Illustrate the types of sewerage appurtenances	K4
CO2	**Analyse** the quality of sewage and understand the characteristics of sewage	K4
CO3	**Design** the treatment units of sewage	K4
CO4	**Interpret** different sewage disposal methods and **design** of septic tank	K4
CO5	**Classify** the sanitary Installations and disposal techniques of the sludge	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**QUANTITY OF WASTEWATER**: Introduction to Sanitary Engineering: Conservancy and water carriage system; Sewerage systems; Sanitary and storm water sewage; Estimation of their quantities;; **SEWERS, SEWER APPURTENANCES, SEWAGE PUMPING:** sewers, sewer appurtenances, sewage pumping, types of sewers, design of sewers, construction	**CO1**
UNIT-2	**QUALITY AND CHARACTERISTICS OF SEWAGE**- Decomposition of sewage-Carbon, nitrogen and sulphur cycles of decomposition- BOD- COD- Physical and chemical analysis of sewage.	**CO2**
UNIT-3	**PRIMARY TREATMENT OF SEWAGE** Primary treatment- theoretical concepts of Screens; Grit chamber; Skimming tanks; design aspects of Sedimentation tanks. **SECONDARY TREATMENT OF SEWAGE**: Trickling filters; high rate trickling filters; Recirculation; Operational problems and remedies; Activated sludge process- Principle of action; Sludge bulking; Sludge volume index	**CO3**
UNIT-4	**SEWAGE DISPOSAL & SEPTIC TANKS** Methods; Disposal by dilution; Self-purification process; Oxygen sag; Zones of pollution of river Disposal by irrigation; sewage sickness; Septic tank-Design; effluent disposal	**CO4**

UNIT-5	**SLUDGE DISPOSAL & Sanitary Installation** : Anaerobic sludge digestion process, factors effecting sludge digestion, sludge digestion tanks, sludge thickening, sludge conditioning, methods of dewatering the sludge, methods of sludge disposal. Basic Sanitary fittings and functionalities, plumbing systems, maintenance of sanitary installations.	**CO5**

Learning Resources

Text Books	1. Environmental Engineering Vol. I& II - Water supply engineering by S. K. Garg; Khanna Publishers, New Delhi, 2017. 2. Elements of public health engineering by K. N. Duggal; S. Chand & Company Ltd., NewDelhi, 2014.
Reference Books	1. B.C. Punmia, Ashok Jain & Arun Jain, Laxmi Publications Pvt. Ltd, New Delhi,2010 2. Metcalf and Eddy, Waste water Engineering Collection, Treatment, Disposal and Reuse, McGraw Hill Pub. Co.,1995.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105104102/ 2. https://nptel.ac.in/courses/105105048/

20CE3602–ESTIMATION AND COSTING

Offering branch:	CE	**Year : III**	**Sem: II**
Course Category:	Professional Course	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	PC- Surveying SKILL2 - Computer aided Building Drawing Using AUTO CAD	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Generalize** drawings, principles of different works in civil engineering, approximate methods of estimating and standard specifications for different items of works in buildings	K2
CO2	**Estimate** detailed estimates for buildings using a long wall short wall method and centre line method	K4
CO3	**Develop** the preparation of rate analysis for different works in civil engineering and reinforcement bar bending schedules	K3
CO4	**Summarize** procedures of contracts and valuation	K2
CO5	**Calculate** earthwork for roads & canals and prepare reports on estimates for the construction of buildings and roads	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION TO ESTIMATION** General items of work in building – Principle of units for various items of works - working out quantities for detailed and abstract estimates – Approximate methods of estimating. **STANDARD SPECIFICATIONS** Standard specifications for different items of building construction.	**CO1**
UNIT-2	**LONGWALL & SHORTWALL METHOD** Detailed Estimates of Buildings using Long wall & short wall method. **CENTRE LINE METHOD** Detailed Estimates of Buildings using Centre line method.	**CO2**
UNIT-3	**STEEL ESTIMATION** Reinforcement bar bending and bar requirement schedules. **RATE ANALYSIS** Rate Analysis – Working out data for various items of work over head and contingent charges.	**CO3**
UNIT-4	**CONTRACTS** Contracts – Types of contracts – Contract Documents – Conditions of contract. **VALUATION** Valuation of buildings.	**CO4**

UNIT-5	**EARTH WORK FOR ROADS AND CANALS** Estimation of earthwork for roads and canals – Lead and Lift considerations **REPORTS** Reports on estimates for the construction of buildings and roads	**CO5**

Learning Resources

Text Books	1. B.N.Dutta, Estimating and Costing, 28th edition, UBS Publishers' Distributors Pvt. Ltd, 2016. 2. G.S.Birdie, Estimating and Costing, 7th edition, Dhanpat Rai Publishing Company (P) Ltd, 2016..
Reference Books	1. A.K.Upadhyay, Civil Estimating and Costing, S.K.Kataria & Sons., 2012. 2. D.D.Kohli, Estimating and Costing, S.Chand & Company Pvt Ltd, 2013.
e-Resources& other digital material	1. https://www.services.bis.gov.in:8071/php/BIS/PublishStandards/published#

20CE2601A - ECOLOGY AND ENVIRONMENT

Offering branch:	CE	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20MC1301 - Environmental Science	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Integrate** information related to structure and functions of ecological units.	K3
CO2	**Analyze** and communicate the concepts of environment.	K4
CO3	**Analyze** various environmental components and demonstrate using technology.	K4
CO4	**Analyze** and evaluate policies and frame works for welfare of environment & social sustainability.	K4
CO5	**Apply** system concepts for bio-monitoring environmental issues.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**ECOLOGY:** Introduction – Biosphere, scope, organization and significance. Ecosystem concept- structure &function, Factors affecting ecosystem. Evolution: Natural Selection and its ecological significance. Population parameters- growth regulation, relationships between organisms.	CO1 CO2
UNIT-2	**NATURAL RESOURCES & MANAGEMENT:** Resource- Definition, category, concept and scarcity of resource. Forests & wild life- Global productivity & human activities (Exploitation). Land Resource- use pattern in India, soil & soil Conservation. Water resource- potentials and use with special reference to India, Concept of Integrated Water Resources Management (IWRM). Remote Sensing and GIS: Applications in conserving resources.	CO1 CO2
UNIT-3	**ENVIRONMENTAL GEOSCIENCES & COMPUTER APPLICATIONS**: Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Scale of meteorology, pressure, temperature, atmospheric stability. Graphical representation of Data, creating Database tables.	CO3
UNIT-4	**ENVIRONMENTAL POLICY, EDUCATION AND ETHICS:** Important National policies: National environmental policy, 2006 & National agricultural policy etc. Legislation: Environment Protection Act, 1986.Environmental education: Goals and objectives of environmental education. Environment awareness and action: Role of NGOs in environmental awareness. Environmental movements in India- silent valley movement, Chipko movement, Narmada Bachao Andolan, Environmental movements in the West- Green Peace.	CO4
UNIT-5	**ENVIRONMENTAL MONITORING AND MANAGEMENT:** Environmental impact analysis and EMP; Analytical approaches and	CO4

	instrumentation in environmental monitoring; Bio-monitoring of air pollution - plants as bio monitors; Bio monitoring of running water pollution. (Software's)Organic Farming and its ecological significance.	CO5

Learning Resources

Text Books	1) 1) Singh, J.S; Singh, S.P. and Gupta S.R. (2014) Ecology, Environmental Science and Conservation. S. Chand & Company Pvt. Ltd. New Delhi. 2) 2) Sharma, P.D. (2011) Ecology and Environment (11th edition) Rastogi Publication, Meerut. 3) Bharucha, E. (2013) Text Book of Environmental Studies (2nd edition.). Universities Press, Hyderabad.
Reference Books	1) Nobel, B.J. and Wright, R.T. (1995) Environmental Science. Prentice Hall. 2) Agarwal, S.K. (1991) Pollution Ecology. Himanshu Publication, Udaipur. 3) S.V.S.Rana, Essentials of Ecology and Environmental Science, Prentice Hall India, New Delhi, 2011.
E-Resources & other digital material	1. http://nptel.ac.in

20CS2601A - INTRODUCTION TO DATA STRUCTURES

Offering branch:	CSE	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts of data structures.	**K2**
CO2	**Apply** suitable Linear Data Structures to solve problems.	**K3**
CO3	**Apply** suitable Non Linear data structures to solve problems.	**K3**
CO4	**Analyze** the problem and develop solution using suitable data structures.	**K4**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		3							3	3				
Avg.	**3**	**3**							**3**	3				

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Introduction to data structures, Abstract data types (ADT). **Array:** Array element identifier and addressing formulas, One-dimensional arrays, Applications. **Linked lists:** Introduction, Single linked list, double linked list, circular linked list, and operations on linked lists.	**CO1, CO2, CO4**
UNIT-2	**Linear Data Structures:** **Stacks:** Definition, operations, array implementation, linked list Implementation and applications.	**CO1, CO2, CO4**
UNIT-3	**Queues:** Definition, operations, array implementation and applications, Circular Queue and Double ended queue (DEQUE).	**CO1, CO2, CO4**
UNIT-4	**Sorting and Searching:** Searching - Linear and Binary search algorithms. Sorting - Bubble, Insertion, Selection, Merge, Quick sort algorithms.	**CO1, CO2, CO4**
UNIT-5	**Introduction to nonlinear data structure:** **Trees:** Definition, binary tree, Properties of Binary Trees, binary tree representation, binary tree traversal. **Graphs:** Definition, Representation of graph, graph traversals.	**CO1, CO3, CO4**

Learning Resources

Text Books	1. Data Structures and Algorithm Analysis in C, Mark Allen Weiss, Second Edition, 2002, Pearson.
Reference Books	1. Classic Data Structures, Debasis Samantha, Second Edition, 2009, PHI.
E-Resources & other	1. https://www.javatpoint.com/data-structure-array 2. http://www.geeksforgeeks.org/data-structures/

digital material	3. http://www.studytonight.com/data-structures/

20EC2601A - MATLAB PROGRAMMING

Offering branch:	ECE	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous	30

		Evaluation:	
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Outline** the basic concepts of MATLAB.	**K2**
CO2	**Develop** programs for scientific and mathematical problems.	**K3**
CO3	**Analyze** an engineering system/Problem through graphical representation and numerical analysis.	**K4**
CO4	**Build** optimized code for various applications in Engineering and Technology.	**K3**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2									1			2	2
CO2	3									2			3	3
CO3		2								2			2	2
CO4	3									2			3	3
Avg.	**3**	**2**								**2**			**2**	**2**

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Starting MATLAB, Working in command window, Arithmetic operations, Display formats, Elementary Math Built-in functions, Defining scalar variables, useful commands for managing variables, Script files, Examples of MATLAB applications	CO1, CO2
UNIT-2	**Creating arrays and Mathematical operations with arrays:**Creating 1-dimensional and 2- dimensional arrays, The Transpose operator, Array addressing, using a colon: in addressing arrays, Adding elements to existing variables, Deleting elements, Built in functions for handling arrays, Strings and strings as variables, Addition and Subtraction, Array Multiplication and Division, Element-by-Element operations, using arrays in MATLAB built-in math functions, Built in functions for analysing arrays, Generation of Random Numbers, Examples of MATLAB applications.	CO1, CO2, CO4
UNIT-3	**Two Dimensional and Three Dimensional Plots:** plot, fplot commands, Formatting a plot, plots with logarithmic axes, error bars, special graphics, Histograms, Polar plots, putting multiple plots on the same page, Multiple figure windows, Examples, Line plots, Mesh and surface plots, plots with special graphics, The view command, Examples of MATLAB applications	CO1, CO2, CO3, CO4
UNIT-4	**Programming in MATLAB:** Relational and Logical operators, conditional statements, The switch-case statement, Loops, Nested Loops and Nested conditional statements, The break and continue commands, creating a function file, structure of a function file, Local and Global variables, saving a function file, using a User-defined function, Examples of simple User-defined functions, comparison between script files and function files.	CO1, CO2, CO4
UNIT-5	**Polynomial, Curve-fitting, Interpolation, Numerical Analysis**: Polynomials, curve fitting, Interpolation, The Basic fitting interface, Examples, solving equation of one variable, Finding minimum or maximum of a function, Numerical integration, ordinary differential equations.	CO2, CO3, CO4

Learning Resources

Text Books	1. MATLAB: An Introduction with applications – Amos Gilat, Wiley India Pvt. Ltd, 4th Ed., 2012.
Reference Books	1. Getting started with MATLAB – Rudra Pratap, Oxford University Press, 2010 2. MATLAB and SIMULINK for Engineers – Agam Kumar Tyagi, Oxford University Press, 2012.

20EC2601B - TV ENGINEERING

Offering branch:	ECE	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	Compare Digital TV transmission standards and performance parameters (L2)	**K2**

CO2	Analyse channel coding, errors, interferences and modulation techniques for Digital TV(L4)	**K4**
CO3	Make use of RF amplifiers, modules and systems for Digital TV (L3)	**K3**
CO4	Identify Transmission lines for Digital TV(L3)	**K3**
CO5	Test for a Digital TV Transmitter(L4)	**K4**

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Digital Television Transmission Standards**: ATSC terrestrial transmission standard, vestigial sideband modulation, DVB-T transmission standard, ISDB-T transmission standard, channel allocations, antenna height and power, MPEG-2 Performance Objectives for Digital Television: System noise, external noise sources, transmission errors, error vector magnitude, eye pattern, interference, cochannel interference, adjacent channel interference, analog to digital TV, transmitter requirements	CO1, CO2
UNIT-2	**Channel Coding and Modulation for Digital Television:** Data synchronization, randomization/scrambling, forward error correction, interleaving, inner code, frame sync insertion, quadrature modulation, 8 VSB, bandwidth, error rate, COFDM, flexibility, bandwidth	CO1, CO2
UNIT-3	**Transmitters for Digital Television**: Precorrection and equalization, up conversion, precise frequency control, RF amplifiers, solid-state transmitters, RF amplifier modules, power supplies, cooling, automatic gain or level control, ac distribution, transmitter control, tube transmitters, performance quality.	CO1, CO3
UNIT-4	**Transmission Line for Digital Television:** Fundamental parameters, efficiency, effect of VSWR, system AERP, rigid coaxial transmission lines, dissipation, attenuation, and power handling, higher-order modes, peak power rating, frequency response, standard lengths, corrugated coaxial cables, wind load, waveguide, bandwidth, waveguide attenuation, power rating, frequency response, size trade-offs, waveguide or coax pressurization	CO1, CO4
UNIT-5	**Test and Measurement for Digital Television:** Power measurements, average power measurement, calorimetry, power meters, peak power measurement, measurement uncertainty, testing digital television transmitters.	CO1, CO5

Learning Resources

Text Books	1. Gerald w. Collins, Fundamentals of Digital Television Transmission, John Wiley, 2001.
Reference Books	1 R. R. Gulati, Modern Television Practice, Principles, Technology and servicing, 2/e, New Age International Publishers, 2001. 2 John Arnold, Michael Frater, Mark Pickering, Digital Television Technology and Standards, John Wiley, 2007.
e- Resources & other digital material	1.https://www.youtube.com/watch?v=_nGnRvyHMEI&list=RDCMUCdlnqMpRrMcClK2fT6z8EEw&index=2 2.https://www.rfwireless-world.com/Tutorials/digital-television-DTV-basics.html

20EE2601A- ENERGY MANAGEMENT

Offering branch:	EEE	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20ES1101 - Basic Electrical & Electronics Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the fundamentals of energy scenario, energy management, power factor, lighting and energy instrument, electric energy and economic aspects.	**K2**
CO2	**Apply** the knowledge of energy scenario and energy management in electrical energy.	**K3**
CO3	**Apply the** knowledge of Power Factor, Lighting and Energy Instruments use in electrical energy systems.	**K3**
CO4	**Analyze the** methods to improve efficiency of electrical energy systems.	**K4**
CO5	**Analyze** the economic aspects for energy conservation.	**K4**
CO6	**Ability** to apply the various laws of energy management tools to measure the basic parameters and submit a report.	**K3**

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					2	2							
CO3	3		2		2									
CO4		3										2		
CO5		3		2							2			
CO6									3	3		2		
Avg.	3	3	**2**	**2**	2	2	2		**3**	3	2	2		

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Energy Scenario** Commercial and non-commercial energy, primary and secondary energy resources, global primary energy reserves, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, sector wise energy consumption in India, energy and environment.	**CO1 CO2 CO6**
UNIT-2	**Energy Management** Introduction to energy management and objectives, principles of energy management, organizational structure, energy management program, energy policy, energy planning, controlling, ownership, reporting, summary.	**CO1 CO2 CO6**
UNIT-3	**Power Factor Improvement, Lighting and Energy Instruments** Power factor –causes of low PF, effects of low PF, advantages of PF improvement, PF with non-linear loads, Lighting fundamentals, process to improve lighting efficiency– List of Instruments for energy audit- wattmeter, data loggers,thermocouples, pyrometers, lux meters, tongue testers (working principle and measurement).	**CO1 CO3 CO6**
UNIT-4	**Electric Energy Management**	**CO1 CO4**

	Introduction, power supply, effects of unbalanced voltages on the performance of motors, electric motor operating loads, determining electric motor operatingloads, power meter, slip measurement, electric motor efficiency, sensitivity ofload to motor rpm, theoretical power consumption, motor efficiency management. **Energy efficient transformers**: Introduction, transformer loading/efficiencyanalysis.	**CO6**
UNIT-5	**Economic Aspects and Analysis** Economics analysis introduction, objectives, general characteristics of capital investment, depreciation methods-straight line, unit production and double declining, time value of money-simple and compound interests, internal rate of return, netpresent value method, calculation of simple payback method.	**CO1 CO5, CO6**

Learning Resources

Text Books	1. Wayne C.Turner, —Energy management Hand book, John Wiley and son, 8th Edition2012. 2. S.C. Tripathy, Electric —Energy Utilization and Conservation, Tata McGraw Hill, 1991. 3. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online).
Reference Books	1. John. C. Andres, Energy Efficient Electric Motors, Marcel Dekker Inc. Ltd – 3rd Edition,2005. 2. Paul W.O. Callaghan, —Energy Management, McGraw hill Book Company,1st Edition,2005.
e- Resources & other digital material	1. https://www.routledgehandbooks.com/doi/10.1201/9781315374178-4 (Economic Aspects) 2. https://www.yourelectricalguide.com/2019/05/lux-meter-working-principle.html 3. https://electricalfundablog.com/clamp-meter-tong-tester-types-operating-principle-how- to-operate/ 4. https://www.elprocus.com/what-is-pyrometer-working-principle-and-its-types/ 5. http://www.dspmuranchi.ac.in/pdf/Blog/qqqqgmailcomthemocouple1.pdf 6. https://www.profitbooks.net/what-is-depreciation/

20IT2601A - INTRODUCTION TO DATA MINING

Offering branch:	IT	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	Database Management Systems	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the basic principles, process and techniques of data mining.	K2
CO2	Use pre-processing techniques on different datasets.	K3
CO3	Apply techniques and algorithms for Mining frequent patterns, classifying and clustering data.	K3
CO4	Analyze the data for mining frequent patterns, associations, classification and outlier	K4

	detection in a real scenario.	

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	
CO2	3			3									3	
CO3	3			3									3	3
CO4	3	3											3	3
Avg.	**3**	**3**		**3**									**3**	**3**

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	Introduction: What is data mining? What kinds of data can be mined? What kinds of pattern can be mined? Which technologies are used? Which kinds of applications are targeted?, Major Issues in Data Mining.	CO1
UNIT-2	Getting to Know Your Data: Data objects and Attribute Types, Basic statistical descriptions of data, Measuring Data Similarity and Dissimilarity. Data Preprocessing: An overview, Data Cleaning, Data integration, Data Reduction, Data Transformation and Discretization.	CO1 CO2
UNIT-3	Mining frequent patterns, Associations and Correlations- Basic Concepts, Frequent itemset Mining methods- Apriori Algorithm, Generating association rules from frequent itemsets, improving the efficiency of Apriori.	CO1 CO3 CO4
UNIT-4	Classification: Basic Concepts – Basic concepts, Decision Tree Induction, Rule Based Classification, Model evaluation and Selection.	CO1 CO3 CO4
UNIT-5	Cluster Analysis: Basic Concepts and Methods- Cluster Analysis, partitioning methods, Hierarchical Methods and evaluation of Clustering	CO1 CO3 CO4

Learning Resources

Text Books	1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques" Third Edition, Elsevier, 2012.
Reference Books	1. Michael Steinbach, Vipin Kumar, Pang-Ning Tan, Introduction to data mining, First Edition, Addison Wesley, 2006 2. Margaret H. Dunham, Data Mining Introductory and Advanced Topics, 1/e, Pearson Publishers, 2006
E-Resources & other digital material	1. https://www.coursera.org/lecture/code-free-data-science/introduction-to-data-mining-hbb2V 2. https://onlinecourses.swayam2.ac.in/cec19_cs01/preview

20ME2601A - VALUE ENGINEERING

Offering branch:	ME	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts, techniques and applications of value engineering	K2
CO2	**Describe** job plan of value engineering.	K2
CO3	**Illustrate** different value engineering techniques and versatility of value engineering.	K3
CO4	**Illustrate** the efforts of value engineering team during the process of value engineering	K3

Contribution of Course Outcomes towards achievement of Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2			3			3		3			3
CO2	1	2	2			3			3		3			3
CO3	1	2	2			3			3		3			3
CO4	1	2	2			3			3		3			3
Avg.	**1**	**2**	**2**			**3**			**3**		3			**3**

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction**: Value engineering (VE) concepts, advantages, applications, problem recognition, and role in productivity, criteria for comparison, element of choice. **Organization**: Level of value engineering in the organization, size and skill of VE staff, small plant, VE activity, unique and quantitative evaluation of ideas.	**CO1**
UNIT-2	**Value engineering job plan**: Introduction, orientation, information phase, speculation phase, analysis phase. **Selection and Evaluation of value engineering Projects**, Project selection, methods selection, value standards, application of value engineering methodology.	**CO1, CO2**
UNIT-3	**Value engineering techniques**: Selecting products and operation for value engineering action, value engineering programmes, determining and evaluating function(s) assigning rupee equivalents, developing alternate means to required functions, **Decision making for optimum alternative**, use of decision matrix, queuing theory and Monte Carlo method make or buy, measuring profits, reporting results, Follow up, Use of advanced technique like Function Analysis System.	**CO1, CO3**
UNIT-4	**Versatility of value engineering**: Value engineering operation in maintenance and repair activities, value engineering in non-hardware projects. **Initiating a value engineering programme**: Introduction, training plan, career development for value engineering specialties.	**CO1, CO3**
UNIT-5	**Value engineering level of effort**: Value engineering team, co-coordinator, designer, different services, definitions, construction management contracts, value engineering case studies.	**CO1, CO4**

Learning Resources

Text Books	1. Anil Kumar Mukhopadhyaya, "Value Engineering: Concepts Techniques and applications", SAGE Publications 2010.
Reference Books	1. Alphonse Dell'Isola, "Value Engineering: Practical Applications for Design, Construction, Maintenance & Operations", R S Means Co., 1997. 2. Richard Park, "Value Engineering: A Plan for Invention", St. Lucie Press, 1999. 3. Del L. Younker, "Value Engineering analysis and methodology", Marcel Dekker Inc, New York, 2004. 4. Miles, L.D., "Techniques of Value Analysis and Engineering", McGraw Hill, second Edition, 1989. 5. Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1993. 6. Anil Kumar Mukhopadhyaya, "Value Engineering Mastermind: From concept toValue Engineering Certification", SAGE Publications, 2003

20ME2601B - HUMAN FACTORS IN ENGINEERING

Offering branch:	ME	**Year : III**	**Sem: II**
Course Category:	Open Elective -II	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the fundamentals of Human factors, Physical work, Anthropometry, Ergonomics, Machine controls, Seating design, Colour - Light, Temperature - Humidity –Illuminations and Measurement of sound.	K2
CO2	Identify the role of Anthropometry and Ergonomics in product design.	K3
CO3	Choose the effective seating design and Machine controls for improvement of human workplace.	K3
CO4	Represent the importance of colour and light, Temperature - Humidity – Illumination, Measurement of sound in human workplace.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		2			3			1			1	3	1
CO2	1		2			3			1			1	3	1
CO3	1		2			3			1			1	3	1
CO4	1		2			3			1			1	3	1
Avg.	**1**		**2**			**3**			**1**			1	3	1

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Fundamentals of Human Factors Engineering**: Human Biological, Ergonomic and psychological capabilities and limitations, Concepts of human factors engineering and Ergonomics, Man-Machine system and Design philosophy. **Physical work and energy expenditure**: Manual lifting, Work posture, Repetitive motion, Provision of energy for muscular work, Heat stress, Role of oxygen physical exertion, Measurement of energy expenditure, Respiration, Pulse rate and blood pressure during physical work, Physical work capacity and its evaluation.	**CO1**
UNIT-2	**Anthropometry**: Physical dimensions of the human body as a working machine, Motion size relationships, Static and dynamic anthropometry, Anthropometric design principles, Using anthropometric measures for industrial design. **Ergonomics and product design**: Ergonomics in automated systems, Expert systems for ergonomic design, Anthropometric data and its application in ergonomic design, Limitations of anthropometric data, Use of computerized database.	**CO1, CO2**
UNIT-3	**Machine controls:** Improvement of human work place through controls, Displays and Controls, Shapes and sizes of various controls and displays, Multiple display and control situations, Design of major controls in automobiles and machine tools, Principles of hand tool design. **Work place and seating design**: Design of office furniture, Redesign of instruments, Work process: Duration of rest periods, Design of visual displays, Design for shift work.	**CO1, CO3**
UNIT-4	**Color and light:** Color and the eye, Color consistency, Color terms, Reactions to color and color continuation, Color on engineering equipments. **Temperature-Humidity-Illumination and Contrast**: Use of Photometers, Recommended illumination levels, the ageing eye, Use of indirect (Reflected) lighting, Cost efficiency of illumination. Special purpose lighting for illumination and quality control.	**CO1 CO4**
UNIT-5	**Measurement of sound**: Noise exposure and hearing loss, Hearing protectors, Analysis and reduction of noise, Effects of noise, Performance annoyance of noise and interface	**CO1 CO4**

	with communication, Sources of vibration and performance effect of vibration.	

Learning Resources

Text Books	1. .M. S. Sanders and E. J. McCormick, Human Factors in Engineering Design, VII Edition, McGraw Hill International, 1993.
Reference Books	1. P. V. Karpovich and W. E. Sinning, Physiology of Muscular Activity", VII Edition, Saunders (W.B.) Co Ltd., 1971. 2. Applied Ergonomics Handbook, I.P.C. Science and Technology Press Limited, 1974. 3. M. Helander, A Guide to the Ergonomics of Manufacturing, II Edition, CRC Press, 1997. 4. K. H. E. Kroemer, H. B. Kroemer, K. E. Kroemer Elbert, Ergonomics: How to design for ease and efficiency, II Edition, Pearson Publications, 2001.

20ES1651- AI TOOLS LAB

Offering branch:	CSE	**Year : III**	**Sem: II**
Course Category:	Engineering Sciences	Credits:	1
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-2
Prerequisites:	Nil	Continuous Evaluation:	25
		Semester End Evaluation:	50
		Total Marks:	75

Course Outcomes

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

CO1	**Apply** various preprocessing techniques on different datasets.	K3
CO2	**Construct** Machine learning programs for Supervised, Unsupervised and Semi supervised learning models.	K6
CO3	**Develop** Deep learning programs for Supervised & Unsupervised learning models.	K6
CO4	**Identify** and **Apply** Artificial Intelligence concepts to solve real world problems.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	2					1		2	1	2
CO2	3	3	2	1	2					1		2	1	2
CO3	3	3	2	1	2					1		2	1	2
CO4	2	2	3	1	2		1			1		2	1	3
Avg.	**3**	**3**	**2**	1	**2**		**1**			**1**		2	1	**2**

1- Low	2-Medium	3-High
Course Content		
Experiment No.1	Apply Data pre-processing techniques.	CO1
Experiment No.2	Construct a Machine Learning model using supervised learning method.	CO2
Experiment No.3	Construct a Machine Learning model using Unsupervised learning method.	
Experiment No.4	Construct a Machine Learning model using Semi supervised learning method.	
Experiment No.5	Develop a Deep Learning model using supervised learning method.	CO3
Experiment No.6	Develop a Deep Learning model using Unsupervised learning method.	
Experiment No.7	Apply a Convolutional Neural Network for Image Classification.	
Experiment No.8	Build an AI application.	CO4
Learning Resources		
e-Resources& other digital material	1. https://github.com/atinesh-s/Coursera-Machine-Learning-Stanford 2. https://github.com/Kulbear/deep-learning-coursera	

20CE3651 - COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	Professional core course	Credits:	1.5
Course Type:	Laboratory	Lecture-Tutorial-Practical:	0-0-3
Prerequisites:	NIL	Continuous Evaluation:	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Explore** and **evaluate** open source software applications in civil engineering	K4
CO2	**Analyse and design** structural elements of Reinforced Concrete Structures using STAAD Software	K6
CO3	**Analyse and design** structural members of Steel Structures using STAAD Software	K6
CO4	**Analyse** Geo spatial data and create maps and reports using GIS Software	K4
CO5	**Apply** Geo spatial data and create maps and reports related to water resources and transportation engineering using GIS Software	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	Introduction to various computer applications in Civil Engineering, Listing out various open source software's available. Download and explore any one open source software in related to Civil Engineering application and prepare a report and record the same.	CO1
Experiment No.2	List of Analysis and Design to be performed using software STAAD.Pro 1. Introduction to STAAD Pro software and basic beam analysis. 2. Structures subjected to wind and earthquake loads. (minimum five storey), Typical detailing of structural elements.	**CO2**
Experiment No.3	Analysis and Design of steel truss to be performed using software STAAD.Pro	**CO3**
Experiment No.4	List of experiments to be performed by Geographical Information System (GIS) 1. Creation and analysis of spatial data using GIS. 2. Generation of maps and reports based on specific queries.	**CO4**
Experiment No.5	Simple applications of GIS in water Resources Engineering & Transportation Engineering	**CO5**

Learning Resources

Text Books & Reference Manuals	1. Concept and Techniques of GIS by C.P.L.O. Albert, K.W. Yong, Prentice Hall Publishers.
Reference Books	1. https://desktop.arcgis.com/en/arcmap/10.3/map/reports/creating-a-report.htm

20SS 8651- SOFT SKILLS

Offering Branches	Training and Placement Cell	**Year : III**	**Sem: II**
Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture-Tutorial-Practical:	1-0-2
Prerequisites:	NIL	Continuous Evaluation:	0
		Semester End Evaluation:	50
		Total Marks:	50

Course Outcomes

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

CO1	**Develop** logical and **Analytical** skill set through Case Studies	K3
CO2	**Proficient** in giving Presentations	K3
CO3	**Understand** the corporate etiquette	K2
CO4	**Develop** Competency in group discussion & Interviews	K3
CO5	**Present** themselves with corporate readiness	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	• Soft Skills- Need & Importance. Intra & Inter Personal Skills • Campus to Corporate- Employability Skills- Need of the hour • SWOT Analysis. • Attitude- Developing Professional & Positive Attitude • Perception – Importance of analytical thinking.	CO1, CO2, CO5.
UNIT-2	• Communication Skills – Need and Methods • Body-Language -I; How to interpret and understand other's body language • Body Language-II; How to improve one's own Body Language • Presentation Skills (Seminar Talk & Power Point Presentation)	CO1 CO2, CO4, CO5.
UNIT-3	• Goal Setting- Need & Importance • Magic of Team Work. • Leadership Qualities. • Six Thinking Hats.	CO1, CO3.
UNIT-4	• Accountability towards Work. • Paragraph Writing – Descriptive and Analytical with illustrations • Email Writing • Work Etiquette	CO1, CO3, CO5.
UNIT-5	• Group Discussion (Open & Monitored) • Resume Preparation • Interview Skills • Mock Interviews	CO2, CO4, CO5.

Learning Resources

Text Books	1. The ACE of Soft Skills by Gopalaswamy Ramesh & Mahadevan Ramesh –Pearson 2. Working with Emotional Intelligence - David Goleman. 3. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd.,Delhi.
Reference Books	1. Soft Skills: Meenakshi Raman. 2. Audio—Visuals / Hand Outs (Compiled/Created by T&P Cell, P.V.P.Siddhartha Institute of Technology), Board & Chalk and Interactive Sessions
Semester End Evaluation	• **15 marks for Report- Which includes** 5marks for Resume 10 Marks for PPT (5M for PPT preparation & Presentation, 5M for Report Preparation on PPT) • **35 Marks for External Exam – Which includes** 10 marks for Viva with external examiner, 20 marks for Vocab test (Which is essential in Recruitment written test) 5 marks for E-mail Writing (which is important for the student to apply for the job through online, to give consent to job offer and to communicate in the work environment)

20CE3662 – MINOR PROJECT

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	Projects	**Credits:**	1.5
Course Type:	Theory & Practical	**Lecture-Tutorial-Practical:**	0-0-3
Prerequisites:	NIL	**Continuous Evaluation:**	15
		Semester End Evaluation:	35
		Total Marks:	50

Course Outcomes

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

CO1	**Develop** capability to acquire and apply fundamental principles of engineering	K6
CO2	**Become** updated with all the latest changes in technological world	K3
CO3	**Make** deep connections between ideas	K3
CO4	**Learn** to take creative risks	K2
CO5	**Be ready** for the creative economy also engage in iterative thinking and divergent thinking	K2
CO6	**Identify, formulate and model** problems and find engineering solution based on a systems approach	K5

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO2	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO3	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO4	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO5	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO6	3	2	2	3	3	3	1	3	3	3	3	3	3	2
Avg.	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

1- Low **2-Medium** **3-High**

Course Content

PURPOSE: To carry out a design project in one of the specializations of civil engineering with substantial multidisciplinary component.

INSTRUCTIONAL OBJECTIVES: To guide the students in such a way so that they carry out a work on a topic as a forerunner to the full-fledged project work to be taken subsequently in VIII semester. The project work shall consist of substantial multidisciplinary component.

The students will carry out a project in one of the following civil engineering areas but with substantial multidisciplinary component involving Architecture, Mechanical engg. Electrical engg., Biotechnology, Chemical engg., Computer science

CO1 CO2 CO3 CO4 CO5 CO6

- Structural Engineering
- Geotechnical Engineering
- Water Resources Engineering and environmental engg.
- Geomatics Engineering and surveying
- Construction management
- Transportation engineering

Student groups will be formed (4 in a group) and a faculty member will be allocated to guide them. There will be three reviews. First review will not carry any marks but the project topic will be finalized in it. Of remaining 2 reviews one will be carried out in the mid-semester and the last one by the end of semester.

INTERNAL ASSESSMENT

Marks	Awarded by	Criteria
5	Guide	For regularity, systematic progress, extent of work and quality of work
5	2nd review	Presentation, contents and viva
5	3rd review	Multidisciplinary component, Quality of project report, Presentation, contents and viva

20CE6601A - ADVANCED PAVEMENT MATERIALS

Offering Branches	CE	Year : III	Sem: II
Course Category:	HONOURS	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3306 – Surveying	Continuous	30

	20CE3502 – Highway Engineering	**Evaluation:**	
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Identify** different pavement materials.	K1
CO2	**Focus** on the sudgrade soil and stabilization concepts.	K4
CO3	**Explain** physical properties of aggregates and recycled aggregates	K4
CO4	**Examine** the functions and applications of geosynthesis	K3
CO5	**Describe** the functions and applications of advanced materials	K1

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1			2			1	1					1	2	
CO2			2			3	3					3	2	
CO3			3			3	3					3	3	
CO4			2			2	2					2	2	
CO5			2			1	1					1	2	
Avg.			**2**			**2**	**2**					**2**	**2**	

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Pavement Materials:** Pavement structure; introduction to materials used in different layers; factors affecting pavement performance; need for material characterization; performance data collection; specification development.	**CO1**
UNIT-2	**Subgrade Soil and Stabilization:** Characterization of subgrade soil for pavement design: index properties, compaction characteristics; stiffness and strength of soil, resilient modulus (Mr); deformation characteristics of subgrade soil; soil Stabilization concepts	**CO2**
UNIT-3	**Aggregates:** Origin, physical characterization of aggregates; requirement of aggregate property in different pavement layers: aggregate gradations; aggregate packing characteristics; factors affecting the performance of unbound aggregate layers, recycled aggregates and Marginal aggregates in pavement construction.	**CO3**
UNIT-4	**Geosynthesis:** An overview on the development, functions and applications of various geosynthetics - the geotextiles, geogrids, geonets, geomembranes, geocomposites and other products.	**CO4**
UNIT-5	**Advanced Materials:** An overview on the development, functions and applications of various like flyash, quarry dust, brick ash, rice husk dust, GGBS etc.,	**CO5**

Learning Resources

Text Books	3. Highway Engineering, (9th edition) by Khanna, S.K. and Justo ,C.E.G., Nem Chand Bros, Roorkee, 2010. 4. Pavement Design and Materials, Papagiannakis, A.T., Masad, E.A., Wiley, 2008, First Edition. 5. Fundamentals of Geosynthetics Engineering, Sanjay Kumar Shukla and Jian-Hua Yin, CRC Press, 2017, 1st edition. 6. Designing with geosynthetics, Koerner, R.M., Pearson Education Inc., 2012, 6th edition
Reference Books	7. Asphalt Binder Handbook, MS-26, Asphalt Institute, 2011, First Edition. 8. Asphalt Mix Design Methods, MS-2, Asphalt Institute, 2015, Seventh Edition. 9. Geosynthetics Engineering: in Theory and Practice, Mandal, J.N., Research Publishing, Singapore, 2018, 1st ed.

	10. IRC Code for flexible pavement – IRC – 37 -2001. 11. IRC Code for Rigid pavement – IRC – 58 – 2002. 12. IS:16352-2020: Testing of HDPE Geomembrane liners.
e- Resources & other digital material	3. https://nptel.ac.in/courses/ 105/101/105101143 1. https://nptel.ac.in/courses/ 105/101/105101176

20CE6601B - INTELLIGENT TRANSPORTATION SYSTEM

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	HONOURS	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3306 – Surveying 20CE3502 – Highway Engineering	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	**Identify** and differentiate ITS user services and their components.	K1
CO2	**Predict** appropriate ITS technology to solve real-life traffic problems.	K2

CO3	**Estimate** traffic congestion by the acquisition of big data using advanced devices.	K2
CO4	**Design** and implement suitable ITS and services for effective transportation.	K6
CO5	**Select** suitable standards for effective implementation of ITS.	K1

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**ITS History and Applications:** ITS Background and Telemetric systems: Definitions, features, and objectives of ITS, History of ITS and its development worldwide, telemetric concept, transport telemetric, telemetric structure, ITS taxonomy, ITS application areas, uses.	**CO1**
UNIT-2	**ITS User Services:** Infrastructure based services; Arterial management and integration, freeway/highway management, crash prevention and safety, road weather management, roadway operation and maintenance, transit management, emergency management, Electronic payment and pricing, traveller information, COV, Intelligent vehicle-based services; Collision notification and avoidance system, driver assistance system	**CO2**
UNIT-3	**ITS Components, Tools, and Strategies:** Components of user services; advanced traffic management system, advanced traveller information system, advanced vehicle control system, commercial vehicle operational management, advanced public transportation system, electronic payment system, advanced rural transportations, security and safety systems, urban traffic control, scoot, and scat systems, benefits and limitations.	**CO3**
UNIT-4	**Design and Implementation:** Design components; data acquisition methods, equipment and used technology, radar and sensor, detectors, vehicle identifiers, and GPS, Communication tools; DSRC, CALM, traveller information tools, data handling, processing and management; TCM, and its working, worldwide ITS implementation and challenges, Traffic Command and Control Centre design and implementation, System Integrator and Smart Transportation Management	**CO4**
UNIT-5	**ITS Standards:** ITS standards, development process, legal issues, financial issues, Mainstreaming ITS; integration and up-gradation; Future of ITS	**CO5**

Learning Resources

Text Books	1. Fundamentals of Intelligent Transportation Systems Planning, M.A. Chowdhury and A. Sadek, Artech House, 2010, First Edition. 2. Intelligent Transport Systems, Sarkar, Pradip Kumar, and Amit Kumar Jain, PHI Learning, 2018, First Edition. 3. Perspectives on Intelligent Transportation Systems (ITS), J.M. Sussman, Springer, 2005, First Edition.
Reference Books	1. Economic Impacts of Intelligent Transportation Systems: Innovations and Case Studies, Bekiaris and Y.J. Nakanishi, Elsevier/JAI, 2004. 2. IET Intelligent Transport Systems and 15th International IEEE Conference on Intelligent Transportation Systems (ITSC), September 2012. 3. Intelligent Transport Systems Standards, Bob Williams, Artech House Publishers, 2008. 4. Intelligent Transport Systems: Cases and Policies, RogerStough, Edward Elgar, 2001. 5. Intelligent Vehicle Technologies – Theory and Applications, L. Vlacic, M. Parent, F. Harashima, Butterworth-Heinemann, 2010. 6. The Imp
e- Resources & other digital	4. http://digital-library.theiet.org/content/journals/iet-its 5. http://digital-library.theiet.org/content/journals/iet-its

material	6. http://www.tandfonline.com/toc/gits20/current 7. https://www.its.dot.gov/history/pdf/HistoryofITS_book.pdf

20CE6601C - SUSTAINABLE TRANSPORTATION

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	HONOURS	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3502 - Highway Engineering 20CE4705C – Urban Transportation Planning	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Identify** a sustainable transportation system.	K1
CO2	**Consider** sustainability in providing mode choices for the public	K3
CO3	**Develop** and plan pedestrian facilities for sustainable transportation.	K3
CO4	**Plan** for bicycle facilities.	K6
CO5	**Explain** policies that improve the sustainability of transportation.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2
CO1	2					1			1				2	
CO2	2					2			2				2	
CO3	3					2			2				3	

CO4	2					3			3				2	
CO5	2					2			2				2	
Avg.	**2**					**2**			**2**				**2**	

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Problem of Sustainability in Transport:** Energy use in the transport sector; Transport and climate change; Greenhouse gas emissions, urban air quality, Congestion, and sustainability, Sustainable Development Goals.	**CO1**
UNIT-2	**Planning for Sustainability:** Urban form, Indicator based planning, land use transport integration, Compact City, Public Transit, TOD, NMT, First and Last Mile Connectivity.	**CO2**
UNIT-3	**Evaluation of Non-motorized Transportation:** Surveys, Demand Estimation, and Analysis; Crash Data, Barrier Effect; Cycling Condition Evaluation Techniques; Pedestrian Condition Evaluation Techniques; Prioritizing Improvements and Selecting Preferred Options.	**CO3**
UNIT-4	**Planning for Pedestrians:** Types of pedestrians and Characteristics; Pedestrian facilities and planning; Pedestrian standards and improvements; Pedestrian facility Design, LOS; Pedestrian safety programs **Planning for Bicyclists:** Types of cyclists and Bikeways; Integrating cycling into roadway planning; Bicycle network planning; Accommodating cyclists on rural roads; Design of Bicycle boulevards/bike paths; Bicycle Parking/storage Facilities; Roadway maintenance for cyclists.	**CO4**
UNIT-5	**Sustainable Policies:** Continuum of Policies, speed and speed limit policies, national policies, sustainable travel demand management; public awareness; pricing transportation: total cost of transportation, pricing, and taxation. **Sustainable Technology:** Telecommuting, Information and Communication Technologies, E-commerce, Alternative Cleaner Fuels, vehicle technologies, fuel cells, Intelligent Transport Systems.	**CO5**

Learning Resources

Text Books	1. An Introduction to Sustainable Transportation: Policy, Planning and Implementation, Preston L. Schiller, Eric C. Brunn, and Jeffrey R. Kenworthy, Routledge, 2010. 2. Sustainable Transport: Planning for Walking and Cycling in urban environments, Rodney Tolley, Editor, CRC Press, 2003. 3. Sustainable Transport: Problems and Solutions, Black, W.R., Guilford Press, New York, 2010.
Reference Books	1. Accessible Cities and Regions: A Framework for Sustainable Transport and Urbanism in the 21st Century, Cervero, R., Center for Future Urban Transport, Institute of Transportation Studies, University of California, Berkeley, 2005. 2. Sustainable Transport: Definitions and Responses, In Transportation Research Board, Integrating Sustainability into the Transportation Planning Process, Conference Proceedings 37, Black, W. R., National Research Council,Washington, DC, 2005. 3. Transportation Technologies for Sustainability, Mehrdad Ehsani, Fei-Yue Wang and Gary L. Brosch (Eds.), Springer-Verlag, New York, 2013.
e- Resources & other digital material	1. https://nptel.ac.in/courses/ 105/107/105107210 2. https://nptel.ac.in/courses/ 105/105/105105157

20CE6601D - TRANSPORT ECONOMICS AND PROJECT APPRAISAL

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	HONOURS	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3502 - Highway Engineering 20CE4705C – Urban Transportation Planning	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Differentiate** macro and microeconomic principles.	K2
CO2	**Estimate** benefits and costs of transport projects and carry out economic analysis.	K4
CO3	**Evaluate** transport projects.	K4
CO4	**Estimate** the life cycle cost of transport projects.	K4
CO5	**Appraise** various financial models for the development of transport infrastructure.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Transport Economics:** Population, Review of Engineering Economics and Microeconomics, Welfare Theory and Equilibrium Conditions, Goals and Objectives, Principles of Economic Analysis.	**CO1**
UNIT-2	**Methods of Economic Analysis:** Discounted Cash Flows: Analysis of User Costs and Benefits, Fixed, variable, marginal, and average cost, opportunity cost, shadow price, the value of time, social cost of transportation, congestion as well as pollution cost.	**CO2**
UNIT-3	**System Selection and Evaluation:** Framework of Evaluation, Measures of effectiveness of economic analysis, Other Evaluation Procedures - Traditional Economic Analysis, the concept of consumer surplus, equity issues in investment.	**CO3**
UNIT-4	**Life Cycle Cost Analysis:** Factors considered for Life Cycle Cost Analysis; data requirements for highway project feasibility analysis, the establishment of technical/ economic/ financial feasibility of a highway project, social benefits.	**CO4**
UNIT-5	**Financial Analysis – Private Sector Participation:** BOT, BOOT, BOLT Projects, Project Planning, Project System Management, Project Implementation, financial analysis in the public and private sector, revenue generation enhancement techniques, Budgetary and Control.	**CO5**

Learning Resources

Text Books

1. Economic Analysis for Transportation: A Guide for Decision Makers, Robley E. Winfrey, International Textbook Co., Northwestern University, 1971 (Digitized in 2011).
2. Theory and Applications of Economics in Highway and Transport Planning, Maitri, V., Sarkar, P.K., Standard Publishers Distributors, 2010, First Edition.
3. Transport Economics (Critical Concepts in Economics), Hensher, D.A., Routledge 2011, First Edition.

Reference Books	1. Manual on Economic Evaluation of Highway Projects in India, IRC: SP30, Indian Roads Congress, New Delhi, 2019. 2. Transportation Planning: Principles, Practices and Policies, Sarkar, P.K., Maitri, V., Joshi, G.J., PHI Learning, 2017, Second Edition. 3. Urban Transport: Planning and Management, Jain A.K., APH Publishing Corporation, 2008.
e- Resources & other digital material	1. https://dspace.mit.edu/bitstream/handle/1721.1/107706/11-540j-fall-2006/contents/lecture-notes/index.htm 2. https://nptel.ac.in/courses/ 105/107/105107067

20CE5601A - BASIC MECHANICS OF FLUIDS

Offering Branches	CE	**Year : III**	**Sem: II**
Course Category:	MINORS	Credits:	4
Course Type:	Theory	Lecture-Tutorial-Practical:	3-1-0
Prerequisites:	20BS1101- Calculus and Linear Algebra 20BS1201- Differential Equations and Vector Calculus 20BS1104-Applied Physics	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand, analyze** and **apply** various fluid properties to solve the fluid problems and use various devices for measuring fluid pressure.	K4
CO2	**Apply** hydrostatic law to find hydrostatic force on various submerged planes and use of law of conservation mass to fluid flow.	K3

CO3	**Apply** the concept of boundary layer theory to determine lift and drag forces on a submerged body.	K3
CO4	**Apply** appropriate flow equations and principles to **analyse** pipe flow problems.	K4
CO5	**Apply** Bernoulli's equation to fluid flow problems and use of different fluid flow measuring devices.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION:** Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapour pressure and their influences on fluid motion. Pressure at a point-Pascal's law, Hydrostatic law, Pressure and its Measurement: Atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential manometers.	**CO1**
UNIT-2	**HYDROSTATIC FORCES:** Hydrostatic forces on submerged, horizontal, vertical and inclined surfaces, Total pressure and centre of pressure derivations and problems. **FLUID KINEMATICS-** Description of fluid**,** stream line, path line and streak lines and stream tube. Classification of flows- steady, unsteady, uniform non-uniform, laminar, turbulent, rotational, irrotational flows, Equation of continuity for one, three dimensional flows.	**CO1, CO2**
UNIT-3	**FLUID DYNAMICS:** Surface and body forces – Euler's and Bernoulli's equations for flow along a stream line for 3-D flow, Momentum equation and its application – forces on pipe bend. Boundary layer – concept, characteristics of boundary layer along a thin flat plate, Separation of boundary layer, Flow around submerged objects- drag and lift**.**	**CO1, CO3**
UNIT-4	**LAMINAR FLOW:** Reynold's experiment- Characteristics of laminar and turbulent flows. Flow between fixed parallel plates, Flow through horizontal pipes. **FLOW THROUGH PIPES –** Laws of fluid friction – Darcy's equation, minor losses Pipes in series- pipes in parallel-equivalent pipe, total energy line and hydraulic gradient line**.**	**CO1, CO4**
UNIT-5	**MEASUREMENT OF FLOW:** Pitot tube, Venturi meter and orifice meter. Classification of orifices, Flow over rectangular, triangular, trapezoidal notch, Broad crested weirs	**CO5**

Learning Resources

Text Books	3. P.N. Modi and S.M. Seth, Fluid Mechanics (18th edition) Standard Book House,2017. 4. A.K. Jain, Fluid Mechanics, Khanna publishers,2010
Reference Books	5. L. Victor, Streeter and E. Benjamin Wylie, Fluid Mechanics, Tata McGraw Hill,1985. 6. M. Franck White, Fluid Mechanics, Tata McGraw Hill,2017. 7. K. Subramanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill,2001. 8. A text book of Fluid Mechanics and Hydraulic Machines by R. K. Rajput, S. chand Technical publishers
e-Resources& other digital material	4. Fluid Mechanics virtual labs. http://eerc03-iiith.vlabs.ac.in/ 5. https://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/fluid_mechanics/index.htm

	6. https://nptel.ac.in/courses/105105119.

VII– SEMESTER SYLLABUS

20CE4701A –ADVANCED DESIGN OF REINFORCED CONCRETE STRUCTURES

Offering Branches	CE	Year : IV	Sem: I
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3503-Structural Analysis	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Analyze** and **design** staircases spanning transversely and longitudinally.	K6
CO2	**Analyze** and **design** cantilever and counterfort retaining walls.	K6
CO3	**Analyze** and **design** of flat slabs as per IS:456-2000.	K6
CO4	**Analyze** and **design** of water tanks as per IS:3370-2009.	K6
CO5	**Analyze** and **design** deep beams and Corbels	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**DESIGN OF STAIRCASES** Introduction, Principles of Design, Applied Loads, Design of Stairs Spanning Transversely (Horizontally) and Stairs spanning Longitudinally.	CO1
UNIT-2	**RETAINING WALLS** Types of retaining walls, forces on retaining walls, stability requirements, Preliminary proportioning of cantilever/counterfort retaining walls, Design of cantilever and counterfort retaining walls.	CO2
UNIT-3	**DESIGN OF FLAT SLABS** Direct Design Method – Distribution of Moments in column strips and middle strip – moment and shear transfer from slabs to columns – shear in flat slabs – check for one way shear – Introduction to equivalent frame method. Limitation of direct design method – Distribution of moments in column strips and middle strip.	CO3
UNIT-4	**DESIGN OF WATER TANKS** Introduction, Design Requirement, Methods of Analysis, Design of Circular tanks resting on ground, Design constants, rectangular tanks resting on ground.	CO4
UNIT-5	**DEEP BEAMS AND CORBELS** Design of simply supported deep beam, Design of Corbel	CO5

Learning Resources

Text Books

1. P.C.Varghese, Advanced Reinforced Concrete Design, 2/e, Prentice Hall of India, 2010.
2. S.S.Bhavikatti, Advance R.C.C Design(R.C.C. Volume- II), 2/e, New Age International Publishers, 2012.
3. T.R.Jagadeesh and M.A.Jayaram, Design of Bridge Structures, 2/e, Prentice Hall of India, 2014.
4. P.C.Varghese, Limit State Design of Reinforced Concrete, 2/e, Prentice Hall of India,

	2015.
Reference Books	3. Pillai and Menon, Reinforced Concrete Design, 3/e, Tata McGraw Hill, 2017.
e- Resources & other digital material	1. https://freevideolectures.com/course/2686/design-of-reinforced-concrete-structures/26 2. https://nptel.ac.in/courses/105/105/105105104/ 3. https://freevideolectures.com/course/3269/advanced-foundation-engineering/24

20CE4701B - ADVANCED FOUNDATION ENGINEERING

Offering branch	CE	**Year : IV**	**Sem: I**
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3402- Geotechnical Engineering 20CE4601B – Foundation Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Generalize** the bearing capacity equation and utilize it to determine soil bearing pressure	K2
CO2	**Assess** the bearing capacity of layered soils and slopes	K5
CO3	**Evaluate** the strain in sand	K5
CO4	**Evaluate** the strain in clay soil	K5
CO5	**Construct** the buildings at a shallow depth supported on mat or raft foundations	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**BEARING CAPACITY OF FOUNDATIONS**: Using general bearing capacity equation, Meyerhof's, Brinch Hansen's and Vesic's methods.	**CO1**
UNIT-2	**BEARING CAPACITY OF LAYERED SOILS:** Strong layer over weak layer, Weak layer on strong layer, bearing capacity of foundations on a top of slope, Bearing capacity of foundations at the edge of the slope.	**CO2**
UNIT-3	**SETTLEMENT ANALYSIS:** Immediate settlement of footings resting on granular soils, Schmertmann& Hartman method, De Beer and Martens method.	**CO3**
UNIT-4	**SETTLEMENT IN CLAYS**: Immediate settlement, Janbu's method, correction for consolidation settlement using Skempton and Bjerrum's method, Correction for construction period	**CO4**
UNIT-5	**MAT FOUNDATIONS:** Purpose and types of isolated and combined footings, Mats/ Rafts, Proportioning of footings.	**CO5**

Learning Resources

Text Books	1. Principles of Foundation Engineering, BM Das, CENTAG Learning 2. Soil Mechanics and Foundation Engineering, VNS Murthy, CBS Publishers
Reference Books	1. Foundation Analysis and Design, J.E. Bowles, John Wiley Foundation Design, W.C. Teng, Prentice Hall Publishers.

e-Resources& other digital material	1. https://nptel.ac.in/courses/105108069/

20CE4701C – REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM

Offering Branches	CE	**Year : IV**	**Sem: I**
Course Category:	Program Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3306 – Surveying	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understanding** of aerial photographs, stereoscopy and Remote sensing sensors and platforms, their properties and calibration.	K2
CO2	**Apply** the knowledge of technical issues relating to the storage, management, analysis and display of the GIS Spatial data.	K3
CO3	**Interpretation of** image processing sequence and its importance in Remote Sensing & Spatial Analysis.	K2
CO4	**Appraise** on GIS Map Projections, buffering techniques, raster data models and vector data models.	K4
CO5	**Developing** GIS in urban planning, traffic management and urban change mapping.	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Basic Concepts and Foundation of Remote sensing** – Elements involved in Remote Sensing, Electromagnetic Spectrum, Resolution, Satellite visual interpretation techniques, Basic elements, Converging evidence, Interpretation for Terrain evaluation. Remote Sensing Applications, Advantages and Disadvantages of Remote Sensing. **Photogrammetry** and Types of Aerial photographs, Stereoscopy, Map Vs Mosaic, ground control, Stereoscopic Parallax, Orthophoto	**CO1**
UNIT-2	**Basic Concept of GIS:** Introduction to GIS, GIS Categories, Spatial Data and Non-Spatial Data, Basic Components of GIS, Fundamental Operations of GIS, Projections of Maps, Classification of Maps, Advantages of GIS.	**CO2**
UNIT-3	**DIGITAL IMAGE PROCESSING:** Basic Character of Digital Image; Pre-processing, Geometric Correction Methods, Atmospheric correction method, Image Registration, Image Enhancement. Image Classifications, Supervised Classifications, Unsupervised Classifications.	**CO3**
UNIT-4	**GIS DATA REPRESENTATION:** Types of Data Representation**,** Data Collection and input overview, data input and output. Keyboard entry, Digitizing and Scanning, Raster GIS, Vector GIS – File Management, Layer Based GIS, Feature based GIS mapping, GIS Data File Management. Buffering Techniques.	**CO4**
UNIT-5	**GIS APPLICATIONS FOR URBAN PLANNING:** Introduction, urban planning theory, Land use/ land cover Mapping, Base maps for Urban Areas, Urban Infrastructure & Utility Mapping, Remote Sensing Platforms and Sensors Application in Urban Studies. Aerial Photography and Satellite Data in Urban Studies, Traffic Management, Urban Change Detection and Mapping.	**CO5**

Learning Resources

Text Books	2. Remote Sensing and Geographical Information systems, (4th edition) by M.Anji Reddy B.S. Publications, JNTU Kakinada, 2018. 3. Remote Sensing and GIS, (2nd edition) By Basudeb Bhatta Oxford Higher Education.
Reference Books	1. Remote Sensing and Image Interpretation, (6th edition) by Thomas Lillesand. M and Ralph Kiefer W, 2007 2. Remote Sensing of the Environment: An Earth Resource Perspective by John R. Jensen, 2009.
e- Resources & other digital material	1. http://nptel.ac.in/courses.php 2. http://jntuk-coeerd.in/

20CE4701D –OPEN CHANNEL HYDRAULICS

Offering Branches	CE	**Year : IV**	**Sem: I**
Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	CE3301- Mechanics of Fluids 20BS1101-Calculus and Algebra	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the concept of open channels	K2
CO2	**Design** economic channel sections	K3
CO3	**Apply** gradually varied flow equation and able to solve problems	K3
CO4	**Understand** and **analyze** energy dissipation during hydraulic jump	K4
CO5	**Understand** the concept of flood routing	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	Introduction, types of channels, classification of flows, velocity distribution, pressure distribution, specific energy, critical depth – calculation, kinetic energy correction factor, momentum correction factor. Bottom slopes and Surface profiles.	CO1
UNIT-2	Uniform Flow: Chezy's equation, Manning's formula, velocity distribution, uniform flow computations, hydraulically efficient channel sections, Specific Energy, Specific Force, Critical Flow, Compound channel section, Irrigation canal.	CO2
UNIT-3	Gradually Varied Flow (GVF): Differential equation for GVF, classification and features of flow profiles, control sections, simple numerical solutions of GVF problems.	CO3
UNIT-4	Rapidly Varied Flow: Hydraulic jump in horizontal rectangular channel, use of jump as energy dissipater, Applications of hydraulic Jump. Types of hydraulic jump	CO4
UNIT-5	Flood Routing through reservoirs and flood routing through channel, Muskingum method of flood routing.	CO5

Learning Resources

Text Books	1. K. Subramanya, Flow in Open Channels, 5/e, Tata McGraw Hill, 2015. 2. VenTe Chow, Open-Channel Hydraulics, McGraw-Hill, 2009.
Reference Books	1. P.N. Modi and S.M. Seth, Hydraulics and Fluid Mechanics and Hydraulic Machines, 20/e, Standard Book House, 2015. 2. A.K. Jain, Fluid Mechanics, 12/e, Khanna publishers, 2014.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105/103/105103096/ 3. https://nptel.ac.in/content/storage2/courses/105107059/module1/lecture1/lecture1.pdf

20CE4702A –ADVANCED DESIGN OF STEEL STRUCTURES

Offering Branches	CE	Year : IV	Sem: I
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3601-Design of Steel Structures	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Analyze** and **design** cross section of plate girder and its connections.	K6
CO2	**Analyze** and **design** web stiffeners, web splice of plate girder.	K6
CO3	**Analyze** and **design** roof trusses and purlins.	K6
CO4	**Analyze** and **design** column bases and grillage foundation.	K6
CO5	**Analyze** and **design** gantry girder.	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**PLATE GIRDERS** Components of a plate girder, economical depth, design of flanges, design of cross section of plate girders, design of connection.	CO1
UNIT-2	**PLATE GIRDERS** Web stiffeners - design of vertical, horizontal and bearing stiffener, web splice.	CO2
UNIT-3	**ROOF TRUSSES** Types of trusses, economical spacing of roof trusses, loads on roof trusses, estimation of wind load on roof trusses as per IS:875, design of members of roof truss and joints, design of purlins.	CO3
UNIT-4	**COLUMN BASES AND FOUNDATIONS** Slab base, gusset base and grillage foundations for axially loaded columns.	CO4
UNIT-5	**GANTRY GIRDER** Introduction - loading consideration and maximum load effect - selection of gantry girder – design of gantry girders for primary loads only.	CO5

Learning Resources

Text Books	1. S.K. Duggal, Limit state Design of steel structures, 2/e, Tata McGraw Hill, 2017. 2. N. Subramanyam, Design of Steel Structures, 2/e, Oxford University Press, 2016.
Reference Books	1. V.L. Shah and Veena Gore, Limit State Design of steel structures IS:800- 2007, Structures Publications, 2012. 2. M.L. Gambhir, Fundamentals of Structural Steel Design, McGraw Hill Education, 2013. 3. Ramachandra and V. Gehlot, Design of Steel Structures, 2/e, Scientific Publishers, 2015.
e- Resources & other digital material	1. https://freevideolectures.com/course/2679/design-of-steel-structures/38 2. http://nptelvideos.com/video.php?id=1655 3. https://www.digimat.in/nptel/courses/video/105103094/L36.html 4. http://www.nptelvideos.in/2012/11/design-of-steel-structures.html-

20CE4702B – RAILWAY AND HARBOR ENGINEERING

Offering Branches	CE	Year : IV	Sem: I
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Engineering Mathematics I 20CE3502 - Highway Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Explain** about planning and functions of railway, railway tracks and joints	K2
CO2	**Analyze** geometric design of track, sleepers, fishplates and ballast	K4
CO3	**Examine** points, crossing and signalling system	K3
CO4	**Analyze** the Design and plan of airport, air craft characteristics	K4
CO5	**Explain** the harbour engineering with plan and design	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Transportation Systems:** Role of railways in transportation, Comparison of railway and highway transportation, Development of railway systems with particular reference to India **Railway Track, Rails & Rail Joints:** Permanent way, Gauges in Railway track, Railway track cross-sections, Coning of wheels, Functions of rails, Requirements of rails, Types of rails sections, Rail failures, Wear on rails, Types of rail joints, Welding of rails.	**CO1**
UNIT-2	**Sleepers, Fish Plates & Ballast:** Functions of sleepers, Requirements of sleepers, Classification of Sleepers, Comparison of different types of sleepers, failure of fish plates, Functions and requirements of ballast, Types of ballast, Renewal of ballast. **Geometric Design of Track:** Necessity, Gradients & Gradient Compensation, Elements of horizontal alignment, Super elevation, Cant deficiency	**CO2**
UNIT-3	**Points and Crossings:** Functions of components of turnout, Crossings. **Stations & Signalling System:** Site selection for railway station, Requirements of railway station, Classifications, Objects of signalling, Classification of signals, Controlling, absolute block system, Automatic block system	**CO3**
UNIT-4	**Airport Planning:** International Civil Aviation Organization, Directorate General of Civil Aviation,	**CO4**

	Airports Authority of India; Airport planning studies: airport system plan, airport site selection **Airport Lighting & Marking:** Runway lighting, taxiway lighting; Runway and taxiway marking	
UNIT-5	**Docks and Harbour Engineering:** Introduction, Types of water transportation, Economics and advantages of water transportation **Planning and Design of Port Facilities:** Pier and wharf structures, Fender systems and Apron, Docks, Light Houses.	**CO5**

Learning Resources

Text Books	1. Saxena S.C. and S.P. Arora, A text book of Railway Engineering, Dhanpat Rai, 2010. 2. Khanna, S. K., Arora, M. G., and Jain, S. S. Airport planning and Design, Sixth Edition, Nem Chand and Bros, Roorkee, India, 2012 3. Bindra, S.P.A Course in Docks and Harbour Engineering, Dhanpat Rai and Sons, New Delhi, India, 1992
Reference Books	1. Railway Engineering by Agarwal M.M., Prabha & Co, New Delhi, 2012. 2. Airport Engineering by Rao G.V., Tata Mc Graw Hill, New Delhi, 1992. 3. Dock and Harbour engineering by Oza H.P. and Oza G., Anand Chartor Publishing House Pvt , Gujarat, 2010.
e- Resources & other digital material	1. https://nptel.ac.in/courses/ 105/107/105107123

20CE4702C -IRRIGATION MANAGEMENT

Offering Branches	CE	**Year : IV**	**Sem: I**
Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3401-Environmental engineering 20CE3405-Water resources engineering 20MC1301-Environmental science	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** and **analyze** various approaches in irrigation management	K4
CO2	**Understand** and **analyze** the capability of irrigable soils and management	K4
CO3	**Apply** Societal approach to irrigation management	K3
CO4	**Understand** the provisions of irrigation and conflict resolution	K2
CO5	**Understand** the basic concepts of integrated water management	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Need for proper management of land and water resources. Planning of irrigation projects – Inadequacies in present approaches in canal irrigation management – command area development programmes.	CO1
UNIT-2	**Soil Management:** Classification of irrigable soils – soils-plant-water relationships – soil management. Water logging and salinity – water quality for irrigation – Reclamation of salt affected soils	CO2
UNIT-3	**Irrigation Management:** Irrigation management – Irrigation Management Matrix – Society and irrigation –perceptions of various stake holders on irrigation system performance. Livelihood and Production Thinking Philosophy – the different approaches. Macro and precision irrigation.	CO3
UNIT-4	Participatory irrigation management – Farmer's management of irrigation system acts - conflict resolution.	CO4
UNIT-5	Legal aspects in water sharing and management – PC-CP - case studies Introduction to Integrated Water Resources Management (IWRM).	CO5

Learning Resources

Text Books	1. Irrigation Theory and practice by A. M. MICHAEL Vicas publishing house pvt ltd 2. Irrigation Water Management: Principles and Practce by Dilip Kumar Majumdar PHI Learning pvt.Ltd
Reference Books	1. Chambers R, Canal Management, Oxford IBH. 2. VVN Murthy, Land and Water Management Engineering, Kalyani Publishers.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105/102/105102159/ 2. https://nptel.ac.in/courses/126/105/126105010/

20CE4702D–SOLID WASTE MANAGEMENT

Offering Branches	CE	**Year : IV**	**Sem: I**
Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20MC1301 – Environmental Science 20CE3501 – Environmental Engineering	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Analyse** the sources, composition, handling and storage of Municipal Solid Waste	K4
CO2	**Understand** the process of collection and transport of Municipal Solid Waste	K2
CO3	**Classify** the processing, separation& Transformation of Municipal Solid Waste	K3
CO4	**Design** the construction and operations of landfill facilities, management of leachate and landfill gases	K4
CO5	**Categorize** different composting methods and management of Plastic waste	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Sources, Types And Composition Of Municipal Solid Waste** Sources- Types- Composition of Solid Waste- Effects of improper disposal of solid waste-public health effects-Types of materials recovered from MSW. **Waste Handling, Separation And Storage:** On- site handling and separation at solid waste-on - site storage of solid waste-options under Indian conditions.	**CO1**
UNIT-2	**Collection Of Municipal Solid Waste**: Methods of collection-equipment- types of vehicles-man power requirement-collection routes. **Transfer And Transport Of Municipal Solid Waste**: Need for Transfer operations-Transfer Stations-Selection of Location of Transfer Station-Transport means and methods.	**CO2**
UNIT-3	**Processing, Separation & Transformation:** Objectives of waste processing –material separation and processing technologies –biological &chemical conversion technologies –methods and controls of Composting -thermal conversion technologies –incineration – energy recovery methods	**CO3**
UNIT-4	**Disposal of Solid Waste:** Disposal of Solid Waste – Sanitary land Fills- Site selection-Planning-Design and operation of Sanitary landfills- Leachate collection & treatment-composition of land fill gases.	**CO4**
UNIT-5	**Composting**: Principle – types- factors affecting compost process- mechanical composting methods. Reuse and recycling of paper, glass, rubber. Plastic waste status in India. Effect of plastic wastes on environment, management of plastic waste.	**CO5**

Learning Resources

Text Books	1. Integrated Solid waste management by Goerge Tchobanolous, Hilary Theisen & Samuel

	A. Vigil. McGraw Hill International Editions 2. Design of Land Fills and Integrated Solid waste management by Amalendu Bagchi , John Wiley & Sons
Reference Books	1. CPCB Manual on solid waste Management 2. Solid waste management K.sasikumar, sanoop Gopi Krishna PHI Learning (P) Ltd. 3. Solid waste management in India by Urvashi Dhamija.
e- Resources & other digital material	1. www.nptel.ac.in/courses/120108005 2. nptel.ac.in/courses/10510605 3. https://www.coursera.org/learn/solid-waste-management

19CE4703A – PRESTRESSED CONCRETE STRUCTURES

Offering Branches	CE	Year : IV	Sem: I
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3501-Design of reinforced Concrete Structures	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Explain** the fundamental concepts of stress analysis and systems of prestressing	K2
CO2	**Evaluate** and analyze the stresses under various conditions.	K5
CO3	**Estimate** the various losses of prestress occurring in the pressed members.	K5
CO4	**Design** and detail the prestressed concrete members subjected to flexure	K6
CO5	**Analyze** and design of end block of prestressed concrete members	K6

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION AND SYSTEMS OF PRESTRESSING** **Introduction**:Basic concepts of prestressing, Historical Development, Need for high strength steel and concrete, Terminology, Advantages of prestressed concrete, Applications of prestressed concrete. **Systems of prestressing** : Classification of prestressed concrete. Pre tensioning techniques - long line system (Hoyer system), post - tensioning Techniques (a) Fressinet system and (b) Gifford Udall system.	CO1
UNIT-2	**ANALYSIS OF PRESTRESS AND BENDING STRESSES** Basic assumptions, Analysis of prestress, Resultant stresses at a section, Pressure line or thrust line and internal resisting couple, Concept of load balancing, Stresses in tendons, Cracking moment.	CO2
UNIT-3	**LOSSES OF PRESTRESS** Nature of losses of Prestress, Loss due to elastic deformation of concrete, Loss due to shrinkage of concrete, Loss of prestress due to creep of concrete, Loss of prestress due to relaxation of stress in steel, Loss of prestress due to friction, Loss due to Anchorage slip, Total losses allowed for in design.	CO3
UNIT-4	**DESIGN OF PRESTRESSED CONCRETE SECTIONS** Allowable stresses -Elastic design of simple beams having rectangular and I-section for flexure -kern lines -cable profile and cable layout.	CO4
UNIT-5	**ANCHORAGE ZONE STRESSES IN POST-TENSIONED MEMBERS** Introduction, Stress distribution in end block, Investigations on anchorage zone stresses, comparative analysis, Anchorage zone reinforcement.	CO5

Learning Resources

Text Books	1. N. Krishna Raju, Prestressed concrete, 4/e, Tata McGraw Hill, 2012. 2. G.S. Pandit, Prestressed concrete, CBS Publishers, 2014.
Reference Books	1. P. Dayaratnam, Prestressed Concrete Structures, Oxford and IBH Publishing Company, 2014. 2. T.Y. Lin, and H. Ned, Burhns, Design of Prestressed Concrete Structures, 3/e, John Wiley and Sons, 2010. 3. H. Arthur, Nilson, Design of prestressed concrete, Wiley India Pvt.ltd, 2011.

	4. J.R. Libby, Modern prestressed concrete, CBS Publishers, 2007.
e- Resources & other digital material	1. https://nptel.ac.in/courses/105/106/105106118/ 2. https://freevideolectures.com/course/94/prestressed-concrete-structures 3. http://www.nptelvideos.in/2012/11/prestressed-concrete-structures.html 4. http://www.nptelvideos.com/course.php?id=337--

20CE4703B - GROUND IMPROVEMENT TECHNIQUES

Offering branch	CE	Year : IV	Sem: I
Course Category:	Professional Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20CE3402- Geotechnical Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Explain** the interaction between clay and water and how the clay will be normalized using various methods	K4
CO2	**Explain** what factors will be taken into account when designing for impact and shock resistance	K4
CO3	**Formulate** the amount of time necessary to accelerate the dissipation of excess pore water pressure	K6
CO4	**Calculate** the design factors for reinforced soil	K3
CO5	**Identify** the design factors that will be considered when constructing a foundation on reinforced soil	K1

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Role of ground improvement in foundation engineering, geotechnical problems in alluvial, **Stabilization of Soils:** Clay Chemistry, Reaction Dynamics, Methods of soil stabilization, clay salt interaction	**CO1**
UNIT-2	**Theory of Vibration:** Harmonic Motion, Vibrations of single Degree Freedom system, Earthquake Loading **Methods:** Insitu densification of cohesionless soil, vibrofloation, Sand pile compaction, stone columns and Three-Dimensional Consolidation of clay, lime piles	**CO2**
UNIT-3	**Drainage and Dewatering:** Vacuum and electro osmotic methods, criteria for choice of filler material around drains, Seepage analysis(simple case only)	**CO3**
UNIT-4	**Reinforced soil:** Basic components, soil reinforcement interface friction, Internal and external stability	**CO4**
UNIT-5	**Foundation of Reinforced soil bed:** Analysis of strip footing on reinforced soil bed; Analysis of isolated square footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab	**CO5**

Learning Resources

Text Books	1. Ground Improvement Techniques, Purushotham Raj, Laxmi Publications, New Delhi. 2. Ground Improvement Techniques, Nihar Ranjan Patro, Vikas Publishing House (p) limited , New Delhi. 3. An introduction to Soil Reinforcement and Geosynthetics, G. L. Siva Kumar Babu, Universities Press.
Reference Books	1. Ground Improvement, M.P. Moseley, Blackie Academic and Professional, USA. 2. Designing with Geosynethetics, R. M Koerner, Prentice Hall

e-Resources& other digital material	1. https://nptel.ac.in/courses/105106052/

20CE4703C - URBAN TRANSPORTATION PLANNING

Offering Branches	CE	Year : IV	Sem: I
Course Category:	Honours Course	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20BS1101- Engineering Mathematics II 20CE3502 - Highway Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Explain** the urban travel demand and independent variables	K4
CO2	**Analyze** the traffic surveys and trip generations modules	K4
CO3	**Analyze** and study the trip distribution factors and mode choice analysis	K4
CO4	**Calculate** the traffic assignment methods and plans	K3
CO5	**Simulate** the mass transit systems and study about advance transit systems	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**URBAN TAVEL DEMAND** Urban development - Urban transport problems - Urban travel characteristics - Need for planning urban travel demand - Trends - Components of travel demand **INDEPENDENT VARIABLES** Travel Attributes - Sequential travel demand modeling - Simultaneous travel demand modeling - Study area - Cordon lines Screen lines -Zoning.	**CO1**
UNIT-2	**TRAVEL DEMAND SURVEYS** Sampling methods - Home interview surveys - Road side interview surveys - Terminal surveys - Cordon surveys - Taxi surveys - Onboard surveys - Economic surveys - Data checking. **TRIP GENERATION** Trip characteristics - factors influencing Trip productions and attractions - Trip rates - Zonal regression models -Category analysis - Personal trip generation models	**CO2**
UNIT-3	**TRIP DISTRIBUTION** Factors influencing trip distribution - Growth factor methods - Trip length frequency diagram - Growth models - LP method - Opportunity models - Gravity opportunity model. **MODE CHOICE ANAYSIS** Factors influencing passenger mode choice - Zonal regression models - Utility maximization - Binary and Multinomial Logit models - Probit arid nested Logit models.	**CO3**
UNIT-4	**TRAFFIC ASSIGNMENT** Need for Assignment - Diversion curves - Shortest path Algorithms - All or nothing Assignment technique - Multi path Assignment - Link flows - Sufficiency and Deficiency analysis. **PLAN PREPARATION AND EVALUATION** Types of plans- conceptual plan, Master plan - Short term planning vs Long term planning - Corridor Identification and Evaluation - Plan preparation	**CO4**
UNIT-5	**MASS TRANSIT SYSTEMS** Need for Mass Transit systems - Recommendations of Committee on urbanization & Alternate systems of UT	**CO5**

	ADVANCE TRANSIT Characteristics & Capacities of different MT systems - LRT, monorail, Metro, BRTS, etc.	

Learning Resources

Text Books	1. Kadiyali L.R - Traffic Engineering and Transportation Planning -Khanna Publishers, New Delhi. 2. Papacostas C.S. - Fundamentals of Transportation Engineering Prentice Hall of India Pvt. Ltd; New Delhi. 3. John Khisty C - Transportation Engineering - An Introduction, Prentice Hall, Englewood Cliffs, New Jersey. 4. Nicholas J. Garber, A. Hoel, Raju Sarkar, Cengage learning, Principles of Traffic and Highway Engineering.
Reference Books	**1.** Chari, S.R. UTP Lecture Notes - Regional Engg. College, Warangal. **2.** Hutchinson, B.G. Introduction to Urban System Planning, McGraw Hill. 3. Mayer M and Miller E, Urban Transportation Planning: A decision oriented Approach, McGraw Hill.Bruton, Urban Transportation Planning. 4. Dicky, Metropolitan Transportation Planning, DC Script Book Co. 5. Saxena, Traffic Planning and Design, Dhanpat Rai Publishers, New Delhi.
e- Resources & other digital material	1. https://nptel.ac.in/courses/ 105/105/105105208 2. https://nptel.ac.in/courses/ 105/105/105105204 3. https://nptel.ac.in/courses/ 105/107/105107067

20CE4703D -WATERSHED MANAGEMENT

Offering Branches	CE	**Year : IV**	**Sem: I**
Course Category:	Professional Elective	**Credits:**	3
Course Type:	Theory	**Lecture-Tutorial-Practical:**	3-0-0
Prerequisites:	20CE3405 - Water resource engineering	**Continuous Evaluation:**	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the concept of watershed development and approaches in India	K2
CO2	**Understand** the principle and **apply** the universal soil loss equation to estimate soil erosion	K3
CO3	**Understand** rain water harvesting techniques and **apply** concepts in daily life	K3
CO4	**Understand** various concepts of artificial recharge and able to implement	K3
CO5	**Understand** and **analyze** the bio mass management activities	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** concept of watershed, need for watershed management, concept of Sustainable development. Hydrology of small watersheds.	CO1
UNIT-2	**Soil Management:** Principles of soil erosion, causes of soil erosion, types of soil erosion, estimation of soil erosion from small watersheds. Control of soil erosion, methods of soil conservation – structural and non-structural measures.	CO2
UNIT-3	**Water Harvesting:** Principles of water harvesting, methods of rainwater harvesting, rainwater harvesting structures, farm ponds and percolation tanks	CO3
UNIT-4	**Artificial recharge** :Artificial recharge of groundwater in small watersheds, methods of artificial recharge. Reclamation of saline soils.	CO4
UNIT-5	**Bio Mass Management:** Micro farming, biomass management- dry land agriculture , silvi -pasture horticulture, social forestry and afforestation- Case studies of Watershed Management.	CO5

Learning Resources

Text Books	1. Murthy, V.V.N., Land and Water Management, Kalyani Publishers.
Reference Books	1. Chatterjee, S. N., Water Resources Conservation and Management, Atlantic Publishers. 2. Muthy, J. V. S., Watershed Management, New Age International Publishers. 3. Suresh Rao, Soil and Water Conservation Practices, Standard Publishers
e- Resources & other digital material	1. https://nptel.ac.in/courses/105/101/105101010/ 2. http://www.nptelvideos.in/2012/11/watershed-management.html

20HS7701A - MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** basics of managerial economics, demand forecasting, cost analysis, industrial organization, financial accounting and capital and capital budgeting.	K2
CO2	**Apply** the managerial economics, e-commerce, demand forecasting and cost analysis techniques in economics related problems.	K3
CO3	**Summarize** different types of industrial organization	K3
CO4	**Analyze** the financial accounting and depreciation related problems.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	INTRODUCTION TO MANAGERIAL ECONOMICS: Introduction to Managerial Economics & Demand Analysis: Definition of Managerial Economics, Characteristics and Scope – Managerial Economics and its relation with other subjects- Basic economic tools in Managerial Economics. Demand Analysis: Meaning- Demand distinctions- Demand determinants- Law of Demand and its exceptions. ELASTICITY OF DEMAND & DEMAND FORECASTING: Definition -Types of Elasticity of demand - Measurement of price elasticity of demand: Total outlay method, Point method and Arc method- Significance of Elasticity of Demand. Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting (survey of buyers' Intentions, Delphi method, Collective opinion, Analysis of Time series and Trend projections, Economic Indicators, Controlled experiments and Judgmental approach) - Forecasting demand for new products- Criteria of a good forecasting method.	**CO1 CO2**
UNIT-2	THEORY OF PRODUCTION AND COST ANALYSIS- INTRODUCTION TO MARKETS-PRICING POLICIES & E-COMMERCE: Production Function- Isoquants and Isocosts, MRTS, Law of variable proportions- Law of returns to scale- Least Cost Combination of Inputs, Cobb-Douglas Production function-Economies of Scale COST ANALYSIS: Cost concepts, Opportunity cost, Fixed Vs Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs.-Determination of BreakEven Point (Simple problems) - Managerial Significance and limitations of BEP. Market structures: Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Internet Pricing Models: Flat rate pricing, Usage sensitive pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model, Smart market mechanism model. Introduction to e-commerce-types of e-commerce; M-commerce.	**CO1 CO2**
UNIT-3	TYPES OF INDUSTRIAL ORGANIZATION & INTRODUCTION TO BUSINESS	**CO1**

	CYCLES: Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types. Changing business environment in post-liberalization scenario.	**CO3**
UNIT-4	FINANCIAL MANAGEMENT AND INTRODUCTION TO FINANCIAL ACCOUNTING: Functions of financial management, simple and compound interest, Methods of evaluating alternatives- Present Worth method. Future worth Method, Annual equivalent method. Introduction to Double-entry system	**CO1 CO4**
UNIT-5	DEPRECIATION: Introduction, common methods of depreciation: straight line method, Declining balance method, sum of year's digits method. CAPITAL AND CAPITAL BUDGETING: Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (simple problems)	**CO1 CO4**

Learning Resources

Text Books	1. ENGINEERING ECONOMICS, R. Panneerselvam,2nd Edition, PHI Learning Pvt. Ltd., 2013. 2. Managerial Economics and Financial Analysis, by J.V.Prabhakar Rao, Maruthi Publications, 2011.
Reference Books	1. Managerial Economics and Financial Analysis, by A R Aryasri, TMH 2011 2. Financial Accounting,SN Maheswari,SK Maheswari, Vikas Publishing House Pvt Ltd., NewDelhi, 4th Edition,2006 3. Managerial Economics by Suma damodaran, Oxford 2011 4. Mangerial Economice and Financial Analysis by S.A. Siddiqui & A.S. Siddiqui, New Age International Publishers, 2011. 5. Engineering economy- Theusen & Theusen, 8th edition,1993,Prentice Hall.
E-Resources & other digital Material:	1. www.tectime.com 2. www.exinfm.com 3. www.economywatch.com

20HS7701B - HUMAN RESOURCE MANAGEMENT

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the basic concepts, techniques and applications of Human Resource Management.	K2
CO2	Describe job design, job Analysis, job evaluationand different levels of recruitment	K2
CO3	Illustrate different Training and development of human resources	K3
CO4	Summarize e-Human Resource Management and Human resource for small scale industries	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Functions,Policies & Roles, Skills for HR Professionals, HRM Models, Evolution of HRM, Recent developments in HRM, Nature of Strategic HRM, Strategic HRM versus Conventional HRM, Strategic Management Process, Benefits of SHRM, Barriers to Strategic HRM, Typical HR Strategies, Selecting Strategies to Enhance Performance. **Human Resource Planning:** Nature of HRP, Importance of HRP, Factors Affecting HRP, The Planning Process, Human Resource Planning and the GovernmentRequisites for Successful HRP, Barriers to HRP	**CO1**
UNIT-2	**Analysis of Work, Designing Jobs and Job Evaluation:** Nature of Job analysis, Job Analysis and Competitive Advantage, The Process of Job Analysis, Methods of Collecting Job Data, Job Analysis and Strategic HRM, Potential Problems with Job Analysis. **Requisites for Job Analysis**, Competency-based Job Analysis, Job Design, Significance of Jobs Design, Factors Affecting Job Design, Job Design Approaches, Contemporary Issues in Job Design, Job Evaluation, Job Evaluation Process, Methods of Job Evaluation, Alternative to Job Evaluation.	**CO1 CO2**
UNIT-3	**Recruiting Talent:** Nature of Recruitment, Purposes and Importance, Factors Governing Recruitment, Recruitment Process, Evaluation and Control, Philosophies of Recruiting, Alternatives to Recruitment. **Selecting Right Talent:** Nature of Selection, Selection as a Source of Competitive Advantage, Organization for Selection, Selection Process, Assessment Centers, Barriers to Effective Selection, Evaluation of Selection Process, Making Selection Effective.	**CO1 CO2**
UNIT-4	**Training and Development, Career Management and Talent** **Management:** Orientation, Orientation Programme, Requisites of an Effective Programme, Evaluation of Orientation Programme, Problems of Orientation, Typical Orientation Programme, **Nature of Training and Development**, Inputs in Training and Development, Training and	**CO1 CO3**

	Development as Source of Competitive Advantage, The Training Process, Impediments to Effective Training. Government Initiative, Management Development, Career Development, Talent Management.	
UNIT-5	**e-Human Resource Management:** Nature of e-HRM, e-HR Activities, e-Recruitment, e-Selection, e-Performance Management, e-Learning, e-Compensation **Human Resource Management in Small Scale Units:** Introduction to Small Business Unit, Significance of MSM Enterprises, Facilities Problems, People Practices in Small Units, Challenges in Introducing HR Practices, Current Practices, Guidelines for Application of HR Practices.	**CO1 CO4**
Learning Resources		
Text Books	1. Human Resource Management, Text & Cases by K. Aswathappa	
Reference Books	1. Human Resource Management, by S. Khandkar, S. Chand Publications 2. Personnel Management - Text & Cases, By C. B. Mamoria& V. S. P. Rao, Himalaya 3. Human Resource Management by Gary Dessler, Pearson Education	

20HS7701C - ENTREPRENEURSHIP MANAGEMENT

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts and factors for starting and successful running of different forms of an enterprise.	K2
CO2	**Describe** characteristics, values and attitudes of an entrepreneur.	K2
CO3	**Illustrate** different forms of Entrepreneurial structures and Intrapreneurship.	K3
CO4	**Summarize** critical Factors for starting a new enterprise and ethics to be followed during running of enterprise.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Entrepreneurship**: Meaning, Nature, origin and development of entrepreneurship in India, Need and Importance, Core elements, Principles, Essentials, Types, Functions, Concept of entrepreneurship management, Motives behind being an entrepreneur, Entrepreneurial Process.	**CO1**
UNIT-2	**Entrepreneurial Values and Attitudes**: Introduction to entrepreneurial Values and Attitudes, Dominant characteristics of successful entrepreneurs, Internal and external factors for entrepreneurial motivation, Entrepreneurial Skills, Identifying business opportunities, Role of creativity in Entrepreneurship, the creative process, the Innovation process, types of innovation, sources of innovation, principles of innovation, Sources of Business Ideas**.**	**CO1 CO2**
UNIT-3	**Forms of Entrepreneurial structures**: Sole Proprietorship-meaning, merits and limitations, Partnership-Meaning, Forms, merits and limitations, Corporations-Meaning, merits and limitations, Limited Liability partnerships and corporations, Franchising-Meaning, types, merits and limitations.	**CO1 CO3**
UNIT-4	**Intrapreneurship**: Meaning, Characteristics, Intrapreneurs Activities, types of Corporate Entrepreneurs, Corporate V/s Intrapreneurial culture, Climate, Fostering Intrapreneurial culture, Promoting intrapreneurship- Pinchot's Spontaneous teams and Formal Venture teams, establishing intrapreneurial ventures**.**	**CO1 CO3**
UNIT-5	**Critical Factors for starting a new enterprise**: Personal, Environmental, Sociological factors, Problems of a new venture- Financial, administrative, marketing, production and	**CO1 CO4**

	other problems **Ethics and Entrepreneurship**: Defining Ethics, Approaches to Managerial ethics, ethics and business decisions, Ethical practices and code of conduct, Ethical considerations in corporate entrepreneurship.	

Learning Resources	
Text Books	1. Entrepreneurship development, Moharanas and Dash C.R., RBSA Publishing, Jaipure 2. Beyond entrepreneurship, Collins and Lazier W, Prentice Hall, New Jersey, 1992 3. Entrepreneurship, Hisrich Peters Sphephard, Tata McGraw Hill 4. Fundamentals of entrepreneurship, S.K. Mohanty, Prentice Hall of India.
Reference Books	1. Small scale industries and entrepreneurship, Dr. Vasant Desai, Himalayan Publishing House. 2. Management of small scale industries, Dr. Vasant Desai, Himalayan Publishing House 3. Management of small scale industries, J.C. Saboo Megha Biyani, Himalayan Publishing House 1. A Guide to Entrepreneurship, David Oates, Jaico Publishing House, Mumbai, Edn 2009.
E-Resources & other digital Material:	1. https://onlinecourses.swayam2.ac.in/cec20_mg19/preview 2. https://onlinecourses.swayam2.ac.in/ntr22_ed08/preview

20HS7701D - ORGANIZATIONAL BEHAVIOUR

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Demonstrate the applicability of the concept of organizational behaviour to understand the behaviour and culture of people in the organization.	K2
CO2	Demonstrate the applicability of analysing the complexities associated with management of individual behaviour in the organization.	K2
CO3	Analyse the complexities associated with Personality Development in the organization and role of leadership.	K4
CO4	Demonstrate how the organizational behaviour can integrate in understanding the motivation between the formation of teams and stages of group development.	K2
CO5	Demonstrate how the organizational behaviour can influence in understanding the development and culture of the individuals in the organization.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Organizational Behaviour:** Definition of Organizational Behaviour-Nature and Scope of Organizational Behaviour-Opportunities of Organizational Behaviour-Linkage of Organizational Behaviour with other disciplines-Organizational Behaviour Models	**CO1**
UNIT-2	**Foundations of Individual Behaviour: Perception:** Definition of Perception-Factors of Perception- The Perception Process-**Motivation:** Definition of Motivation-Theories of Motivation: Maslow's Hierarchy Theory of Needs-Herzberg's Two-Factor Theory-Mc Gregor's Theory of Motivation-**Learning:** Definition Learning- Objectives of Learning-Process of Learning- Theories of Learning-Classical conditioning theory- Operant conditioning theory.	**CO2**
UNIT-3	**Personality Development and Leadership: Personality Development-** Definition of Personality-Objectives of Personality-Dimensions of Personality- Stages of Personality Development-**Leadership**- Definition of Leadership – Objectives of Leadership –Styles of Leadership in Organization	**CO3**
UNIT-4	**Formation of Teams and Group Dynamics: Formation of Teams-** Definition of Team-Objectives of Teams -Types of Teams- Team Building-Creating Effective teams-**Group Dynamics:** Definition of Group- Formal Vs Informal Groups- Stages of Group Development-Johari Window- Transactional Analysis- Conflict -Definition, Conflict Resolution Mechanisms in Groups	**CO4**
UNIT-5	**Organizational Change and Culture: Organizational Change-**Definition- Change Models- Organizational resistance to change Management of Change Process-Organizational Culture- Definition- Objectives-Distinction between Organizational Culture and Organisational Climate	**CO5**

Learning Resources

Text Books	1. Fred Luthans, Organizational Behaviour, McGraw Hill, 11th Edition, 2001. 2. Stephen P. Robins, Organisational Behaviour, PHI Learning / Pearson Education, 11th edition, 2008.
Reference Books	1. Hellrigal, Slocum and Woodman, Organizational Behaviour, Cengage Learning, 11th Edition 2007. 2. Aswathappa K., "Organizational Behaviour-Text, Cases and Games", Himalaya Publishing House, New Delhi, 2008. 3. Schermerhorn, Hunt and Osborn, Organizational Behaviour, John Wiley, 9th Edition, 2008. 4. Udai Pareek, Understanding Organizational Behaviour, 2nd Edition, Oxford Higher Education, 2004. 5. Ivancevich, Konopaske &Maheson, Organizational Behaviour & Management, 7th edition, Tata McGraw Hill, 2008. 6. Hitt, Michael .A., Organizational Behaviour- A Strategic Approach, Wiley, India,2008.

20CE7701A - CONSTRUCTION MANAGEMENT

Offering Branch	CE	**Year : IV**	**Sem: I**
Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20ES1301- Construction materials and Concrete Technology	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Knowledge** on different methods of planning, scheduling and controlling and Work break down structure	K2
CO2	A complete i**dea** on developing time estimates and problems on network analysis.	K2
CO3	**Understanding** of cost analysis and resource allocation and scheduling	K2
CO4	An **idea** on construction management, safety and roles of different stake holders	K2
CO5	**Knowledge** on types of organization and related policies and acts	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Construction Management :** Introduction : Origin of PERT and CPM, Planning, Scheduling and controlling, Bar Charts, Milestone charts, weaknesses in Bar charts, PERT and CPM networks and Problems, Comparison, Event, Activity, Rules for drawing networks Numbering the events (Fulkerson's law), Dummy activities, Work Break-down structure.	CO1.
UNIT-2	**CPM-PERT-Network Analysis:** Time estimate-Expected time, Earliest allowable occurrence time, Latest allowable occurrence time, slack and Problems, Problems on Network Analysis, project duration, probability of completion, Start and Finish time estimates, Floats and Problems, Project scheduling, Critical and sub-critical path. Updating – Process of updating; when to update	CO2.
UNIT-3	**CPM Cost Model & Resources allocations, resource scheduling:** Cost Analysis; direct and indirect costs, operation time, Normal and crash times and costs, Problems on cost analysis, Optimizing project cost, crash limit, Free float limit, Optimization Resource smoothening. Resource levelling.	CO3
UNIT-4	**Management:** Scope of Construction Management; Significance of Construction Management, Concept of Scientific Management; Safety in Construction, Qualities of Manager; The roles/functions performed by effective and competent Managers, The Manager: i) as a decision maker; ii) as a motivator; iii) as a communication-link; iv) as a conflict resolver; v) as a well – wisher of co-employees and the employer; etc Role play with roles of different stakeholders of construction industry.	CO4
UNIT-5	**Organization –** Types of organization; Merits and demerits of different types of organization – Authority –Policy– Labour Problems; Labour Legislation in India; 'Workmen's compensation Act of 1923 and Minimum Wages Act of 1948', and subsequent amendments.	CO5

Learning Resources

Text Books	1. Dr. B. C. Punmia and K. K. Khandelwal, Project Planning and Control with PERT and CPM, 4/e, Laxmi Publications, 2016

	2. Kumar Neeraj Jha, Construction Project Management: Theory and Practices, 2/e, Pearson Education, 2015
Reference Books	1. Dr. P. N. Modi, Rajeev Modi, PERT and CPM - Project Evaluation Review Technique and Critical Path Method, 5/e, Standard Book House, 2012. 2. L S Srinath, PERT and CPM Principles and Applications, 3/e, Affiliated East-West Press, 2001. 3. U.K. Shrivastava, Construction Planning and Management, 2/e, Galgotia Publications- New Delhi, 2000. 4. Kerzner H., Project Management- A systems approach to planning, scheduling and controlling, 10/e, John Wiley & Sons, Inc., New Jersey, USA, 2009.
e-Resources& other digital material	1. https://nptel.ac.in/courses/105104161/ 2. http://jntuk-coeerd.in/

20ME7701A - INDUSTRIAL ENGINEERING & MANAGEMENT

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	**Understand** the basic concepts of management, organizational structures, leadership, operations management and project management.	K2

CO2	**Explain** the leadership qualities and concept of plant layout.	K2
CO3	**Elucidate** different quality control techniques.	K2
CO4	**Explain** various operations management Techniques	K2
CO5	**Solve** operations management and project management problems	L3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION**: Definition of Industrial Engineering, Applications, Role of Industrial Engineer, Quantitative tools of IE, Functions of Management, Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Hertzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs.	**CO1**
UNIT-2	**ORGANISATIONAL STRUCTURES**: Basic concepts related to Organization – Depart mentation and Decentralization, Flat and Tall organizations, Organizational chart, Line organization, Line and staff organization, functional organization **LEADERSHIP**: Introduction, Definition, Types of leadership based on authority- their area of applicability and suitability, advantages and limitations, Traits approach to leadership **PLANT LOCATION**: Definition, factors affecting the plant location, comparison of rural and urban sites. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.	**CO1** **CO2**
UNIT-3	**INSPECTION AND QUALITY CONTROL**: Types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non-assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling- Single Sampling-OC curves. Introduction to TQM-Quality Circles, ISO 9000 series procedures.	**CO1** **CO3**
UNIT-4	**WORK STUDY**: Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-out line process charts, flow process charts, two handed process charts and SIMO charts. **TIME STUDY**: definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation.	**CO1** **CO4**
UNIT-5	**PROJECT MANAGEMENT**: Network modeling, Probabilistic model-various types of activity times estimation, programme evaluation review techniques (PERT), probability of completing the project, deterministic model- critical path method (CPM), critical path calculation, crashing of simple of networks.	**CO1** **CO5**

Learning Resources

Text Books	1. S.Bhaskar, "Management Science", Anuradha Publications 2. O.P. Khanna, "Industrial Engineering and Management", DhanpatRai 3. T. R. Banga, S. C. Sharma, N. K. Agarwal, "Industrial Engineering and Management Science" Khanna Publishers.
Reference Books	1. PannerSelvam, Production and Operations Management, PHI, 2004. 2. 2. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2004. 3. 3. Chase, Jacobs, Aquilano, Operations Management, TMH 10th Edition, 2003. 4. 4. L.S.Srinath, PERT / CPM, affiliate East-West Press, New Delhi, 2000.

	5. 5. Phillip Kotler, Marketing Management, Pearson, 2004. 6. S. Bhaskar, "Management Science" Anuradha Publications.

20ME7701B - PROJECT MANAGEMENT

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Humanities and Social Sciences Elective	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes		
Upon successful completion of the course, the student will be able to:		
CO1	**Understand** the concepts of project management.	K2

CO2	**Explain** procedure for analysing the project risk, market risk, and firm risk.	K2
CO3	**Apply** social-cost benefit analysis on a project.	K3
CO4	**Analyze** a project by applying various network techniques for planning scheduling and controlling of different activities of the project.	K4
CO5	**Analyze** various aspects to be considered for technical and financial analysis of the Project and the Environmental Appraisal	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PS O1	PSO2
CO1	2	1							2		3	2		
CO2	2	1							2		3	2		
CO3	2	1							2		3	2		
CO4	2	1							2		3	2		
CO5	2	1							2		3	2		
Avg.	2	1							2		3	2		

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**MEANING, NATURE AND IMPORTANCE OF PROJECT :** Introduction, Concept of project and project management, Characteristics of project, Project Family tree, Classification of Project, Project selection process, Project life cycle, Project report, Project appraisal, Tools and techniques for project management, Project manager's roles and responsibilities	**CO1**
UNIT-2	**ANALYSIS OF PROJECT RISK, MARKET RISK AND FIRM RISK:** Introduction, Analysis of project risks- Projects with quantified benefits and not quantifiable benefits, Market risk- Security market risk, Interest rate risk, Purchasing Power Risk, Firm risk- Business risk, financial risk.	**CO1 CO2**
UNIT-3	**COST-BENEFIT ANALYSIS:** Introduction, need for social cost benefit analysis, Procedure of social cost benefit analysis, Main feature of social cost benefit analysis, UNIDO approach, Little-Mirrless approach, SCBA in India, Public investment decision making in India, Limitation of SCBA	**CO1 CO3**
UNIT-4	**NETWORK TECHNIQUES FOR PROJECT MANAGEMENT:** Introduction, Network modelling, Probabilistic model-various types of activity times estimation, programme evaluation review techniques (PERT), probability of completing the project, deterministic model- critical path method (CPM), critical path calculation, crashing of simple of networks	**CO1 CO4**
UNIT-5	**TECHNICAL AND FINANCIAL ANALYSIS OF PROJECT:** Introduction, Technical analysis- Materials and inputs, Production, Choice of technology, Product Mix, Plant capacity, Location and site, Structures and civil works, Project charts and layouts, Financial analysis - Significance of financial analysis, Utility of financial and accounting statements, **ENVIRONMENTAL APPRAISAL OF PROJECTS:** Introduction, Types and Environmental Dimensions of a Project, Stresses on Environment, Environmental Impact Assessment Methodologies	**CO1 CO5**

Learning Resources

Text Books	1. Prasanna Chandra, Projects Planning, Implementation and Control, Tata McGraw Hill Publishing Company Limited, New Delhi, 1995.
Reference Books	2. Project Management Institute (PMI), A Guide to the Project Management of Knowledge Newton Square, PA, 1996 3. J.R. Meredith and S.J. Mantel. Project Management: A Managerial Approach. John Wiley and Sons, New York, 1995. 4. L.S. Srinath, PERT & CPM Principles & Applications, 3rd edition, East west Press,2001.
E-Resources & other digital Material:	1. https://nptel.ac.in/courses/105/106/105106149/ 2. https://nptel.ac.in/courses/110/104/110104073/

20CE2701A - DISASTER MANAGEMENT AND PREPAREDNESS

Offering Branch	CE	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20MC1301 - Environmental Science	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100
Course Outcomes			

Upon successful completion of the course, the student will be able to:		
CO1	**Demonstrate** basic terminology and **classify** types of disasters	K3
CO2	**Outline** the impacts of disaster	K2
CO3	**Familiarize** Disaster management activities and phases	K2
CO4	**Explain** the Components of disaster relief, disaster management policies	K3
CO5	**Develop** the responsibilities towards society after disaster	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION & DISASTERS CLASSIFICATION** Concepts and definitions: disaster, hazard, vulnerability, resilience, risks severity, frequency and details, capacity, impact, prevention, mitigation. Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, forest fires.); manmade disasters (industrial pollution, nuclear radiation, chemical spills, terrorist strikes); hazard and vulnerability profile of India.	**CO1**
UNIT-2	**DISASTER IMPACTS** Disaster impacts (environmental, physical, social, ecological, economical, political); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters	**CO2**
UNIT-3	**DISASTER MITIGATION AND PREPAREDNESS** Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Role of remote sensing and GIS in disaster management.	**CO3**
UNIT-4	**POST DISASTER RESPONSE** Emergency medical and public health services; Environmental post disaster response (water, sanitation, food safety, disease control, security, communications); reconstruction and rehabilitation; Roles and responsibilities of government, community, local institutions, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector.	**CO4**
UNIT-5	**DISASTERS - ENVIRONMENT AND DEVELOPMENT** Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.	**CO5**

Learning Resources

Text Books	1. R. B. Singh, Disaster Management, Rawat Publications, 2000 2. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall. 3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
Reference Books	1. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003 2. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

E-Resources & other digital material	1. http://ndma.gov.in/ (Home page of National Disaster Management Authority) 2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

20CS2701A - JAVA PROGRAMMING

Offering Branch	CSE	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20ES1203 - Problem Solving & Programming with Python	Continuous Evaluation:	30
		Semester End Evaluation:	70

Course Outcomes

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

CO1	Understand the fundamental concepts of Object Oriented Programming & constructs of Java programming language.	**K2**
CO2	Apply principles of object oriented programming to solve problems.	**K3**
CO3	Apply concepts of interfaces, exception handling mechanisms to solve the given problem.	**K3**
CO4	Analyze the problem and apply suitable object oriented programming constructs for solving the given problem.	**K4**

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Java Evolution & Environment:** History and Evaluation of Java, Overview of Java language, Java's magic code: Byte code, Java Buzzwords, Three OOP principles, simple program. **Java programming environment**: Data types, variables and Arrays,Operators, control statements.	**CO1, CO2**
UNIT-2	**Classes, Objects and Methods:** Introduction, defining a class, declaring objects, assigning object reference variables, introducing methods, accessing class members, returning a value, constructors, parameterized constructors, this keyword, garbage collection, overloading constructors and methods, recursion, understanding static, introducing final, Using command line arguments. **Strings**: String, String Buffer and String Tokenizer classes.	**CO1, CO2**
UNIT-3	**Basic I/O:** Data Input Stream, Data Output Stream, Buffered Reader, Input Stream Reader, Scanner classes. **Inheritance:** Basics, Using super, creating multilevel hierarchy, order of constructor execution, method overriding, dynamic method dispatch, applying method overridden, Abstract classes, Using final with inheritance, The Object class.	**CO1, CO2**
UNIT-4	**Interfaces:** Introduction, defining an interface, implementing interfaces. Accessing interfaces through interface references, variables in interfaces, interfaces can be extended. **Package:** Defining a package, CLASSPATH, Packages and member access, importing packages.	**CO1, CO2, CO3**
UNIT-5	**Exception Handling:** Fundamentals, types, uncaught exceptions, using try and catch, multiple catch clauses, nested try statement, throw, throws, finally, built-in	

	exceptions, creating your own exception subclasses. **Multi-Threaded programming:** Thread model, Creating a Thread: implementing runnable, extending Thread, creating multiple threads, using isAlive() and join(), Thread Priorities.	**CO1, CO2, CO4**

Learning Resources

Text Books	1. R. B. Singh, Disaster Management, Rawat Publications, 2000 2. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall. 3. Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
Reference Books	1. Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003 2. Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC
E-Resources & other digital material	1. http://ndma.gov.in/ (Home page of National Disaster Management Authority) 2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).

20EC2701A - EMBEDDED AND REAL TIME SYSTEMS

Offering Branch	ECE	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the concepts of project management.	K2
CO2	**Explain** procedure for analysing the project risk, market risk, and firm risk.	K2
CO3	**Apply** social-cost benefit analysis on a project.	K3
CO4	**Analyze** a project by applying various network techniques for planning scheduling and controlling of different activities of the project.	K4
CO5	**Analyze** various aspects to be considered for technical and financial analysis of the Project and the Environmental Appraisal	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PS O1**	**PSO2**
CO1	2	1							2		3	2		
CO2	2	1							2		3	2		
CO3	2	1							2		3	2		
CO4	2	1							2		3	2		
CO5	2	1							2		3	2		
Avg.	2	1							2		3	2		

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** History of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of Embedded Systems, Core of the Embedded System, Sensors and Actuators, Communication Interface, Embedded Firmware.	**CO1**
UNIT-2	**Hardware Software Co-Design And Programme Modeling:** Characteristics of an Embedded System, Quality Attributes of Embedded Systems, Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Hardware Software Trade-offs.	**CO2**
UNIT-3	**Devices in Embedded Systems:** Types of supporting devices for an embedded system –various forms of ROM, RAM devices, interrupt sources, Interrupt Service Mechanism, serial port devices, parallel port devices, timers and counting devices.	**CO3**
UNIT-4	**Communication Buses for Device Networks:** Interfacing Features in Device Ports, Wireless Devices, Networked Embedded Systems, Serial Bus Communication Protocols, Parallel Bus Device Protocols- Parallel Communication Network Using ISA, PCI, PCI-X and Advanced Buses.	**CO3**
UNIT-5	**Design of Real Time Systems:** processors in complex embedded systems, design process in embedded system, optimizing design metrics, Case study for adaptive cruise control system in car.	**CO4**

Learning Resources

Text Books	1. Embedded Systems Architecture, Programming and Design-Raj Kamal, Second Edition, Mc Graw Hill Education. 2. Introduction to Embedded System-ShibuKV, Mc-Graw Hill Edition.
Reference	1. Peckol, “Embedded system Design”, JohnWiley&Sons,2010

Books	2. LylaBDas, “Embedded Systems”-An IntegratedApproach”,Pearson,2013 3. Embedded/Real-Time Systems, Dr.K.V.K.K.Prasad, dream Tech press
E-Resources & other digital Material:	1. Micro soft Power Point-pcp_embedded_system_intro(iitb.ac.in) 2. NPTEL:: Electrical Engineering -Embedded Systems

20EC2701B - E-WASTE MANAGEMENT

Offering Branch	ECE	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Know about the environmental impacts of e-waste.	K2
CO2	Apply various concept learned under e-waste management hierarchy.	K3
CO3	Distinguished the role of various national and internal act and laws applicable for e-waste management and handling.	K2
CO4	Analyze the e – waste management measures proposed under national and global legislations.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2	2							
CO2						2	2							
CO3						2	2							
CO4						2	2							
Avg.						2	2							

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction.** E- waste; composition and generation. Global context in e- waste; E-waste pollutants, E waste hazardous properties, Effects of pollutant (E- waste) on human health and surrounding environment, domestic e-waste disposal, Basic principles of E waste management, Component of E waste management, Technologies for recovery of resources from electronic waste, resource recovery potential of e-waste, steps in recycling and recovery of materials-mechanical processing, technologies for recovery of materials, occupational and environmental health perspectives of recycling e-waste in India.	CO1
UNIT-2	**E-waste hazardous on Global trade** Essential factors in global waste trade economy, Waste trading as a quint essential part of electronic recycling, Free trade agreements as a means of waste trading. Import of hazardous e-waste in India; India's stand on liberalizing import rules, E-waste economy in the organized and unorganized sector. Estimation and recycling of e-waste in metro cities of India.	CO1, CO2
UNIT-3	**E-waste control measures** Need for stringent health safeguards and environmental protection laws in India, Extended Producers Responsibility (EPR), Import of e-waste permissions, Producer-Public-Government cooperation, Administrative Controls & Engineering controls, monitoring of compliance of Rules, Effective regulatory mechanism strengthened by manpower and technical expertise, Reduction of waste at source.	CO1, CO3
UNIT-4	E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016 - Salient Features and its likely implication. Government assistance for TSDFs.	CO1, CO4
UNIT-5	The international legislation: The Basel Convention; The Bamako Convention. The Rotterdam Convention. Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union, Restrictions of Hazardous Substances (RoHS) Directive	CO1, CO4

Learning Resources	
Text Books	1. E-waste: implications, regulations, and management in India and current global best practices",Johri R., TERI Press, New Delhi
Reference Books	1. Electronic Waste – 1st Edition (Toxicology and Public Health Issues), Fowler B. 2017Elsevier 2. Electronic Waste Management. Science ,Hester R.E., and Harrison R.M. 2009

20EE2701A - NON-CONVENTIONAL ENERGY SOURCES

Offering Branch	EEE	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the process of energy collection, quantification, storage, conversion and applicationsof non-conventional sources.	K2
CO2	**Apply** the knowledge of energy conversion by harvesting energy from different natural sourceslike light, heat, wind,water etc.	K3
CO3	**Apply** basic laws of physics for the production of energy from Solar, wind, ocean, biomass,geothermal, fuel cell	K3
CO4	**Analyze** the theory and designing wind mills, MHD, Fuel cells.	K4
CO5	**Examine** the performance of solar and wind generating units and economic aspects of MHDbiomass and Ocean energy sources.	K4
CO6	**Ability** to apply the various energy generation techniques and to measure the **basic** parametersand **submit a report.**	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3						3						2	1
CO3	3						3						2	1
CO4		3											2	1
CO5		3					3						2	1
CO6									3	2		3	2	1
Avg.	3	3					3		3	2		3	2	1

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**PRINCIPLES OF SOLAR RADIATION**: Role and potential of new andrenewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on titled surface. Measurement of Solar Radiation: Pyrometer, shading ring pyrheliometer,sunshine recorder, schematic diagrams and principle of working.	CO1 CO2 CO3 CO6
UNIT-2	**SOLAR ENERGY COLLECTION AND STORAGE:** Solar Light Energy: Photovoltaic effect, characteristics of photovoltaic cells, conversion efficiency, solar batteries and applications of photovoltaic energy conversion. Solar Heat Energy: Sensible, latent heat of Heat storage, solar ponds. Applications-solar heating/cooling technique, solar distillation and drying.	CO1, CO2 CO3 CO5 CO6
UNIT-3	**WIND ENERGY**: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria **OCEAN ENERGY:** OTEC, types of OTEC plants, mini-hydel power plants	CO1, CO6
UNIT-4	**BIO-MASS:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters. **GEOTHERMAL ENERGY:** Resources, methods of harnessing the energy.	CO1, CO3 CO6
UNIT- 5	**BIO-MASS:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters. **GEOTHERMAL ENERGY:** Resources, methods of harnessing the energy.	CO1, CO3 CO5 CO6

Learning Resources

Text Books	1. G.D. Rai, Non-Conventional Energy Sources, Khanna publishers, 5th edition,2014. 2. S. Rao and B. B.Parulekar, Energy Technology- Non conventional, Renewable and Conventional,Khanna Pub ,3rd Edition, 1999.
Reference Books	1. Ashok V Desai, Non-Conventional Energy, New age publishers, 1st edition 1990. 2. B.H.Khan,Non-Conventional Energy Sources, Tata Mc Graw-hill Publishing Company, 2ndedition,2013. 3. B.T. Nijaguna, Biogas Technology, New Age International Pub, First edition 2002. 4. Tiwari and Ghosal, Renewable Energy resources, Narosa, 2nd edition 2005
E-Resources & other digital Material:	https://www.coursera.org/learn/renewable-energy-technology-fundamentals https://nptel.ac.in/courses/121106014

20IT2701A - FUNDAMENTALS OF DATA SCIENCE

Offering Branch	IT	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	DATA MINING	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the basic concepts of Data Science	K2
CO2	**Apply** different modelling methods	K3
CO3	**Discuss** the concepts of web mining	K2
CO4	**Analyze** the different modelling methods	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to data science:** The Data Science process: Roles in a data science project, stages of a data science project **Managing Data:** Cleaning data, Sampling for modeling and validation	CO1
UNIT-2	**Modelling Methods:** Choosing evaluating models: Problems to machine learning tasks, Evaluating models,	CO1 CO2 CO4
UNIT-3	**Linear and Logistic Regression:** **Using Linear Regression:** Understanding Linear regression ,building a linear regression model, Making Predictions **Using Logistic Regression:** Understanding Logistic Regression, building a Logistic regression model, Making Predictions	CO1 CO2 CO4
UNIT-4	**Unsupervised methods:** **Clustering Analysis:** Preparing Data, K-Means Algorithm **Association Rules:** Overview of Association rules, Mining Associations rules	CO1 CO2 CO4
UNIT-5	**Web Mining** :Web Content mining, Web structure mining, Web usage mining, Text mining, Unstructured Text, Episode rule discovery for text ,Text Clustering	CO1 CO3

Learning Resources

Text Books	1. 1. Nina Zumel, John Mount: Practical Data Science with R , Dreamtech, 2015 2. Data Mining Techniques 3rd Edition Arun K Pujari 2013
Reference Books	

E-Resources & other digital material	http://nptel.ac.in

20ME2701A - OPERATIONS RESEARCH

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the basics of linear programming, transportation, queueing, sequencing of jobs, replacement, inventory and simulation problems	K2
CO2	Apply linear programming, transportation and assignment models to solve real life problems	K3
CO3	Apply Sequencing, queueing, Game and Replacement theories to solve problems	K3
CO4	Apply knowledge of inventory control and simulation to solve practical industrial problems	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Operations Research:** History, definition, operations research models, phases of implementing operations research in practice, applications. **Linear Programming**: Introduction, formulation, graphical solution, simplex method, artificial variable techniques – Big M and two-phase methods, duality principle.	**CO1 CO2**
UNIT-2	**Transportation**: Formulation, initial feasible solution, optimal solution – MODI method, unbalanced transportation problems, degeneracy in transportation problems. **Assignment**: Formulation, optimal solution, Hungarian method, travelling salesman problem.	**CO1 CO2**
UNIT-3	**Queuing theory**: Introduction, Kendall's notation, classification of queuing models, single server and multi-server models, Poisson arrival, exponential service, infinite population **Sequencing**: Introduction, assumptions, processing n-jobs through two machines, n-jobs through three machines, and graphic solution for processing 2 jobs through n machines with different order of sequence.	**CO1 CO3**
UNIT-4	**Game Theory**: Introduction, game with pure strategies, game with mixed strategies, dominance principle, graphical method for 2xn and mx2 games. **Replacement Theory**: Introduction, replacement of items that deteriorate with time - value of money unchanging and changing, simple probabilistic model for replacement of items that fail completely	**CO1 CO3**
UNIT-5	**Inventory control**: Introduction, inventory costs, Economic Order Quantity (EOQ)Demand rate Uniform and replenishment rate infinite, demand rate non-uniform replenishment rate infinite, Demand rate uniform, models with and without shortages, inventory model with single price break. **Simulation**: Definition, Types of simulation models, phases of simulation, applications of simulation	**CO1 CO4**

Learning Resources

Text Books	1. Operations Research, by S.D.Sharma, Kedarnath& Ramnath publications (15th edition),2013.

	2. Introduction to Operations Research, by Taha, Pearson Education,New Delhi, (8th edition), 2008
Reference Books	1. Operations Research, (4th edition) by A.M .Natarajan, P. Balasubramani, ATamilarasi, Pearson Education, New Delhi, 2009. 2. Operations Research, (2nd edition) by R.Pannerselvam, 2009,PHI Publications, Noida 3. Operations Research, (2nd edition) by Wagner, 2007, PHI Publications, Noida 4. Operation Research, (4th edition) by J.K.Sharma, 2009, MacMilan publishers, india Ltd. New Delhi.
E-Resources & other digital Material:	1. http://nptel.ac.in/courses/112106134/ 2. http://nptel.ac.in/courses/112106131/

20ME2701B - MANAGEMENT INFORMATION SYSTEMS

Offering Branch	ME	**Year : IV**	**Sem: I**
Course Category:	Open Elective -III	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the basic concepts of MIS, Decision making, Applications of MIS, Decision support systems, BPR and E- Commerce.	K2
CO2	Interpret the MIS decision making and its applications.	K3
CO3	Categorise Decision support systems and Business Process Re-Engineering	K3
CO4	Summarise the Electronic commerce environment and its opportunities.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1			1			1	1	3	2	1	1	3
CO2	2	1			1			1	1	3	2	1	1	3
CO3	2	1			1			1	1	3	2	1	1	3
CO4	2	1			1			1	1	3	2	1	1	3
Avg.	**2**	**1**			**1**			**1**	**1**	**3**	**2**	**1**	**1**	**3**

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to MIS**: Definition of MIS, Role and Impact of MIS, MIS: Support to the management, As tool for Management Process, Basic model of organization, Modifications to the basic model, organization as a system, MIS: organization, Strategic management of business.	**CO1**
UNIT-2	**Decision Making:** Concepts, Methods, Tools, Procedures, Organizational decision making, MIS and Decision making concepts, Information: A Quality Product, Classification of information, Value of information, General model of Human as information processor, Types of systems, Handling system complexity, Development of long range plans of the MIS, Development and implementation of MIS, Factors of Success and failure for MIS.	**CO1, CO2**
UNIT-3	**Applications:** Applications in Manufacturing Sector, Personnel, financial, production, materials, marketing management, Applications in service sector, creating a Distinctive service, MIS in service industry, Technology of Information systems, Data processing, Transaction processing, Application processing, TQM of Information systems, Programming languages for system coding.	**CO1, CO2**
UNIT-4	**Decision support systems and BPR:** Concept and philosophy, Deterministic systems, Artificial Intelligence systems, Knowledge based expert system, Enterprise Management systems, ERP basic features EMS and MIS, Business Process Re- Engineering, Process model of organization, Value stream model of the organization MIS and BPR.	**CO1, CO3**
UNIT-5	**E-Commerce:** Electronic commerce environment and opportunities: back ground, electronic commerce Environment, Modes of electronic commerce: Approaches to safe electronic commerce, Overview, Secure transport protocols, Secure Transactions, Secure Electronic Payment Protocol, and Secure Electronic Transaction.	**CO1, CO4**

Learning Resources

Text Books

1. W.S. Jawadekar, Management Information Systems: A Global Digital Enterprise Perspective, 5th Edition, McGraw Hill Education, 2013.
2. D. Minoli, Web Commerce Technology Hand Book, 1st edition, McGraw Hill Education, 2000.

Reference Books	1. K.C. Laudon and J. Laudon, Management Information Systems: Managing a Digital firm, 11th Edition, Pearson Education, 2012. 2. D. Gordon and M. Oslon, Management Information Systems: Conceptual Foundations, Structure and Development, 2nd Edition, McGraw Hill Education Pvt Ltd, India, 2001. 3. R.G. Murdic, J.E. Ross and J.R. Clagget, Information Systems for Modern Management, 3rd Edition, PHI, 2008. 4. K.Ravi and A.B. Whinston, Frontiers of Electronic Commerce, 1st edition, Pearson India, 2002.
E-Resources & other digital Material:	1. http://nptel.ac.in/courses/112106134/ 2. http://nptel.ac.in/courses/112106131/

20CE 2702A - ENVIRONMENTAL MANAGEMENT AND AUDIT

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20MC1301 - Environmental Science	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Illustrate** basic knowledge on solid waste management	K2
CO2	**Demonstrate** the handling of biomedical waste and its disposal	K3
CO3	**Distinguish** the E-waste sources, problems, control measures and E-waste rules	K3
CO4	**Outline** the basic principles of EIA.	K2
CO5	**Understand** the activities in environmental auditing.	K2

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION TO SOLID WASTE MANAGEMENT** Sources and types of municipal solid wastes-waste generation rates-factors affecting generation, characteristics, segregation of solid wastes – source reduction of waste – objectives of waste processing, elements of solid waste management – public role in solid waste management.	**CO1**
UNIT-2	**BIOMEDICAL WASTE MANAGEMENT** Definition-Sources-Classification of biomedical waste – Objectives of Biomedical waste management-segregation-containers for biomedical waste-Labelling Collection-Transport-Disposal methods	**CO2**
UNIT-3	**E-WASTE MANAGEMENT** E-waste: Sources- Types- components; Collection process- Segregation-Disposal methods; Effect on air, water and soil; Health hazards; Role of individual for E-waste management. Current E-waste Management Rules	**CO3**
UNIT-4	**ENVIRONMENTAL IMPACT ASSESSMENT (EIA)** Introduction-Definition-Scope-Objectives of EIA-Basic EIA Principles, Classification of EIA-Life Cycle Assessment-Environmental Policy of India. Baseline Data Acquisition: Environmental Inventory- Rapid EIA.	**CO4**
UNIT-5	**ENVIRONMENTAL AUDIT INTRODUCTION** Environmental audit Significance for Industry-Elements of Environmental audit. Process of environmental audit-Pre audit- Activity -Activities at site- Post audit.	**CO5**

Learning Resources

Text Books	1. Agarwal, K.M., Sikdar, P.K., Deb., S.C (2005) A Text Book of Environment, Macmillan India Limited. 2. Sharma, R.D. (1976), Organisational Management, Light and Life Publishers, New Delhi. 3. Varma and Agarwal, Theory & practice of Management Forward Book Depot, New Delhi
Reference	1. Kovntz, H and C. Danvel (1978): Essential of management, second edition, Tata

Books	Mc Graw Hill publishing company, New Delhi. 2. Erickson, P.A. (1977) Environmental Impact Assessment – Principles and Erickson, P.A. (1977)
E-Resources & other digital material	http://nptel.ac.in

20CS 2702A - DATABASE MANAGEMENT SYSTEMS

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20MC1301 - Environmental Science	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the basic concepts of database management systems	K2
CO2	Apply SQL commands to find solutions for a given application	K3
CO3	Apply ER Modeling to design a database application	K3
CO4	Apply normalization techniques to improve database design.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction to Databases:** Characteristics of the Database Approach, Advantages of using the DBMS Approach, A Brief History of Database Applications. **Overview of Database Languages and Architectures:** Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database Languages and Interfaces, Database System environment, Centralized and Client-ServerArchitecture for DBMS.	**CO1**
UNIT-2	**Relational Model:** The Relational Model Concepts, Relational Model Constraints and Relational Database Schemas. **SQL:** Data Definition, Constraints, Basic Queries and Updates, Views(Virtual Tables) in SQL	**CO2**
UNIT-3	**Conceptual Data Modeling :** High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Types. **ER-Diagrams:** Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues	**CO3**
UNIT-4	**Database Design Theory**: Functional Dependencies, Normal forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form.	**CO4**
UNIT-5	**Transaction Processing**: Introduction, Transaction and System Concepts, Desirable Properties of Transactions. **Introduction to Protocols for Concurrency Control in Databases:** Two-Phase Locking Techniques for Concurrency Control - Types of Locks and System Lock Tables.	**CO1**

Learning Resources

Text Books	1. Database Systems Models, Languages, Design and Application Programming, Ramez Elmasri, Shamkant B.Navathe, 6th Edition, Pearson.
Reference Books	1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, 3rd Edition, TMH.

	2. Data base System Concepts, Abraham Silberschatz, Henry F Korth, S.Sudarshan, 5th Edition, McGraw Hill.
E-Resources & other digital material	1. https://nptel.ac.in/courses/106/105/106105175/ 2. https://onlinecourses.nptel.ac.in/noc21_cs04/ 3. https://nptel.ac.in/courses/106/106/106106093/

20EC2702A - TELECOMMUNICATIONS

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Infer the basic knowledge of telecommunication system, regulations .	K2
CO2	Make use of revolutionary changes in Tele Communication technologies .	K3
CO3	Analyse different components of tele communication system. .	K4
CO4	Appraise the use of various components of telecommunication systems .	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Telecommunication Systems:** Evolution of Tele Communication Systems, Simple telephone communication, Telephones, Telephone System, Facsimile, Internet Telephony, Tele Communication Standards.	CO1 –CO4
UNIT-2	**Cell Phone Technologies**: Cellular Telephone Systems, A Cellular Industry Overview, 2G and 3G Digital Cell Phone Systems, Long Term Evolution and 4G Cellular Systems	CO1 –CO4
UNIT-3	**Wireless Technologies:** Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless Networks,WiMAX and Wireless Metropolitan-Area Networks-Infrared wireless- Ultra wideband wireless-Additional wireless applications	CO1 –CO4
UNIT-4	**Optical Communication:** Optical Principles, Optical Communication Systems, Fiber-Optic Cables, Optical Transmitters and Receivers.	CO1 –CO4
UNIT-5	**Satellite Communication:** Satellite Orbits, Satellite Communication Systems, Satellite Subsystems, Ground Stations, Satellite Applications, Global Navigation Satellite Systems.	CO1 –CO4

Learning Resources

Text Books	1. Louis E. Frenzel Jr., Principles of Electronic Communication Systems, 4/e, Mc Graw Hill Publications, McGraw-Hill Education, 2016. 2. Telecommunication Switching Systems and Networks, by Thiagarajan Viswanathan, PHI
Reference Books	1. Telecommunication Switching and Networks. By P.Gnanasivam, New Age International 2. Willium C. Y. Lee, “Wireless & Cellular Telecommunications”, McGraw-Hill Companies Inc, Third Edition, 2006.1. 3. Wayne Tomasi, Advanced Electronic Communication Systems, 4/e, Pearson Education, 2013. 4. Dennis Roddy, Electronic Communications, 4/e, Pearson Education, 2003.

20EC 2702B - SATELLITE COMMUNICATIONS

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Illustrate** the basic concepts of satellite communication and different Frequency allocations for satellite services.	K2
CO2	**Analyze** the satellite orbits and link design for transmission & reception of signals	K4
CO3	**Analyze** various satellite subsystems and its functionality.	K4
CO4	**Choose** appropriate multiple access technique for a given satellite communication application	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2									1				1
CO2		3								2				2
CO3		3								2				2
CO4	2									2				2
Avg.	2	**3**								2				2

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications.	CO1
UNIT-2	**Orbital Mechanics And Launchers:** Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.	CO1, CO2
UNIT-3	**Satellite Subsystems:** Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.	CO1, CO3
UNIT-4	**Satellite Link Design:** Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N, System design example.	CO1, CO2
UNIT-5	**Multiple Access:** Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite Switched TDMA On-board processing, DAMA, Code Division Multiple access (CDMA).	CO4

Learning Resources

Text Books	1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2rd Edition, 2003 2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.SuyderhoudPearson Publications, 2nd Edition, 2003.
Reference Books	1. Satellite Communications : Design Principles - M. Richharia, BS Publications, 2rd Edition, 2003 2. Satellite Communication - D.C Agarwal, Khanna Publications, Mc.Graw Hill, 5th Edition, 2008.

	3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004. 4. Satellite Communications – Dennis Roddy, McGraw Hill, 2nd Edition, 1996
E-Resources & other digital material	1. https://nptel.ac.in/courses/117/105/117105131/3.https://nptel.ac.in/courses/108/105/108105159/

20EE 2702B - UTILIZATION OF ELECTRICAL POWER

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Understand** the utilization of electrical systems and their advantages in industrial applications. (L2)	K2
CO2	**Apply** the knowledge to select suitable motor for electric drives, appropriate heating / welding techniques and Illumination systems in various industrial applications. (L3)	K3
CO3	**Apply** the knowledge to select suitable track electrification system and traction motors. (L3)	K3
CO4	**Analyze** the concepts of electric drives, different heating/welding techniques and various Illumination systems for industrial applications. (L4)	K4
CO5	**Analyze** the performance parameters of speed-time curves for different services and the mathematical concepts to design traction system. (L4)	K4
CO6	**Submit a report** on electric drives, electric heating & welding, illumination and electric traction system.	

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3					1								
CO3	3						1							
CO4		3				1								
CO5		3					1							
CO6		3				3			3	3				
Avg.	**3**	**3**				**2**	**1**		**3**	3				

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Electric Drives** Type of electric drive, choice of motor, starting and running characteristics, speed control, temperature rise of electrical machines, heating-time and cooling-time curves, selecting motor power rating for continuous, intermittent and short time duty, types of industrial loads, applications of electric drives.	CO1, CO2 CO4 CO6
UNIT-2	**Electric Heating & Electric Welding** Advantages and methods of electric heating, methods of heat transfer, Stefan's law, design of heating elements, resistance heating, construction and working principle of induction furnaces, arc furnaces and dielectric heating. Types of welding, resistance and arc welding, comparison between A.C and D.CWelding.	CO1, CO2 CO4 CO6
UNIT-3	**Illumination** Introduction, Terms used in illumination, laws of illumination, sources of light, Incandescent lamps, Discharge lamps, MV and SV lamps, fluorescent lamps- CFL-LED lamps, Types of lighting schemes, factory lighting, flood lighting and street lighting.	CO1, CO2 CO4 CO6
UNIT-4	**Electric Traction-I** Systems of electric traction and systems of track electrification, special features of traction motors, methods of electric braking-plugging, rheostat braking and regenerative braking, Speed-time curves for different services- trapezoidal and quadrilateral speed time curves.	CO1, CO3 CO5 CO6

UNIT-5	**Electric Traction-II** Mechanics of train movement, Calculations of tractive efforts and power outputof traction motor, Specific energy consumption for given run, effect of varying acceleration and braking retardation, dead weight, accelerating weight, adhesive weight and coefficient of adhesion, Current collectors for overhead system.	CO1, CO3 CO5 CO6

Learning Resources

Text Books	1. H. Partab, "Art & Science of Utilization of Electrical Energy", Dhanpat Rai & Sons, 12th edition,2012. 2. E. Openshaw Taylor, "Utilization of Electrical Energy", Orient Longman, 15th edition, 2012.
Reference Books	1. J.B.Gupta, "Utilization of Electric Power and Electric Traction", S.K. Kataria & Sons, 10th edition,2012. 2. C.L.Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", New Age international (P) Limited Publishers, 2015.
E-Resources & other digital material	1. https://nptel.ac.in/courses/108105060

20IT2702A - FUNDAMENTALS OF ARTIFICIAL INTELLEGENCE

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Know the challenges and concepts of AI.	K2
CO2	Solve problems using heuristics search algorithms	K3
CO3	Transform knowledge into rules.	K3
CO4	Demonstrate Symbolic reasoning under uncertainty	K3
CO5	Acquainted with expert systems.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

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

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	What is AI: The AI Problems, What is an AI Techniques, Criteria for Successes' Problems and problem spaces and Search: Problem as a state space search, Productio systems, Problem Characteristics, Production system characteristics.	**CO1**
UNIT-2	Heuristic search technique: Generate and test, Hill climbing, Best First search, Problem reduction, Constraint satisfaction.	**CO1 CO2**
UNIT-3	Knowledge Representation issues: Representations and mappings. Representing knowledge using rules: Procedural knowledge Vs Declarative knowledge, Forward Vs Backward reasoning, matching.	**CO3**
UNIT-4	Symbolic reasoning under uncertainty: Introduction to Non monotonic reasoning, Implementation in DFS and BFS. Weak, strong slot and filler structures: Semantic nets, Frames, Conceptual dependency, Scripts.	**CO4**
UNIT-5	Planning: Goal stack planning, Hierarchical planning Expert Systems: Expert system shells, Knowledge acquisition.	**CO5**

Learning Resources

Text Books	1. Artificial Intelligence, 2nd Edition, E.RichandK. Knight (TMH).
Reference Books	1.J.B.Gupta, "Utilization of Electric Power and Electric Traction", S.K. Kataria & Sons, 10th edition,2012. 2. C.L.Wadhwa, "Generation, Distribution and Utilization of Electrical Energy", New Age international (P) Limited Publishers, 2015.
E-Resources & other digital material	1. https://nptel.ac.in/courses/108105060

20ME2702A - MECHATRONICS

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	20ES1101 - Basic electrical and electronics Engineering	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	**Explain** the concepts related to elements of Mechatronic systems.	K2
CO2	**Summarize** the construction and working of sensors used in building mechatronic systems.	K3
CO3	**Illustrate** various types of actuation systems and their components.	K3
CO4	**Develop** mathematical models using building blocks and make use of these models to find the dynamic response.	K3
CO5	**Summarize** the construction and working of closed loop controllers, Micro processor and Microcontrollers.	K3
CO6	**Illustrate** the features and applications of digital logic, PLC and of Fuzzy logic.	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3									2		2	3	1
CO2	3									2		2	3	1
CO3	3		3							2		2	3	1
CO4	3	3			2					2		2	3	1
CO5	3				2					2		2	3	1
CO6	3				2					2		2	3	1
Avg.	3	**3**	**3**		**2**					2		2	3	1

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**INTRODUCTION:** Definition of Mechatronics, evolution of mechatronics, systems, measurement systems, control systems, mechatronic design process, traditional design and mechatronic design, applications of mechatronic systems, advantages and disadvantages of mechatronic systems. **SENSORS:** classification of sensors, basic working principles, Velocity sensors – Proximity and Range sensors, ultrasonic sensor, laser interferometer transducer, Hall Effect sensor, inductive proximity switch. Light sensors – Photodiodes, phototransistors, tactile sensors –PVDF tactile sensor, micro-switch and reed switch, Piezoelectric sensors, vision sensor	**CO1 CO2**
UNIT-2	**PNEUMATICAND HYDRAULIC ACTUATION SYSTEMS:** Actuation systems, Pneumatic and Hydraulic systems- constructional details of filter, lubricator, regulator, direction control valves, pressure control valves, flow control valves, actuators-linear and rotary. **ELECTRICAL ACTUATION SYSTEMS**: Electrical systems, Mechanical switches, solid state switches, solenoids, DC motors, AC motors, stepper motors. Characteristics of pneumatic, hydraulic, electrical actuators and their limitations.	**CO1 CO3**
UNIT-3	**BASIC SYSTEM MODELS:** Mathematical models, mechanical system building blocks, electric system building blocks, fluid system building blocks, thermal system building blocks. **DYNAMIC RESPONSES OF SYSTEMS:** Transfer function, Modelling dynamic systems, first order and second order systems.	**CO1 CO4**
UNIT-4	**CLOSED LOOP CONTROLLERS:** Classification of control systems, feedback, closed loop and open loop systems, continuous and discrete processes, control modes, two step mode, proportional mode, derivative control, integral control, PID controller. **MICROPROCESSOR AND MICRO CONTROLLER:** Introduction, Architecture of a microprocessor (8085), Architecture of a Micro controller, Difference between	**CO1 CO5**

	microprocessor and a microcontroller.	
UNIT-5	**DIGITAL LOGIC:** Digital logic, number systems, logic gates, Boolean algebra, Karnaugh maps, application of logic gates, sequential logic, transducer Signal Conditioning and devices for data conversion. **PROGRAMMABLE LOGIC CONTROLLERS :**Introduction, basic structure, input/output processing, programming, mnemonics, timers, internal relays and counters, shiftregister,masterandjumpcontrols.Datahandling,Analoginput/output,selectionofaPLC. **FUZZY LOGIC APPLICATIONS IN MECHATRONICS**: Fuzzy logic systems, Fuzzy control, Uses of Fuzzy expert systems.	**CO1 CO6**

Learning Resources

Text Books	1. Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering, (3rdedition), by WBolton, Pearson Education Press, 2005. 2. Mechatronics System Design, 5th Indian reprint, 2009, by Devdas shetty, Richard A.kolk, PWS Publishing Company
Reference Books	1. Mechatronics Sou rce Book, by Newton C Braga, Thomson Publications, Chennai. 2. Mechatronics, by N. Shanmugam, Anuradha Agencies Publishers. 3. Control sensors and actuators, by C. W. Desilva, Prentice Hall. 4. Design with Micro processors for Mechanical Engineers, by Stiffler, A. K. McGraw-Hill(1992).
E-Resources & other digital material	1. https://onlinecourses.nptel.ac.in/noc22_me54/course

20ME2702B - ROBOTICS

Course Category:	Open Elective -IV	Credits:	3
Course Type:	Theory	Lecture-Tutorial-Practical:	3-0-0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester End Evaluation:	70
		Total Marks:	100

Course Outcomes

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

CO1	Understand the basic anatomy of robots, actuators, end effectors, robot sensors, programming and applications.	K2
CO2	Understand the working principles of robot actuators, end effectors	K2
CO3	Apply robot programming skills	K3
CO4	Apply knowledge of robot sensors and their applications in industries	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												3	1
CO2	3	3											3	1
CO3	3	3	2		2								3	1
CO4	3		2										3	1
Avg.	3	**3**	**2**		**2**								3	1

1- Low **2-Medium** **3-High**

Course Content

UNIT-1	**Introduction:** Automation and robotics – History of robots -Robot anatomy – classification of robots, major components-robot specifications, selection of robots.	**CO1**
UNIT-2	**Robot actuators**- Pneumatic, Hydraulic actuators, electric & stepper motors **End Effectors**- types of end effectors, grippers and tools, Requirements and challenges of end effectors.	**CO1, CO2**
UNIT-3	**Robot Programming: -** Robot programming languages - programming methods - off and on-line programming - Lead through method - Teach pendent method, simple programs.	**CO1, CO3**
UNIT-4	**Sensors used in robots:** Sensor devices, Types of sensors - contact, position and displacement sensors, Force and torque sensors - Proximity and range sensors - acoustic sensors –slip sensors, Robot vision systems	**CO1, CO4**
UNIT-5	**Applications of robots:** Application of robots in industry - material handling, processing operations, assembly, and inspection operations.	**CO1, CO4**

Learning Resources

Text Books	1. Mikell P. Groover. Industrial Robotics Technology Programming and Applications, McGraw Hill Co., Singapore, 1995. 2. Robotic Engineering by Richard D.Klafter, Prentice Hall
Reference Books	1. Introduction to Robotics – Saeed B.Niku, Prentice Hall 2. Introduction to Robotics – John J. Craig, Addison Wesley
E-Resources & other digital material	1. http://nptel.ac.in/downloads/112101098/

20SA8751 – COMPUTER AIDED PROJECT MANAGEMENT LAB

Course Category:	Skill Oriented Course	Credits:	2
Course Type:	Laboratory	Lecture-Tutorial-Practical:	1-0-2
Prerequisites:	Nil	Continuous Evaluation:	-
		Semester End Evaluation:	50
		Total Marks:	50

Course Outcomes

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

CO1	**Use** Microsoft Project to develop accurate project task, time, resource, and cost relationships following current professional and/or industry standards.	K3
CO2	**Use** critical thinking skills to design and create accurate Gantt charts.	K3
CO3	**Deal** with Resource constraints and Balancing the demand of resources respectively.	K3
CO4	**Review and analyze** the predicted incoming and outgoing cash for a set period of time and also control costs by Earn Value Analysis.	K4

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1					3						3			**3**
CO2					3						3			**3**
CO3					3						3			**3**
CO4											3			**3**
Avg.					**3**						**3**			**3**

1- Low **2-Medium** **3-High**

Course Content

Experiment No.1	**Creating and Defining Projects**: Creating and Saving Projects, Defining Properties and Options, Creating and Organizing the Task List, Importing Data, Modifying and Applying Calendars, Setting Scheduling Options.	CO1 CO2 CO3 CO4
Experiment No.2	**Working with Estimates and Dependencies**: Entering tasks, Creating WBS codes, Entering a Duration or Work Estimate, Creating Links between Tasks, Adding Lag or Lead Times, Displaying Links in Network Diagram View	
Experiment No.3	**Working with Deadlines, Constraints, and Task Calendars**: Displaying the Critical Path *f* Setting a Deadline, Setting a Constraint, Responding to Situations, Triggered by Deadlines and Constraints, Creating and Applying a Task Calendar to Meet a Deadline, Finding and Removing Constraints in a Schedule	
Experiment No.4	**Working With Resources**: Adding Resources to the Resource Sheet View, Creating and Modifying Resource Assignments, Entering Project Costs and Project Budgets.	
Experiment No.5	**Tracking Progress**: Setting and Revising a Baseline, Entering Actual Results Updates for Tasks and Resources, Controlling Projects by Finding Variance and Suggesting Corrective Action, Applying Techniques to Shorten Duration, Reduce Work and Reduce Cost.	
Experiment No.6	**Data Structure of Primavera**: About Organizational Breakdown Structure, Procedure to Create an OBS, About Enterprise Project Structure, Procedure to create EPS, Creation of Project in web and client	
Experiment No.7	**Modification of Calendar**: Introduction to Calendar, Types of Calendars, Creating global calendars both web & client, Editing thestandard work weeks & its time, Create Exception, Creating Project calendars both web & client, Creating Resource calendars both web & client, Conversions in calendars, Working with timescale in Gantt chart.	
Experiment No.8	**Work Breakdown Structure**: Creation of WBS in both Web & Client, Creating an Activity, Assign Calendar to the Project in web, Creating Activities in web, Configuring General Tab, Delete an activity, Various ways to create an Activity in client, Adding Relationships to the Activities in various methods in both web & client, Dissolve Activity, Apply Lead or Lag, Procedure to apply Lead or Lag, Views.	

Experiment No.9	**Resource allocation, smoothening and levelling**: Assigning Resources to an Activity, Assign Resource to Multiple Activities, Assigning Resources by using Role, Resource Analysis and Resource Levelling in both web & client	
Experiment No.10	**Tracking**: Choose a Method for Updates in both Web & Client, Perform Earned Value analysis in web & client server.	

Learning Resources

Text Books	1. Jimmie W. Hinze, Construction Planning and Scheduling, edition 4th 2011,(3rd edition), Publisher: Prentice Hall
Reference Books	1. User Manual- MS Project & Primavera P6. 2. Rain Diana ,"Training Guide to Microsoft Access", 2008 BPB Publications, New Delhi 3. Raina V.K. ,"Construction Management practice", edition 2nd 2009 (1988), Tata – McGraw Hill publishing co.Ltd.

20CE3781B/C – INDUSTRIAL/RESEARCH INTERNSHIP

Offering Branches	CE		
Course Category:	Internship	**Credits:**	3
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-0
Prerequisites:	NIL	**Continuous Evaluation:**	-
		Semester End Evaluation:	50
		Total Marks:	50

Course Outcomes

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

CO1	**Enhance** capability to acquire and **apply** fundamental principles of engineering	K3
CO2	**Become** master in one's specialized technology	K3
CO3	**Become** updated with all the latest changes in technological world	K3
CO4	**Demonstrate** hands on practice within a real job situation	K2
CO5	**Inculcate** self-improvement through continuous professional development and life-long learning	K5
CO6	**Be** a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills	K3

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO2	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO3	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO4	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO5	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO6	3	2	2	3	3	3	1	3	3	3	3	3	3	2
Avg.	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

1- Low **2-Medium** **3-High**

Course Content

Internships are educational and career development opportunities, providing practical experience in a field or discipline. They are structured, short-term, supervised placements often focused around particular tasks or projects with defined timescales. An internship may be compensated, non-compensated or some time may be paid. The internship has to be meaningful and mutually beneficial to the intern and the organization. It is important that the objectives and the activities of the internship program are clearly defined and understood. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' in classroom will be used in classroom discussions
- Create conditions conducive to quest for knowledge and its applicability on the job.
- Learn to apply the Technical knowledge in real industrial situations.
- Gain experience in writing Technical reports/projects.
- Expose students to the engineer's responsibilities and ethics.
- Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control.

CO1 CO2 CO3 CO4 CO5

• Promote academic, professional and/or personal development. • Expose the students to future employers. • Understand the social, economic and administrative considerations that influence the working environment of industrial organizations Understand the psychology of the workers and their habits, attitudes and approach to problem solving.	

Guidelines:

1. The student has to complete the internship for a period of 4 to 6 weeks during summer vacation between VI Semester & VII Semesters.
2. The internship can be carried out in any industry / R&D Organization / Research Institute / Premier Educational Institutes like IITs, NITs and IIITs etc.
3. The registration process of internship should be completed before the commencement of IV-semester end examinations.
4. The registration process for internship involves:
    e) Students have to approach respective course coordinator with name of proposed company / organization in which they wish to carry out internship.
    f) The Department shall nominate guide to supervise the interns.
    g) Student has to obtain a no objection certificate (NOC) in the prescribed format from the department and submit the same to the respective organization.
    h) Student has to submit acceptance letter issued by the respective organization to the course coordinator.
5. The internal guide has to visit place of internship at least once during student's internship.
6. The students shall report the progress of the internship to the guide in regular intervals and seek advice.
7. After the completion of Internship, students shall submit a final report along with internship and attendance certificates to the course coordinator with the approval of internal guide.
8. The evaluation of internship shall be done during VII-Semester.
9. The student has to give a PPT presentation for duration of 10 to15 minutes in the presence of departmental evaluation committee consists of Head of the Department, External Examiner and One Senior Faculty from the respective departments.
10. After the successful presentation by the student, the evaluation committee recommends the result as satisfactory for the internship.
11. In case of students who have not registered for internship / not submitted the internship certificate and report, the VII-Semester result will not be declared till completion for that student.

VIII– SEMESTER SYLLABUS

20CE3861 – PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY (6 MONTHS)

Offering Branches	CE		
Course Category:	Project Work and Internship	**Credits:**	8
Course Type:	Practical	**Lecture-Tutorial-Practical:**	0-0-0
Prerequisites:	NIL	**Continuous Evaluation:**	60
		Semester End Evaluation:	140
		Total Marks:	200

Course Outcomes

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

CO1	**Develop** capability to acquire and apply fundamental principles of engineering	K6
CO2	**Become** updated with all the latest changes in technological world	K3
CO3	**Make** deep connections between ideas	K3
CO4	**Learn** to take creative risks	K2
CO5	**Be ready** for the creative economy also engage in iterative thinking and divergent thinking	K2
CO6	**Identify, formulate and model** problems and find engineering solution based on a systems approach	K5

Contribution of Course Outcomes towards achievement of Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO2	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO3	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO4	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO5	3	2	2	3	3	3	1	3	3	3	3	3	3	2
CO6	3	2	2	3	3	3	1	3	3	3	3	3	3	2
Avg.	**3**	**2**	**2**	**3**	**3**	**3**	**1**	**3**	**3**	**3**	**3**	**3**	**3**	**2**

1- Low **2-Medium** **3-High**

Course Content

PURPOSE: To simulate real life situations related to civil engineering and impart adequate training so that confidence to face and tackle any problem in the field is developed in the college itself.

INSTRUCTIONAL OBJECTIVE: To guide the students such a way that the they carry out a comprehensive work on the chosen topic which will stand them in good stead as they face real life situations. The project work so chosen by the student shall culminate in gaining of major design experience in the related area of specialization.

CO1 CO2 CO3 CO4 CO5 CO6

MAJOR PROJECT

Each project will cover all the aspects (to the extent possible) like investigation, planning, designing, detailing and estimating of a civil engineering structure in which the aspects like analysis, application of relevant codes, etc., will find a place. Alternately, a few research problems also may be identified for investigation and the use of laboratory facilities to the fullest extent may be taken as a project work. The project shall be driven by realistic constraints like that related to economic,

environmental, social, political, ethical, health & safety, manufacturability and sustainability. The outcomes to be attained by students by doing the project work shall be spelt out clearly. A project report is to be submitted on the topic which will be evaluated during the final review. Assessment procedure will be as spelt out in the regulations. **PRACTICE SCHOOL** Alternately, a student is encouraged to take an industrial project with civil engineering organizations or firms chosen by the institute for a period of one semester i.e., 8th semester. In such cases the student will stay with the firm and carry out the project. The project will be guided by the faculty member and the concerned officer in the industry. All the requirements spelt out under 'MAJOR PROJECT' above, shall be incorporated under this work also. However, reviews will be conducted in the institute which the student shall attend	