B. TECH FOUR YEAR DEGREE COURSE

SR-21, ACADEMIC REGULATIONS,

COURSE STRUCTURE & SYLLABUS

(Applicable for the batches admitted from 2021-22)

SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY
(UGC Autonomous Institution**)**

Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada Accredited by NAAC with 'A' grade, Recognised by UGC under sections 2(f) & 12(B)
Cheyyeru (V), Amalapuram, East Godavari District – 533216 Andhra Pradesh, India

INSTITUTE VISION

To develop the institution into a world class destination for technological education and research

INSTITUTE MISSION

- To impart high quality, industry relevant, career oriented , engineering education to rural students , to translate our vision into a reality
- To provide the best of instructional and institutional infrastructure facilities
- To have strategic linkages with industry and other institutions
- To mould students to meet the challenges of life with ethics , courage and conviction

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION

To become a centre of Excellence in the field of Technical Education and Research. So as to produce globally competent Electrical Engineers Capable enough to contribute to the society.

MISSION

1) To provide quality Technical Teaching combined with practical skills.
2) To strive for centre of excellence in Research
3) To promote ethics and moral values among the students and make them responsible professionals.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURES

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

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

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

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

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

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

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

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

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

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

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

CoE: Controller of Examinations

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

Continuous Internal Assessment (CIA): It is an examination conducted towards internal assessment.

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

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

Credit: A credit is a unit that gives a weightage to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture hour per week.**Credit point:** It is the product of grade point and number of credits for a course.

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

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

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

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

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

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

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

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

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

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

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

Institute: Means SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY, Cheyyeru, East Godavari Dist, Andhra Pradesh unless indicated otherwise by the context.

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

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

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

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

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

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

Regulations: The regulations, common to all B.Tech programs offered by Institute are designated as "SR21 Academic Regulations" and are binding on all the stakeholders.

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

Semester End Examinations (SEE): It is an examination conducted for all the courses offered in a semester after completion of that semester class work.

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

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

2. ACADEMIC REGULATIONS

B.Tech. Regular Four Year Degree Programme
(For the batches admitted from the academic year 2021-22) &
(B.Tech. Lateral Entry Scheme For the batches admitted from the academic year 2022 – 23)

For pursuing four year undergraduate Bachelor Degree Programme of study in Engineering (B.Tech) offered by SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY under autonomous status and herein after referred to as SIET

3.CHOICE BASED CREDIT SYSTEM

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

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

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

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

The CBCS permits students to:

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

4. ELIGIBILITY FOR ADMISSION

Admission to the B. Tech Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or on the basis of any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines vide G.O No.52.

- The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.
- Under Category A: 70% of the seats are filled through EAPCET counseling.
- Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE.

Admission eligibility-Under Lateral Entry Scheme Students with diploma qualification have an option of direct admission into II year B. Tech. (Lateral entry scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three year B.Tech later entry Programme will be through ECET. The maximum period to complete B. Tech. under lateral entry scheme is six consecutive academic years from the date of joining.

5. DURATION OF PROGRAMME

The course duration for the award of the Degree in **Bachelor of Technology** will be four academic years, with two semesters in each year. However, if a student is unable to complete the course within 4 academic years, student can do so by giving more attempts but within 8 consecutive academic years from the date of admission.

Academic Calendar

For all the eight semesters a common academic calendar shall be followed in each semester by having an average of sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

6. MEDIUM OF INSTRUCTION

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

7. BRANCHES OF STUDY

- Civil Engineering (CE)
- Electrical & Electronics Engineering (EEE)
- Mechanical Engineering (ME)
- Electronics & Communication Engineering (ECE)
- Computer Science & Engineering (CSE)
- Artificial Intelligence and Machine Learning (AI&ML)

8. TYPES OF COURSES

a. Basic Science Course:

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

b. Professional Core Course:

Professional Core Course is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

c. Professional Elective Course:

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

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

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

There are four professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective

courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives is to be selected.

d. Open Elective Course:

Open elective course by other department students will have learning awareness and job-oriented benefits. Students require the opportunity to choose any open elective course from different departments to acquire knowledge in that field of course. Learning and employment benefits are not only through their own course subjects but also through open elective courses.

e. Mandatory Course:

For mandatory courses like Induction Training, Environmental Sciences, Indian

Constitution, Essence of Indian Traditional Knowledge, a student has to secure 25 marks out of 50 marks (i.e 50% of the marks allotted) in the end examination for passing the subject/course. For **Mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

No marks or letter grade shall be allotted for all mandatory/non-credit courses.

f. NCC / NSS Activities:

NSS/NCC training is optional to the Undergraduate students. The activities shall be beyond class hours. The student participation shall be for a minimum period of 45 hours for certification in case of NSS.

9. SEMESTER STRUCTURE

Each academic year is divided into two semesters, TWO being MAIN SEMESTERS (one odd + one even). Main Semesters are for regular class work. However, the following cases are exempted:

a. Students admitted on transfer from JNTUK affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.
b. Each semester shall be of 21 weeks (Table 1) duration and this period includes time for registration of courses, course work, examination preparation and conduct of examinations.
c. Each semester shall have a minimum of 90 working days, out of which number of contact days for theory / practical are 75 and 15 days for conduct of examinations and preparation.
d. The academic calendar shown in **Table 1** is declared at the beginning of the academic year.

Table 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Examinations			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation/Summer Internship			10 weeks

10. REGISTRATION

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

IN ABSENTIA registration will not be permitted under any circumstances.

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

11. UNIQUE COURSE IDENTIFICATION CODE

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

Table 2: Courses and their codes

S. No	Branch	Code
1	Civil Engineering	01
2	Electrical & Electronics Engineering	02
2	Mechanical Engineering	03
3	Electronics & Communication Engineering	04
4	Computer Science & Engineering	05
5	Artificial Intelligence & Machine Learning	61

12. CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Foundation/ Skill Courses, Core Courses, Elective Courses, Open Electives, Laboratory Courses, Technical Seminar, Communication Skills Practice, Soft Skills Practice, Professional Society Activities, Community Service Project, Summer Internship and Major Project. The list of elective courses may include subjects from allied disciplines also.

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

- Contact classes (Theory / Tutorial): 1credit per lecture hour per week.
- Laboratory Hours (Practical): 0.5 credit for 1 Practical hour per week.
- Summer Internship:2 credits
- Project Work and Full Semester Summer Internship (6 Months): 12 Credits
- MOOCS: 2 Credits per course
- Comprehensive Viva Voce: 1 Credit
- Mandatory Courses (MC):**Non-Credit**
- Induction Program: **Non-Credit**

Credit distribution for courses offered is shown in Table 3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core/Foundation/Elective)	3	3
2	Professional Core Courses	3	3
3	Professional Elective Courses	3	3
4	Open Elective Courses	3	3
5	Engineering Science courses (Engineering Graphics/Engineering Workshop)	1L+4P	3
6	Engineering Science courses	3	3
7	Laboratory Courses	3	1.5
8	MOOC Courses	0	2
9	Skill Oriented Course / Certification Course	1L+2P	2
10	Skill Advanced Course / Certification Course	1L+2P	2
11	Soft Skill Course / Certification Course	1L+2P	2
12	Summer Internship (8 Weeks)	-	2
13	Community Service Project	-	4
13	Seminar	-	1
14	Project Work	-	10
15	Mandatory Courses	2	0
16	Minor Degree Courses	4	4

Course Structure

Every program of study shall be designed to have **36** theory courses, **5** Skill Oriented / Certification Courses, Summer Internship, Community Service Project, **5** Mandatory Courses and **17** laboratory courses. Every course of the B.Tech program will be placed in one of the 10 categories with minimum credits as listed in the **Table 4**. In addition, a student has to carry out a Project Work.

Table 4: Category Wise Distribution of Credits

S. No	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	**10**
2	Basic Sciences (BSC) including Mathematics, Physics and Chemistry.	BSC (10% to 15%)	**21**
3	Engineering Sciences (ESC), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ESC (10% to 15%)	**24**

4	Professional – Core Courses (PCC), relevant to the chosen specialization/ branch.	PCC (30% to 40%)	**51**
5	Professional Electives Courses (PEC), relevant to the chosen specialization/ branch.	PE (5% to 10%)	**15**
6	Open Electives Subjects / MOOCs -(OEC), from other technical and/or emerging subject areas.	OEC (5% to 10%)	**12**
7	Project Work through full Semester Summer Internship and Summer Internships (PW)	PW 5% to 10%	**17**
8	Skill Oriented Courses/Certification Courses project	SC (5% to 7%)	**10**
9	Mandatory Courses(Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge, Social Values and Professional Ethics)	MC (0%)	**0**
TOTAL CREDITS			**160**

For Four-Year Regular Programme:

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech I Semester	2 Basic Science+ 1 Humanities and Social Science + 2 Engineering Science	1 Humanities and Social Science Lab + 1 Basic Science Lab + 1 Engineering Science Lab + Induction Training	19.5
B.Tech II Semester	2 Basic Science + 3 Engineering Sciences	2 Engineering Science Lab + 1 Basic Science Lab+ Environmental Science (MC)	19.5
B.Tech III Semester	1 Basic Science + 4 Professional Core subjects	3 Professional Core Lab + Skill Oriented Course + Essence of Indian Traditional Knowledge (MC)	21.5
B.Tech IV Semester	1 Basic Science + 2 Professional Core + 1 Engineering Science / Professional Core (Interdisciplinary) + Humanities and Social Science	Engineering Science / Professional Core (Interdisciplinary) Lab + 2 Professional Core Lab + Skill Oriented Course+ Basics of Indian Constitution (MC)	21.5

B.Tech V Semester	3 Professional Core + 1 Open Elective/ Job Oriented Elective - I+ Professional Elective – I	2 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course + Summer Summer Internship 2 Months after Second Year (To be Evaluated during V Semester) + Professional Ethics and Human Values (MC)	24
B.Tech VI Semester	3 Professional Core+ Professional Elective - II+ Open Elective/ Job Oriented Elective – II	3 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course +IPR & Patents (MC)	21.5
B.Tech VII Semester	3 Professional Elective-III,IV&V + Open Elective/ Job Oriented Elective –III, IV+ Humanities and Social Science Elective	Industry Oriented Mini Project+ Comprehensive Viva Voce+ 1 Skill Advanced Course / Soft Skill Course.	21.5
B.Tech VIII Semester	Project Work Seminar		11
Total	6 Basic Science + 3 Humanities and Social Sciences + 5 Engineering Science + 12 Professional Core + 1 Professional Interdisciplinary Core+ 5 Professional Electives + 4 Open Electives / Job Oriented Electives + Project Work	1 Humanities and Social Sciences Lab + 2 Basic Science Lab + 3 Engineering Science Lab + 1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab + 2 Professional Elective Lab + 2 Skill Oriented Course + 3 Skill Advanced Course / Soft Skill Course + Summer Internship + +Community Service Project + Mandatory Courses (Non-Credit)	160

For Three year lateral entry programme :

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech III Semester	1 Basic Science + 4 Professional Core subjects	3 Professional Core Lab + Skill Oriented Course + Essence of Indian Traditional Knowledge (MC)	21.5
B.Tech IV Semester	1 Basic Science + 2 Professional Core + 1 Engineering Science / Professional Core (Interdisciplinary) + Humanities and Social Science	Engineering Science / Professional Core (Interdisciplinary) Lab + 2 Professional Core Lab + Skill Oriented Course+ Basics of Indian Constitution (MC)	21.5
B.Tech V Semester	3 Professional Core + 1 Open Elective/ Job Oriented Elective - I+ Professional Elective – I	2 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course + Summer Internship 2 Months after Second Year (To be Evaluated during V Semester) + Professional Ethics and Human Values (MC)	21.5
B.Tech VI Semester	3 Professional Core+ Professional Elective - II+ Open Elective/ Job Oriented Elective – II	3 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course +IPR & Patents (MC)	24
B.Tech VII Semester	3 Professional Elective-III,IV&V + Open Elective/ Job Oriented Elective –III, IV+ Humanities and Social Science Elective	Industry Oriented Mini Project+ Comprehensive Viva Voce+ 1 Skill Advanced Course / Soft Skill Course.	21.5
B.Tech VIII Semester	Project Work Seminar		11

Total	2 Basic Science + 2 Humanities and Social Sciences + 12 Professional Core + 1 Professional Core (Interdisciplinary)+ 5 Professional Electives + 4 Open Electives / Job Oriented Electives + Project Work through Summer Internship (6 Months)	1 Engineering Science / Professional Core (Interdisciplinary) Lab + 10 Professional Core Lab + 2 Professional Elective Lab + 2 Skill Oriented Course + 3 Skill Advanced Course / Soft Skill Course + Summer Internship +Industry Oriented Mini Project+ Comprehensive Viva Voce + Basics of Indian Constitution (MC) + Professional Ethics and Human Values (MC) + Essence of Indian Traditional Knowledge (MC) +IPR & Patents (MC)	121

Course wise break-up for Regular Program:

Total Theory Courses - 36 (6 Basic Science + 3 Humanities and Social Sciences + 5 Engineering Science + 12 Professional Core + 1 Professional Core(Interdisciplinary) + 5 Professional Electives + 4 Open Electives / Job Oriented Electives)	36@3credits each	108
Laboratory Courses –17 (2 Basic Science Lab +1 Humanity Science Lab+ 3 Engineering Science Lab + 1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab	17 @ 1.5 credits each	25.5
Summer Internship	1@1.5credit	1.5
Community Service Project	1 @4 credit	04
Seminar	1 @ 1 credit	01
Skill Oriented Courses / Certification Courses-2	2 @2credits each	04
Skill Advanced Courses / Soft Skill Courses / Certification Courses-3	3 @2 credit	06
Project Work	1 @10credits	10
Mandatory Courses	5 @ 0 credits	0
Total Credits		**160**

Course wise break-up for three years lateral entry program:

Total Theory Courses - 26 (2 Basic Science +2 Humanities and Social Sciences + 12 Professional Core + 1 Professional Core(Interdisciplinary) + 5 Professional Electives + 4 Open Electives / Job Oriented Electives)	26 @3credits each	78
Laboratory Courses –11 (1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab)	11 @ 1.5 credits each	16.5
Summer Internship	1 @1.5 credit	1.5
Community Service Project	1 @4 credit	04
Seminar	1 @ 1 credit	01
Skill Oriented Courses / Certification Courses - 2	2 @2credits each	04
Skill Advanced Courses / Soft Skill Courses / Certification Courses – 3	3 @2 credit	06
Project Work	1 @10credits	10
Mandatory Course	4 @ 0 credits	0
Total Credits		**121**

13. EVALUATION METHODOLOGY

The performance of a student in each semester shall be evaluated through Continuous Internal Assessment (CIA) and /or Semester End Examination (SEE) conducted semester wise.

S. No	Course	Marks	Examination and Evaluation		Scheme of Examination
1	Theory	70	Semester end examination of 3 hours duration (External Evaluation)		Shall be evaluated as given in 13.2
		30	Internal Examination		Shall be evaluated as given in 13.3
2	Laboratory	35	Semester end Laboratory Examination for 3 hours duration (External Evaluation)		Shall be evaluated as given in 13.5
		15	10	Day to Day Evaluation for performance in Laboratory experiments	Shall be evaluated as given in 13.6
			05	Practical Test (Internal Evaluation)	
3	i. Summer Internship ii. Community Service Project	100 100	Internal Evaluation Internal Evaluation		The evaluation shall be done by the Department Evaluation Committee (DEC) as given in 13.7

4	Skill Oriented Courses/ Skill Advanced Courses / Soft Skill Courses	30	Internal Evaluation	Shall be evaluated as given in 13.8
		70	End Semester Evaluation	
5	MOOCs	100	Semester End Evaluation	Shall be evaluated as given in 13.9
6	Project Work	60	Internal Evaluation	Continuous evaluation shall be done by the Project Evaluation Committee (PEC) as given in 13.10
		140	Semester End Evaluation	Project Work Viva-Voce Examination shall be conducted by a Committee at the end of the semester as given in 13.11
7	Mandatory Course	-	-	Shall be evaluated as given in 13.12

13.1Theory Course:

The performance of a student in every theory course shall be evaluated for total of 100 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 30 marks and 70 marks respectively.

13.2 External Evaluation for Theory Course - Semester End Examination:

The Semester End Examination (SEE) in each theory subject shall be conducted for 3 hours duration at the end of the semester for 70 marks.

Pattern of the Semester End Examination question paper is as follows:

The semester end examinations will be conducted institute examination section for 70 marks consists 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.

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

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

13.3 Internal Evaluation for Theory Course:

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 a duration of 20 minutes

(ii) One descriptive examination (3 full questions for 10 marks each) which will be reduced to 15 marks for a duration of 90 minutes and

(iii) One assignment for 5 marks.

(iv) All the internal exams shall be conducted as per institute norms from

50% of the syllabi.

b) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. Which consists of marks of objective examination, descriptive examination and assignment shall be submitted to the Institute examination section within one week after completion of the mid-term examinations.

c) 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 examination-1+descriptive examination-1 +one assignment-1)
Mid-2 marks = Marks secured in (objective examination-2+descriptive examination-2 +one 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)
If a student scores 23 marks and 24 marks in the first and second mid-term examinations respectively, then Weighted Average Marks = 24 x 0.8 + 23 x 0.2 = 23.8, rounded to 24 Marks.

d) With the above criteria, institute examination section shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of institute examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

13.4 Laboratory Course:

The performance of a student in every practical course shall be evaluated for total of 50 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 15 marks and 35 marks respectively.

13.5 External Evaluation for Practical Course:

Out of **35** marks **30** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks. Readings, calculations & results-10 marks and Records – 5 marks) and **5** marks for viva-voce examination.

Each Semester External Lab Examination shall be evaluated by an Internal Examiner along with an External Examiner appointed by the Principal.

A student has to secure not less than a minimum of 35% of marks (17 marks) exclusively at the Semester End Examinations in each of the practical subjects in which the candidate had appeared.A candidate shall be declared to have passed in individual lab course if he secures a minimum of 40% aggregate marks (20 marks out of 50 marks) (Internal & Semester External Examination marks put together).

13.6 Internal Evaluation for Laboratory Course:

For practical subjects there shall be a Continuous Internal Evaluation during the semester for 15 internal marks. Out of the 15 marks for internal evaluation, day-to-day assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 05 marks conducted by the laboratory teacher concerned.

13.7 Summer Internship and Community Service Project

Summer Internship each of 8 weeks / 2 Months duration at the end of II B.Tech (i.e., IV Semester) are Mandatory with 1.5 credits.

The Summer Internship after II year shall be in the form of community service project as mentioned below,

- 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.

Objective:

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships / Apprenticeships / On 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 in-charge.
- 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 Summer 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 b e 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

Suggestive List of Programmes under Community Service Project:

The following 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

- Water facilities and drinking water availability
- Health and hygiene
- Stress levels and coping mechanisms
- Health intervention programmes
- Horticulture
- Herbal plants
- Botanical survey
- Zoological survey

- Marine products
- Aqua culture
- Inland fisheries
- Animals and species
- Nutrition
- Traditional health care methods
- Food habits
- Air pollution
- Water pollution
- Plantation
- Soil protection
- Renewable energy
- Plant diseases
- Yoga awareness and practice
- Health care awareness programmes and their impact
- Use of chemicals on fruits and vegetables
- Organic farming
- Crop rotation
- Floury culture
- Access to safe drinking water
- Geological survey
- Sericulture
- Study of species
- Food adulteration
- Incidence of Diabetes and other chronic diseases
- Human genetics
- Blood groups and blood levels
- Internet Usage in Villages
- Android Phone usage by different people
- Utilisation of free electricity to farmers and related issues
- Gender ration in schooling level- observation.

Complimenting 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.
8.

Programmes for Women Empowerment:

1. Government Guidelines and Policy Guidelines
2. Women's 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
   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, Natural Disaster Management, Irrigation

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.
   - A survey form based on the type of habitation to be prepared before visiting the habitation 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 student's 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.

Evaluation of Summer Internship

Evaluation of the Summer Internship / Community Service Project shall be through the departmental committee. A student will be required to submit a detailed project report to the concerned department and appear for an oral presentation before the departmental committee.

- Day to day assessment log book - 20 Marks
- Summer Internship / Project Report - 40Marks

- Presentation and Viva-Voce - 40 Marks

A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

13.8 Skill Oriented / Skill Advanced / Soft Skill Courses:

- For skill oriented/skill advanced /Soft skill Courses, one theory and 2 practical hours may be allotted or two theory hours may be adopted as per the decision of concerned BoS.
- From the five skill courses two shall be skill-oriented programs related to the domain and shall be completed in 2nd year. The remaining 3 skill courses, one shall be necessarily a soft skill course and the remaining 2 skill-advanced courses can be in the same domain or Job oriented skills which can be inter disciplinary.
- A pool of interdisciplinary job-oriented skill courses shall be prepared by joint Board of studies and the syllabus along with the pre requisites shall be prepared for each of the requirements of laboratory infrastructure. The list of such courses shall be included in the curriculum of each branch of Engineering, so as to enable the student to choose from the list.
- The student shall be given an option to choose between the skill advanced courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies.
- 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 skills based on industrial demand.
- The credits assigned to the skill advanced course shall be awarded to the student upon producing the certificate of skill from the agency/professional bodies as approved by the Board of studies.
- 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.

Evaluation Procedure

Evaluation of the Skill oriented / Skill advanced / Soft skills / Certificate course shall be through the departmental committee. A student will be registered for the courses being offered by the department or interdisciplinary. The evaluation procedure is,

Internal Examination - 30 Marks (CIA Mode) External Examination - 70 Marks (SEE Mode)

A student will be registered for the course being offered by industries / Professional bodies / APSSDC or any other accredited bodies. The Merit / Pass certificate obtained from the course are considered for **2** credits.

13.9 Massive Open Online Courses (MOOCs):

Meeting with the global requirements, to inculcate the habit of self learning and incompliance

with UGC guidelines, MOOCs (Massive Open Online Courses) have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list of courses from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOCs shall be displayed in Grade card of a student, provided student submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than **8**weeks.

Two credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

Internal Evaluation for Design/ Drawing Courses:

For the subject having design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing, production drawing and building drawing) the internal marks distribution shall be 15 marks for day-to-day performance and 15 marks for Mid-Term Examinations.

External Evaluation for Design/ Drawing Courses:

The Semester End Examination in Design / Drawing Course shall be conducted for 3 hours duration at the end of the semester for 70 marks.

Pattern of the Semester End Examination question paper is as follows:

- A total of two Sections (Section-I & Section-II)
- Section-I contains five two mark questions. One question from each unit and a student has to be answered all the five questions compulsory (5x2=10 Marks)
- Section-II contains ten questions are to be designed taking two questions from each unit (Unit Wise - Either or type) of the total five units. (5x12=60 Marks)

A student has to secure not less than a minimum of 40% of marks (24 marks) exclusively at the Semester End Examinations in each of the theory subjects in which the candidate has appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

Project Work

13.10 Internal Evaluation for Project Work and Full Semester Summer Internship at Industry:

The object of Project Work and Summer Internship is to enable the student to take up investigative study in the broad field of his branch of Engineering/Interdisciplinary, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or three/four students in a group under the guidance of a supervisor/ guide. This is expected to provide a good initiation for the student(s) in R&D work.

The total internal weightage for Project work, Summer Internship course is 60 marks and will be evaluated as follows,

- Submission of Abstract (Identification of Problem & Literature Survey)Profile and Abstract –Student has to submit the industry profile and abstract of the project within four weeks from date of commencement of Summer Internship through mail or post – 15 Marks
- Review-1 – at 6th week from date of commencement of Summer Internship - 10Marks
- Review-2 – at 12th week from date of commencement of Summer Internship - 15 Marks
- Review-3 – at 18th week from date of commencement of Summer Internship - 20 Marks

13.11External Evaluation for Project Work and Full Semester Summer Internship at Industry:

The external evaluation based on the report submitted and viva-voce exam for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be based on the report submitted and a viva-voce exam for 140 marks by a committee comprising the Head of the Department, the project supervisor and an external examiner. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

Project Work through full Semester Summer Internship in the Industry carry 12 credits. During Full semester Summer Internship, student has to spend one full semester (6 Months) in an identified industry /firm / organization and has to carry out the Summer Internship as per the stipulated guidelines of that industry / firm / organization and the institute.

Distribution of Project Work &Full Semester Summer Internship Marks

- Summer Internship Certificate is Mandatory
- Project Report - 30 Marks
- Seminar on Summer Internship - 50 Marks
- Project Viva Voce - 60 Marks

13.12 Mandatory Courses:

Mandatory courses carry **"ZERO"** credits. There shall be **NO Semester-end** examination. However, ATTENDANCE in Mandatory courses shall be considered while calculating aggregate attendance in a semester. The internal examination shall be conducted and evaluated similar to the THEORY courses for 50 Marks. The student shall be declared to have passed the mandatory courses only when Student secures **40% marks in the internal examination.** If the student FAILS, a re-examination shall be conducted for FAILED candidates in the Consecutive semester. The performance of the student shall be indicated in the grade sheets **"COMPLETED" (or) "NOT COMPLETED"** as given in

12.1. The student should pass all the mandatory courses, for the award of B.Tech degree.

For the Mandatory Courses, if the student obtained 40% or more marks, then his performance shall be indicated as COMPLETED, otherwise the performance shall be indicated as NOT COMPLETED in the grade sheet.

14. GRADING PROCEDURE

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	A+ (Outstanding)	10
80 and less than 90%	A (Excellent)	9
70 and less than 80%	B (Very Good)	8
60 and less than 70%	C (Good)	7
50 and less than 60%	D (Fair)	6
40 and less than 50%	E (Pass)	5
Absent	AB	0
For Mandatory & Audit Courses		
Greater than or equal to 40%	Completed	-
Below 40%	Not Completed	-

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practical's, Skill oriented Course / Skill Advanced course / Soft Skill course, Summer Internships, Project Work and Full Semester Summer Internship in Industry (6 Months). Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 11 above, a corresponding letter grade shall be given.As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks for theory & practical shall be followed as mentioned in the table.

A student who has 'failed' in any subject is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

To a student who has not appeared for an examination in any subject, 'AB' grade will be allocated in that subject, and he is deemed to have 'failed'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = grade point (GP) x credits …. For a course

A student passes the subject/ course only when GP □5 ('E' grade or above)

- A student to obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.
- For Mandatory courses "Completed" or "Not Completed shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

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

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

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma\ (C_{ui} \times S_i)/\ \Sigma\ C_{ui}$$

Where, "S_i" is the SGPA of the i^{th} semester and C_{ui} is the total number of credits in that semester.

iii. Both SGPA and CGPA shall be rounded off to two decimal points and reported in the transcripts.

iv. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D and E.

Example: Computation of SGPA and CGPA Illustration for SGPA

Course	Credit (C_i)	Grade Letter	Grade Point(G_i)	Credit Point (C_ixG_i)
Course-I	3	A+	10	3x10=30
Course-II	3	A	9	3x9=27
Course-III	3	B	8	3x8=24
Course-IV	3	D	6	3x6=18
Course-V	2	B	8	2x8=16
Course-VI	1	C	7	1x7=7
	15			122

Thus SGPA = $\frac{122}{15}$ **=8.13**

Illustration for CGPA

I Semester	II Semester	III Semester	IV Semester
Credit: 19 SGPA: 8.13	Credit: 19.5 SGPA: 6.9	Credit: 21.5 SGPA: 7.3	Credit: 21.5 SGPA: 6.8
V Semester	**VISemester**	**VII Semester**	**VIII Semester**
Credit: 22 SGPA: 8.2	Credit: 21.5 SGPA: 7.4	Credit: 21 SGPA: 7.2	Credit: 14 SGPA: 7.8

Thus, CGPA = $\frac{(19\times8.13)+(19.5\times6.9)+(21.5\times7.3)+(21.5\times6.8)+(22\times8.2)+(21.5\times7.4)+(21\times7.2)+(14.\times7.8)}{160}$ **=7.45**

15. AWARD OF CLASS

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

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

A student with final CGPA is < 4.00 will not be eligible for the Award of the Degree.

16. CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

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

Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by CoE and senior subject expert before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.

The answer papers of semester end examination should be evaluated by the examiner immediately after the completion of exam and the award sheet should be submitted to CoE in a sealed cover.

CoE shall invite required number of external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

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

17. SUPPLEMENTARY EXAMINATIONS

part from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such

students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

18. ATTENDANCE REQUIREMENTS AND DETENTION POLICY

A candidate shall put in a minimum required attendance of 75 % in that semester. Otherwise, The student shall be declared detained and has to repeat semester. For cases of medical issues, deficiency of attendance in a semester to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% and 65% in a semester, subjected to submission of medical certificates and other needful documents to the concerned departments. The condonation is permitted maximum of two times during the entire course of study.

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

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

19. PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned for promotion to higher classes

a) A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per University norm.

b) A student will be promoted from II 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.

c) 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.

A student shall register and put-up minimum attendance in all 160 credits and earns all 160 credits. Marks obtained in all160 credits shall be considered for the calculation of aggregate percentage of marks obtained. In the course structure within eight academic years from the year of their admission. Coure and their admission shall stand cancelled

A lateral entry student shall register and put-up minimum attendance in all 121credits and earn all the 121credits. Marks obtained in all 121credits shall be considered for the calculation of aggregate percentage of marks obtained. If the student did not complete the

course within six academic years from the year of admission, their seat shall surrender in B.Tech. Course and their admission shall stands cancelled.

20. MAJOR DEGREE WITH A MINOR:

1. 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; student will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.

   Student can opt the Industry relevant tracks of any branch to obtain the Major degree with Minor, for example, a B.Tech Mechanical Engineering student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.
2. A student shall be permitted to register for Minors program at the beginning of 4th semester provided that the student must have acquired 7.5 SGPA (Semester Grade point average) upto the end of 2nd semester without any history of backlogs. It is expected that the 3rdsemester results may be announced after the commencement of the 4thsemester, if a student fails to acquire 7.5 SGPA upto 3rdsemester or failed in any course, his registration for Minors program shall stand cancelled. An SGPA of 7.5 has to be maintained in the subsequent semesters without any backlog in order to keep the Minor registration active.
3. Minor degree will cumulatively require additional **20** credits in the specified area in addition to the credits essential for obtaining the under graduate degree in Major discipline (i.e., 160 credits).
4. 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 CSE, CSE(AI), CSE(DS), ECE, EEE,CE,ME etc. or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science(DS), Robotics, Electric vehicles, VLSI etc. The list of disciplines/ branches eligible to opt for an industry relevant minor specialisation shall be clearly mentioned in the respective BOS.
5. Student must complete 4 courses each of 4 credits by choosing from six courses mentioned in the course structure of the department.
6. In addition to acquiring 16 credits from courses, students shall have to pursue at least 2 courses for two credits each through MOOCS/NPTEL. The concerned BOS shall list the MOOCS/NPTEL courses to be pursued by the student. Attendance will not be monitored for this MOOCS course. A student has to acquire a certificate of MOOCS/NPTEL course from the agencies approved by the BOS in order to earn the required credits, and that should be evaluated by Department committee for the credits.
7. Student can opt the Industry relevant minor specializations as approved by the concerned departmental BoS or student can opt the courses from skill development corporation (APSSDC) or student 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 skill based on industrial demand.

8. 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.
9. If a student prefers to take test from an external agency, student must take a comprehensive viva-voce conducted at University level and the marks assigned for the Viva-voce will be assigned to that course. However, if students wish to take the courses from the department, student should take examination conducted by the University only. Also, if a student completes courses from external agency without taking test are also eligible to get minor degree after fulfilling all the formalities assigned by the departmental committee.
10. It is the responsibility of the student to acquire prerequisite knowledge of the minor program domain before taking the course. The University/Institution BoS concerned shall prepare the list of subjects and pre requisites for each minor track.
11. 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 "Pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.
12. In case a student fails to meet the CGPA requirement for B.Tech Degree with Minor at any point after registration, student 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.

21. HONORS PROGRAM:

1. Students from same department are eligible for Honour program.
2. A student shall be permitted to register for Honours program at the beginning of 4th semester provided that the student must have acquired 7.5 SGPA upto the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester, if a student fails to acquire 7.5 SGPA upto 3rdsemester or failed in any course, his/her registration for Honours program shall stand cancelled.
3. Students can select advanced subjects from their respective branch in which they are pursuing the degree. E.g. If Mechanical Engineering student completes the selected advanced subjects from the same branch under this scheme, student will be awarded B.Tech (Honours) in Mechanical Engineering.

4. Student must complete 4 courses @ 4 credits from each pool and 2 MOOC/NPTEL courses @ 2 credits (Total 20 credits)
5. The student who has registered for Honours shall choose one course from each pool. There shall be 4 pools with 5 courses each as mentioned in course structure of Honours program. The board of studies concerned will decide the courses under each pool for Honours programs.
6. For Honours program, all the courses offered in each pool shall be domain specific courses and advanced courses.
7. In addition to the 4 courses chosen, one from each pool, students shall have to pursue at least 2 courses through MOOCS/NPTEL. The concerned BoS shall list the MOOCS/NPTEL courses to be pursued by the student. Attendance will not be monitored for this MOOCS course. Student has to acquire a certificate of MOOCS/NPTEL course from the agencies approved by the BoS in order to earn 2 credits. BoS concerned shall prepare the list of advanced courses for each pool taking into consideration the core courses offered in the curriculum. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall provide pre requisites to take the specific course by the student. It is the responsibility of the student to acquire/complete prerequisite before taking the course.
8. If a student drops (or terminated) from the Honours 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 "Pass" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Honours will be shown in the transcript. None of the courses done under the dropped Honours will be shown in the transcript.
9. In case a student fails to meet the CGPA requirement for Degree with Honours at any point after registration, student will be dropped from the list of students eligible for Degree with Honours and they will receive B.Tech Degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

22. GRADUATION REQUIREMENTS

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

- Student shall register and acquire minimum attendance in all courses and secure 160 credits for regular program and 121 credits for lateral entry program.
- A student of a regular program, who fails to earn 160 credits within eight consecutive academic years from the year of their admission with a minimum CGPA of 4.0, is not eligible to get degree.
- A student of a lateral entry program, who fails to earn 121 credits within six consecutive academic years from the year of their admission with a minimum CGPA of 4.0, shall not get their degree and the admission stands cancelled.

23. REVALUATION

A student, who seeks the re-evaluation of the answer script, is directed to apply for the photocopy of their semester examination answer paper(s) in the theory course(s), within 5 working days from the declaration of results in the prescribed format with prescribed fee to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. If COE found the difference between the evaluation and reevaluation is more than 10 marks, then the COE shall arrange another evaluation. Revaluation is not permitted to the courses other than theory courses.

24. TERMINATION FROM THE PROGRAMME

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

- The student fails to satisfy the requirements of the program within the stipulated maximum period for that program.
- A student shall not be permitted to study any semester more than three times during the entire Program of study.
- The student fails to satisfy the norms of discipline specified by the institute from time to time.

25. WITH-HOLDING OF RESULTS

If the candidate has any dues not paid to the institute or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and student will not be allowed/ promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

26. TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the program after the break from the commencement of the respective semester as and when it is offered , she/he shall apply to the Principal in advance. Such application shall be submitted before the of the semester in question commencement and forwarded through the Head documents and endorsement of his / her parent / guardian.

a) The institute shall examine such type of applications, and if it finds the case to be genuine, it may permit the student to rejoin. Such permissions are accorded only to those who do not have any outstanding dues like tuition fee etc.

b) The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period of 8 years for regular and 6 years for lateral entry students. The maximum period includes the break period.

27. STUDENT TRANSFERS

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh, University and Institute from time to time.

28. GRADUATION DAY

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

29. CONDUCT AND DISCIPLINE

- Students shall have a good conduct within and outside the premises of the Institute in a decent and dignified manner befitting the students of Srinivasa Institute of Engineering & Technology.
- As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with the following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum, indecent behavior anywhere within or outside the college campus.

(ii) Damage of college property or Possession, consumption and distribution of Alcoholic drinks or any kind of narcotics to fellow students / citizens.

- Mutilation or unauthorized possession of library books.
- Noisy and unruly behavior, disturbing studies of fellow students.
- Hacking in 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 cyber crime etc.
- Usage of camera /cell phones in the campus.
- Plagiarism of any nature.
- Any other act of gross indiscipline as decided by the college academic council from time to time.
- Commensurate with the severity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarring from 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) the hostel (ii) department or in a class room and (iii) Else where, the chief Warden, the concern 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 corrective action.
- All cases of serious offence, possibly requiring punishment other than reprimand, shall

be reported to the Academic council of the college.

- The Institute Level Standing Disciplinary Action Committee constituted by the academic council 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.
- The Principal shall deal with any problem, which is not covered under these rules and regulations.

30. GRIEVANCE REDRESSAL COMMITTEE

Grievance and Redressal Committee constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. All the students must abide by the code and conduct rules prescribed by the college from time to time.

31. TRANSITORY REGULATIONS

Required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semesters she/he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

c) Four Year B.Tech Regular course:

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

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

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

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

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

e) Transfer candidates (from non-autonomous college affiliated to JNTUK):

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

f) Transfer candidates (from an autonomous college affiliated to JNTUK):

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

32. REVISION OF REGULATIONS AND CURRICULUM

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

33. B.TECH - PROGRAM OUTCOMES (POS)

PO-1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering Knowledge**).

PO-2 : Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences **(Problem Analysis).**

PO-3 : Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations **(Design/Development of Solutions).**

PO-4 : Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions **(Conduct Investigations of Complex Problems).**

PO-5 : Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations **(Modern Tool Usage).**

PO-6 : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice **(The Engineer and Society).**

PO-7 : Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development **(Environment and Sustainability).**

PO-8 : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice **(Ethics).**

PO-9 : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

PO-10 : Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions **(Communication).**

PO-11 : Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12 : Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change **(Life-long learning).**

35. MALPRACTICES RULES

DISCIPLINARY ACTION FOR MISCONDUCT IN DURING EXAMINATIONS

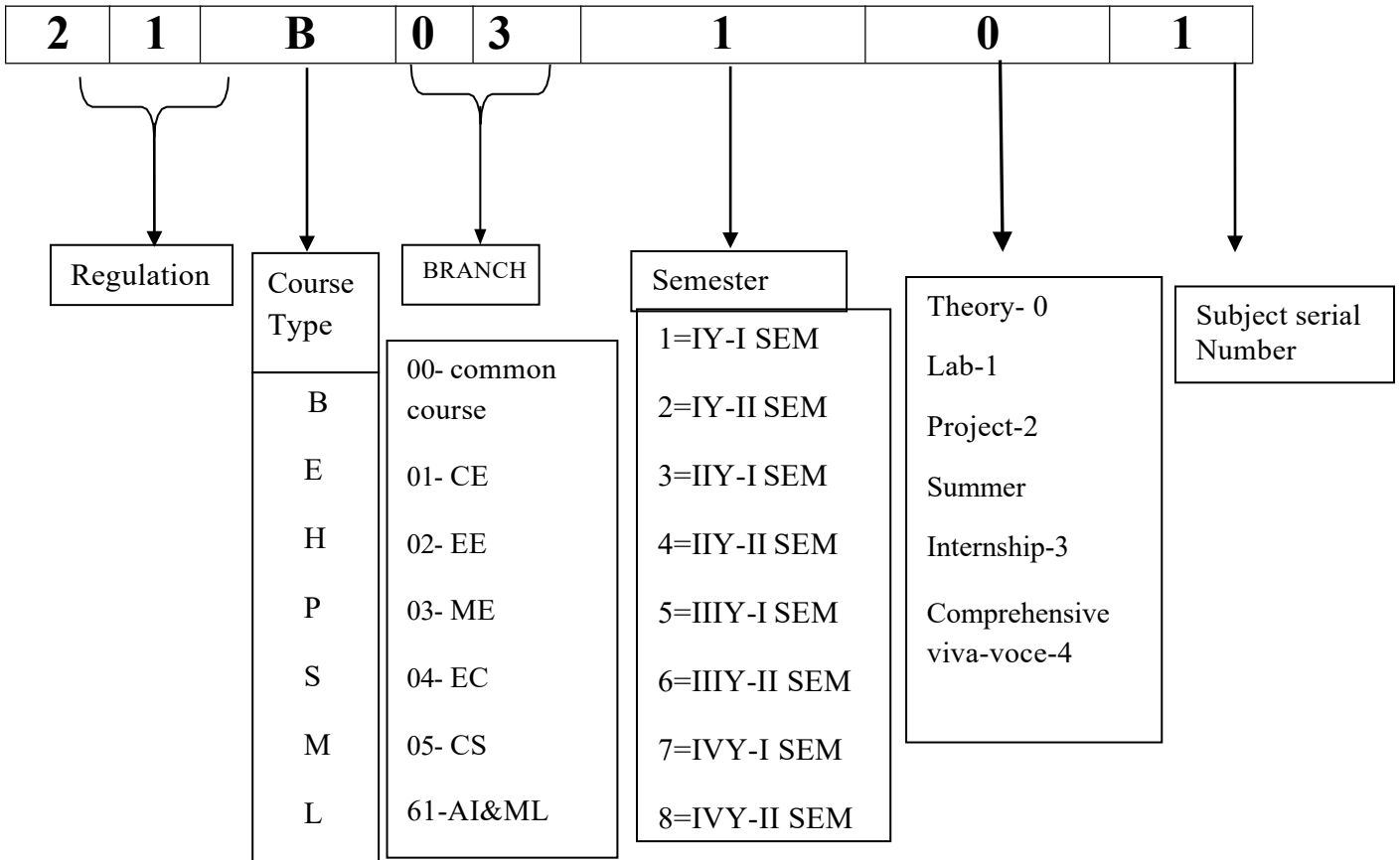
S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.

6.	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage toordestruction of property in the examination hall or any part of the Institute premises or engages in any other act which in the opinion of the officer on duty Amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	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 give up their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears 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 semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and gives up the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and gives up the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Director/Principal for further action toawards suitable punishment.	

COURSE CODING STRACTURE



B	BASIC SCIENCES
E	ENGNEERING SCIENCES
H	HUMANITIES & SOCIAL SCIENCES
P	PROFFESSIONAL CORE
S	SKILL ORIENTED COURSE
M	MANDATARY COURSE
L	PROFESSIONAL ELECTIVE
N	OPEN ELECTIVE
U	HONOUR
R	MINOR

COURSE STRUCTURE

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
COURSE STRUCTURE –
B.Tech 2021-2022

I Year B.Tech I Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21B00101	Mathematics-I	4	1	0	30	70	100	3
2	21B00104	Applied Physics	3	0	0	30	70	100	3
3	21H00102	Managerial Economics for Engineers	3	0	0	30	70	100	3
4	21E05101	Programming in C	3	1	0	30	70	100	3
5	21E03101	Engineering Drawing	1	0	3	30	70	100	3
6	21B00114	Applied Physics Laboratory	0	0	3	15	35	50	1.5
7	21E05111	Programming in C Laboratory	0	0	3	15	35	50	1.5
8	21E03111	Basic Engineering Workshop	1	0	3	15	35	50	1.5
		Total	**15**	**2**	**12**	**195**	**455**	**650**	**19.5**

I Year B.Tech II Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21H00201	Communicative English	3	0	0	30	70	100	3
2	21B00201	Mathematics- II	4	1	0	30	70	100	3
3	21B00203	Applied Chemistry	3	0	0	30	70	100	3
4	21E03203	Basic Civil and Mechanical Engineering	3	0	0	30	70	100	3
5	21E02202	Electrical Circuit Analysis -I	3	1	0	30	70	100	3
6	21H00211	Communicative English Laboratory	0	0	3	15	35	50	1.5
7	21B00213	Applied Chemistry Laboratory	0	0	3	15	35	50	1.5
8	21E03213	Basic Civil and Mechanical Engineering Lab	0	0	3	15	35	50	1.5
9	21M00201	Environmental Science	2	0	0	50	-	50	-
		Total	**18**	**2**	**09**	**245**	**455**	**700**	**19.5**

II Year B.Tech I Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21B00301	Mathematics-III	4	1	0	30	70	100	3
2	21P02301	Electrical Circuit Analysis -II	3	1	0	30	70	100	3
3	21P02302	Electrical Machines - I	3	1	0	30	70	100	3
4	21P02303	Electro Magnetic Fields	3	1	0	30	70	100	3
5	21P02304	Electronic Devices and Circuits	3	0	0	30	70	100	3
6	21P02311	Electrical Circuits Laboratory	0	0	3	15	35	50	1.5
7	21P02312	Electrical Machines - I Laboratory	0	0	3	15	35	50	1.5
8	21P02313	Electronic Devices and Circuits Laboratory	0	0	3	15	35	50	1.5
9	21S02301	Design of Electrical Circuits using Engineering Software Tools	1	-	2	30	70	100	2
10	21M00301	Basics of Indian Constitution	2	-	-	-	-	-	-
		Total	**19**	**4**	**11**	**225**	**525**	**750**	**21.5**

II Year B.Tech II Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21B00401	Mathematics- IV	4	1	0	30	70	100	3
2	21P02401	Electrical Machines - II	3	1	0	30	70	100	3
3	21P02402	Electrical Power Generation, Transmission And Economic Aspects	3	1	0	30	70	100	3
4	21P02403	Control Systems	3	1	0	30	70	100	3
5	21P02404	Digital Electronics	3	0	0	30	70	100	3
6	21P02411	Electrical Machines - II Laboratory	0	0	3	15	35	50	1.5
7	21P02412	Control Systems Laboratory	0	0	3	15	35	50	1.5
8	21P02413	Digital Electronics Laboratory	0	0	3	15	35	50	1.5
9	21S02411	Electrical Workshop Laboratory	1	0	2	30	70	100	2
		Total	**17**	**4**	**11**	**225**	**525**	**750**	**21.5**

***Community Service Project, to be evaluated in III B.Tech I-Semester**

III Year B.Tech I Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P02501	Power System Analysis	3	1	0	30	70	100	3
2	21P02502	Power Electronics	3	1	0	30	70	100	3
3	21E02501	Cyber Security in Engineering	3	0	0	30	70	100	3
4	**Professional Elective-I**		3	1	0	30	70	100	3
	21L02501	1.Electrical Measurements & Instrumentation							
	21L02502	2.Advanced Control Systems							
	21L02503	3. Energy Auditing and Demand Side Management							
5	21N02501	Open Elective- I	3	0	0	30	70	100	3
6	21P02511	Power Electronics Laboratory	0	0	3	15	35	50	1.5
7	21P02512	Electrical Measurements & Instrumentation Laboratory	0	0	3	15	35	50	1.5
8	21S00511	Employability Skills - I	1	0	2	30	70	100	2
9	21P02531	Community Service Project	0	0	0	100	-	100	4
10	21M00501	Professional Ethics &Human Values	3	0	0	-	-	-	0
		Total	**19**	**3**	**8**	**310**	**490**	**800**	**24**

III Year B.Tech II Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P02601	Switch Gear and Protection	3	1	0	30	70	100	3
2	21P02602	Power System Operation & Control	3	1	0	30	70	100	3
3	21P02603	Micro Processors and Micro Controllers	3	1	0	30	70	100	3
4	**Professional Elective –II**		3	1	0	30	70	100	3
	21L02601	1.Smart Grid Technologies							
	21L02602	2.VLSI Design							
	21L02603	3. Hybrid Electric Vehicles							
5	21N02601	Open Elective- II	3	0	0	30	70	100	3
6	21P02611	Electrical Simulation Laboratory	0	0	3	15	35	50	1.5
7	21P02612	Power Systems & Simulation Laboratory	0	0	3	15	35	50	1.5
8	21P02613	Microprocessors & Microcontrollers Laboratory	0	0	3	15	35	50	1.5
9	21S02611	Employability Skills - II	1	0	2	30	70	100	2
10	21M00601	Intellectual Property Rights & Patents	3	0	0	-	-	-	0
		Total	**19**	**4**	**11**	**225**	**525**	**750**	**21.5**

***Internship 2 Months During Summer Vaccation to be Evaluated in IV B.Tech I- Semester**

IV Year B.Tech I Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	**Professional Elective –III**		3	1	0	30	70	100	3
	21L02701	1. Renewable Energy Systems							
	21L02702	2. Electrical Distribution Systems							
	21L02703	3. High Voltage Engineering							
2	**Professional Elective- IV**		3	1	0	30	70	100	3
	21L02704	1. Utilization of Electrical Energy							
	21L02705	2. Power Quality							
	21L02706	3.ANN and Fuzzy - Logic							
3	**Professional Elective –V**		3	1	0	30	70	100	3
	21L02707	1.Flexible Alternating Current Transmission Systems							
	21L02708	2.Special Electrical Machines							
	21L02709	3.Electric Drives							
4	21N02701	Open Elective- III	3	0	0	30	70	100	3
5	21N02702	Open Elective- IV	3	0	0	30	70	100	3
6	**Humanities and Social Science Elective**		3	0	0	30	70	100	3
	21H03701	1.Sociology&Elements of Indian History for Engineers							
	21H03702	2.Law for Engineers							
	21H03703	3.Business Communication and Presentation Skills							
7	21P02721	Summer Internship	0	0	3	100	-	100	1.5
8	21S02711	Python Programming Laboratory	1	0	2	30	70	100	2
		Total	**16**	**3**	**8**	**410**	**490**	**900**	**21.5**

IV Year B.Tech II Semester Course Structure- EEE-SR21

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P02831	Seminar	0	0	0	100	-	100	1
2	21P02821	Project Work	0	0	18	40	160	200	10
		Total	**0**	**0**	**18**	**140**	**160**	**300**	**11**

OPEN ELECTIVE - I

S.No	Open Elective Course Title
1	IC applications
2	Basic of Civil Engineering
3	Operating systems
4	Introduction to Additive Manufacturing

OPEN ELECTIVE - II

S.No	Open Elective Course Title
1	Principles of communication
2	Air Pollution and Control
3	Machine learning
4	Nano Technology

OPEN ELECTIVE - III

S.no	Open elective course title
1	Electronic measurements and instrumentation
2	Green buildings
3	Introduction to internet of things
4	Fundamentals of robotics

OPEN ELECTIVE - IV

S.No	Open Elective Course Title
1	Fundamentals of Automobile Engineering
2	Sustainability concepts in Civil Engineering
3	Data Science
4	Engineering Materials

Minor Degree Program Courses

Students are advised to select any 5 courses in the specific stream for minor degree.

LIST OF MINOR COURSES OFFERD BY ELECTRONICS AND COMMUNICATION ENGINEERING DEPARTMENT

Fundamentals of signals and systems
Embedded systems and applications
Fundamentals of communication systems
Principles of electronic instrumentation
Fundamentals of digital signal processing
Digital system design

LIST OF MINOR COURSES OFFERD BY CIVIL ENGINEERING DEPARTMENT

Surveying & geomatics
Construction technology
Fundamentals of transportation Engineering
Basic soil mechanics
Environmental engineering and management
Smart Cities

LIST OF MINOR COURSES OFFERD BY MECHANICAL ENGINEERING DEPARTMENT

Fundamentals of Manufacturing Processes
Fundamentals of Automobile Engineering
Non-Conventional Energy Resources
Introduction to Additive Manufacturing
Engineering Materials
Prodcut Lifecycle Management

LIST OF MINOR COURSES OFFERD BY COMPUTER SCIENCE AND ENGINEERING DEPARTMENT

Cloud Computing
Mobile Computing
Software Engineering
Data Base Management Systems
Fundamentals of Artificial Intelligence and Machine Learning
Cybersecurity Forensics

I-B.TECH.-I-SEMESTER SYLLABUS

MATHEMATICS – I
(Linear Algebra and Calculus)

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21B00101 **4 1 0 3**
Pre Requisite: Nil

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

1. develop the use of matrix algebra techniques that is needed by engineers for solving system of linearequations in practical applications
2. verify Cayley – Hamilton theorem and reduce quadratic forms to canonical form by orthogonal transformation
3. test the convergence of an infinite series and verify mean value theorems for a continuous function
4. apply the techniques of multi variable differential calculus to determine extrema and series expansions
5. apply double integration techniques in evaluating areas bounded by region and triple integration techniques in evaluating volumes of solids

Unit-I: Solving systems of linear equations, Eigen values and Eigen vectors 12 hours

Rank of a matrix by echelon form and normal form–Solving system of homogeneous and non-homogeneous linear equations –Gauss Elimination method –Eigen values and Eigen vectors and problems on properties (without proofs) of Eigen values

Unit-II: Cayley–Hamilton theorem and Quadratic Forms 12 hours

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem–Reduction to Diagonal form – Quadratic forms-rank,index,signature and nature of the quadratic forms– Reduction of quadratic form to canonical forms by orthogonal transformation.

Unit-III: Sequences,Series and Mean ValueTheorems 12 hours

Sequences and Series : Convergence and divergence–Ratio test–Comparison test–Integral test – Cauchy's root test – Alternate series– Leibnitz's rule. Mean Value Theorems(without proofs): Rolle's Theorem – Lagrange's mean value theorem– Cauchy's mean valuetheorem– Taylor's and Maclaurin's theorems with remainders, Problems and applications on the above theorems.

Unit-IV:Partial Differentiation 10 hours

Introduction – Homogeneous function – Euler's theorem– Total derivative– Chain rule– Jacobian –Functional dependence –Taylor's and MacLaurin's series expansion of functions of two variables.Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method of undetermined multiplier.

Unit-V: Multiple Integrals 10 hours

Double and Triple integrals–Change of order of integration in double integrals–Change of variables to polar,cylindrical and spherical coordinates.Applications: Finding Area and Volume

Textbooks:

1. **B.S.Grewal,**Higher Engineering Mathematics,44thEdition,Khanna Publishers.
2. **R. K. Jain and S. R. K. Iyengar** Advanced Engineering Mathematics,FifthEdition Narosa Publishing House

References:

1. **Erwin Kreyszig,** Advanced Engineering Mathematics,10th Edition,Wiley&Sons,2011
2. **V.Ravindranath and P.Vijayalaxmi**, Mathematical Methods,Himalaya Publishing House.
3. **Lawrence Turyn,**Advanced Engineering Mathematics,CRC Press.
4. **N.P.Bali&Manish Goyal**,Engineering Mathematics,Lakshmi Publications.

APPLIED PHYSICS

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21B00104 **3 0 0 3**
Pre Requisite: Nil

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

1. apply concepts of Interference and diffraction and Polarization
2. devise laser mechanism and fiber optics for the communications systems.
3. calculate free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles
4. illustrate band formation, electrical conductivities in semiconductors and their dependence on temperature and frequency response.
5. identify the type of semiconductor using Hall effect& Classify superconductors based on Meissner's effect

Unit-I: Wave Optics **11 hours**

Interference :Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index

Diffraction: Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating (Qualitative)

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plate.

Unit-II: Lasers and Fiber Optics **8hours**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers

Fiber optics: Introduction –Principle of optical fiber- Acceptance Angle - Numerical Aperture - Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Applications.

Unit-III: Quantum Mechanics, Free Electron Theory and Band Theory **8 hours**

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.

Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids–concept of hole.

Unit-IV:Dielectric and Magnetic Materials **8 hours**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro&Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Engineering applications

Unit-V: Semiconductors and Superconductors 9hours

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.

Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High Tc superconductors – Applications of superconductors

Textbooks:

1. M. N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Applied Physics by P.K.Palanisamy SciTech publications

References:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Engineering Physics" by D.K.Bhattacharya and PoonamTandon, Oxford press (2015).
4..Ch. Srinivas, Ch. Seshubabu, Engineering Physics, Cengage learning publications

MANAGERIAL ECONOMICS FOR ENGINEERS

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21H00102 **3 0 0 3**
Pre Requisite: Nil

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

1.apply Managerial Economic concepts for decision making
2.perform cost analysis in Production
3. apply management theories in Markets & Firms
4. industrial & business organizations & its financial management
5. illustrate the concepts of capital & capital budgeting in decision Making

Unit-I: Introduction to Managerial Economics and Demand Analysis 10hours
Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting,Concept of Supply and Law of Supply.

Unit-II: Theory of Production and Cost Analysis 8 hours

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

Unit-III: Introduction to Markets, Managerial Theories of the Firm &Pricing Policies 8 hours
Market structures: Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Price-Output Determination under Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly Managerial theories of the firm - Marris and Williamson's models. Pricing Policies: Methods of Pricing-Marginal Cost Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Bundling Pricing, and Peak Load Pricing. 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.

Unit-IV: Types of Industrial Organization & Introduction to Business Cycles 10 hours
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.
FINANCIAL MANAGEMENT: Functions of financial management, simple and compound interest, Methods of evaluating alternatives.
Depreciation: common methods of depreciation

Unit-V: Capital and Capital Budgeting 10hours
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)

Textbooks:

1. Managerial Economics and Financial Analysis, by J.V.PrabhakarRao, Maruthi Publications,2011
2. Managerial Economics and Financial Analysis,by N.AppaRao. & P.VijayaKumar, Cengage Publications, New Delhi,2011

References:

1. Managerial Economics and Financial Analysis, by A R Aryasri, TMH2011
2. Managerial Economics by Suma damodaran, Oxford2011
3. MangerialEconomiceandFinancialAnalysisbyS.A.Siddiqui&A.S.Siddiqui,NewAge International Publishers, 2011.

PROGRAMMING IN C

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E05101 **3 1 0 3**
Pre Requisite: Nil

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

1.write algorithms and to draw flowcharts for solving problems.
2.use different operators, data types and write programs that use two-way/ multi way selection.
3.select the best loop construct for a given problem.
4.make use of Arrays in solving complex problems.
5.solve problems using concept of structures, unions and File I/O operations.

Unit-I: **10 hours**

Introduction to Computers: Computer Systems, Computer software and hardware, Computing Environments, Computer Languages.
Introduction to the C Language: Algorithm and Flow chart, Structure of C Program, Creating and running programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions.

Unit-II: **10hours**

Control Structures: Selection Statements (making decisions) – Two Way Selection (if-else), Multi way Selection (nested if and switch) statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, Jump statements related to looping – break, continue, go to. Simple C Program examples.

Unit-III: **10 hours**
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Example Programs
Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String, Example Programs.

Unit-IV: **10 hours**
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter Function Communication, Standard Functions, Storage Classes, Scope and lifetime, Passing Array to Functions, Command Line Arguments and Recursion.
Pointers: Concept of pointer, declaring and initializing pointer variables, pointer expressions and address arithmetic, null pointers, generic pointers, pointers as function arguments, pointers and arrays, pointer and strings, pointer to pointer, dynamic memory allocation, dangling pointer.

Unit-V:10hours

Structures &Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Example Programs.
Data Files: Introduction to Files, Using files In C, Reading from Text Files, Writing to Text files, Random Access File.
Textbooks:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2. Programming in C, ReemaThareja, and OXFORD University press.

References:

1. Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill.
2. Programming in C, Ashok N. Kamthane, AmitKamthane, and Pearson.
3. C Programming – Balaguruswamy, McGraw Hill

ENGINEERING DRAWING

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E03101 **1 0 3 3**
Pre Requisite: Nil

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

1.construct polygons, conics, cycloids and involutes
2.draw the projections of points and lines
3.draw the projections of planes and solids
4.draw the projections of sections ofsolids and development of surfaces
5.draw the isometric projections and conversion from pictorial views in to Orthographic views and Vice-versa

Unit-I: Construction of Polygons & Engineering Curves **10 hours**
General: Principles of Engineering Graphics and their significance, usage of drawing instruments, lettering.
Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.
Curves: Parabola, Ellipse and Hyperbola by general methods only. Cycloids, involutes, tangents &normals for the curves.
Unit-II:Orthographic Projections of Points&Lines **10 hours**
Orthographic Projections: Reference plane,importance of reference lines,projections of points in various quadrants,
Projections of lines: line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both theplanes, determination of true lengths, angle of inclination and traces.
Unit-III: Projections of Planes & Solids **10 hours**
Projections of planes:regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane;inclined to both the reference planes.
Projections of Solids–Prisms, Pyramids, Cones and Cylinders with the axis inclined to boththe reference planes.
Unit-IV: Sections Of Solids & Its Surface Developments **10 hours**
Section of Solids: Sections of Prisms, Pyramids, cylinders and Cones.True shapes of sections.(Limited to the cutting plane perpendicular to one of the principal plane).
Development of surfaces: Development of surfaces of Right Regular Solids Prism, Pyramid,Cylinder and Cone.
Unit-V: Isometric Views & Conversions **10hours**
Principles of Isometric projection- Isometric Scale, Isometric Views, Conventions; IsometricViews of lines, Planes, Simple and compound Solids.
Orthographic Projections: Conversion of pictorial views in to Orthographic views and Vice-Versa.(Treatment is limited to simple MODELS).
Textbooks:

1. Engineering Drawing by BhattN.D.Charotar Publishing HousePvtLtd; FIFTY THIRD EDITION 2014); Charotar Publishing House PvtLtd.
2. Engineering Drawing by KLNarayana, P.Kannaiah, 3rdEdition,ScitechPublications

References:

1.Dhanajay A Jolhe, Engineering Drawing, Tata McGraw-Hill,2009.
2.Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009.
3.K. Venugopal, Engineering Drawing and Graphics, 6/e, New Age Publishers, 2011.
4.K.C. John, Engineering Graphics, 2/e, PHI, 2013.

APPLIED PHYSICS LABORATORY

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code : 21B00114	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. acquire knowledge on the optical Experiments like Newton rings, wedge method etc
2. Determine p photoelectric effect, Hall effect experiments etc
3. determine resistance of semiconductor, resistivity on semiconductors

List of Experiments

(Any 10 of the following listed experiments)

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method &Meissner effect.

PROGRAMMING IN C LAB
(Common to CSE, AI& ML, ECE, EEE, CE, ME)

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code : 21E05111	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1.illustrate various concepts of C language and generate programs
2.draw flowcharts and write algorithms.
3.design and develop solving skills through C.

List of Experiments

Exercise - 1 Basics I
a) Write a simple program using printf ( ), scanf ( )
b) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers

Exercise - 2 Basics II
a) Write a C Program to Simulate 3 Laws at Motion (v=u+at,s=ut+1/2at 2 , v2-u 2=2as)
b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I
a) Write a C Program to Find Whether the Given Year is a Leap Year or not.
b) Write a C Program to Add Digits & Multiplication of a number

Exercise - 4 Control Flow - II
a) i) Write a C Program to Find Whether the Given Number is Prime Number or Not
ii) Write a C Program to Find Whether the Given Number is Armstrong Number or not
b) Write a C program to print Floyd Triangle

Exercise - 5 Control Flow - III
a) Write a C Program to print Pascal Triangle
b) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch-case statement.

Exercise – 6 Arrays
a) Write a program in C for multiplication of two square Matrices.
b) Write a program in C to find transpose of a given matrix.

Exercise – 7 Functions
a) Write a C Program demonstrating of parameter passing in Functions and returning values.
b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 8 Functions
a) Write a program in C to add numbers using call by reference.
b) Write a program in C to swap elements using call by reference

Exercise – 9 Arrays and Pointers
a) Write a C Program to Access Elements of an Array Using Pointer
b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 10Strings

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

Exercise – 11 Structures

a) Write a C program to find sum of n elements entered by user. To perform this program, Allocate memory dynamically using malloc () function
b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function

Exercise -12 Files

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

BASIC ENGINEERING WORKSHOP

(For EEE & ME)

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code : 21E03111	**1**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. prepare required models using various engineering trades
2. apply safety norms while handling the workshop equipment
3. install and make use of operating systems and MS office tools, configure fire walls and trouble shoot network connections

List of Experiments

1. Carpentry
   a. T-LapJoint
   b. Cross LapJoint
   c. DovetailJoint
   d. Mortise and TenonJoint
2. Fitting
   a. Vee Fit
   b. SquareFit
   c. Half RoundFit
   d. DovetailFit
3. BlackSmithy
   a. Round rod toSquare
   b. S-Hook
   c. Round Rod to FlatRing
   d. Round Rod to Square headedbolt
4. HouseWiring
   a. Parallel / Series Connection of threebulbs
   b. Stair Casewiring
   c. Florescent LampFitting
   d. Measurement of EarthResistance
5. Tin Smithy
   a. TaperTray
   b. Square Box withoutlid
   c. OpenScoop
   d. Funnel
6. IT Workshop.
   1. Assembly& Disassembly of Computer
   2 .OS& other software installation

I-B.TECH.-II-SEMESTER SYLLABUS

COMMUNICATIVE ENGLISH

	L	T	P	C
I-B.Tech-II-Sem.				
Subject Code : 21H00201	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. identify the context, topic, and pieces of specificinformation.
2. apply the concepts of communication in various channelstointroduceone/other.
3. benchmark with standards to comprehend effective communication.
4. quantify expression by using adjectives, adverbs and antonyms.
5. write technical/academic proposals through appropriate glossary of words.

Unit-I: **10 hours**

Lesson-1: A Drawer full of happiness from "**Infotech English**", Maruthi Publications
Lesson-2: Deliverance by Premchandfrom "**The Individual Society",**Pearson Publications. (Non-detailed)
Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose andconversation.
Speaking: Asking and answering general questions on familiar topics such as home,family, work,studies and interests. Self introductions and introducing others.
Reading: Skimming text to getthemainidea.Scanningtolookforspecificpiecesof information.
Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers,sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20)
GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; **Nouns:**countableanduncountable;singularandpluralbasicsentencestructures;simple question form - wh-questions; word order insentences.

Unit-II: **10 hours**

Sesson-1: Nehru's letter to his daughter Indira on her birthday from "InfoTech English", Maruthi Publications
Lesson-2: Bosom Friend by Hira Bansode from "The Individual Society",Pearson Publications.(Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening toaudio texts, both in speaking and writing.
Speaking: Discussion in pairs / small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings.
Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Reading: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Writing: preparing posters, slides and presentation papers.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications)
Grammar: Use of articles and zero article; prepositions.

Unit-III: **8 hours**

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from "InfoTech English", Maruthi Publications.
Lesson-2: Shakespeare's Sister by Virginia Woolf from "The Individual Society", Pearson Publications.(Non-detailed)
Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is

discussed.**Functional English:** Complaining and Apologizing.

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting **specific contextclues;** strategies to use text clues for comprehension. Critical reading.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing-mail etiquette, Writing CV's.

Vocabulary:Technicalvocabularyfromacrosstechnicalbranches(20words).GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing ofwords

Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Unit-IV: 10 hours

Lesson-1: Liking a Tree, Unbowed: WangariMaathai-biography from "InfoTech English", Maruthi Publications

Lesson-2: Telephone Conversation-Wole Soyinka from "The Individual Society", Pearson Publications.(Non-detailed)

Listening: Making predictions while listening to conversations/ transactional dialogues without video(only audio); listening to audio-visual texts.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting,and Inviting.

Reading: Studying the use of graphic elements in texts to convey information, revealtrends/patterns/relationships, communicative process or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20words) (Antonyms and Synonyms, Word applications) Cloze Encounters.

Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; Degrees of comparison; use of antonyms

Unit-V:10hours

Lesson-1: The Chief Software Architect from "English Encounters", Maruthi Publications

Lesson-2.Still I Rise by Maya Angelou from "The Individual Society", Pearson**Publications**.(Non-detailed)

Lesson-3: G.D.Naidu 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers

Listening: Identifying key terms, understanding concepts and interpreting the concepts both inspeaking and writing.

Speaking: Formal oral presentations on topics from academic contexts - without the use of **PPTslides.** Functional English: Suggesting/Opiniongiving.

Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques.

Writing: Writing academic proposals- writing research articles: format and style.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE **Vocabulary** (20words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.

Grammar: Editing short texts – identifying and correcting common errors in grammar and usage(articles, prepositions, tenses, subject verb agreement)

Textbooks:

1. "**Infotech English**", Maruthi Publications.(Detailed)
2. "**The Individual Society",** PearsonPublications.(Non-detailed)

References:

1. **TextBook English Encounters"**, MaruthiPublications
2. **TextBook** : 'Trail Blazers' by Orient Black Swan Pvt. Ltd.Publishers
3. Bailey, Stephen. *Academic writing: A handbook for international student*. Routledge, 2014.
4. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT;2nd Edition,2018.

MATHEMATICS–II

(Differential Equations and Numerical Methods)

(Common to All Branches)

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00201 **4 1 0 3**
Pre Requisite: Nil

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

1. solve the differential equations related to various engineering fields
2. apply the concept of differential equations in L-C-R circuits and L-C circuits
3. evaluate the approximate roots of polynomial and transcendental equations by different algorithms
4. apply Newton's forward & backward interpolation for equal intervals and Lagrange's formulae for unequal intervals
5. apply numerical integral techniques to different Engineering problems and apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations

Unit-I: DifferentialEquationsofFirstOrderAndFirstDegree **12hours**

Linear differential equations– Bernoulli's equations –Exact equations and equations reducible toexact form.Applications: Newton'sLawofcooling –Lawofnaturalgrowthanddecay – Orthogonal trajectories.

Unit-II: Linear Differential Equations of HigherOrder **12hours**

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax}, $\sin ax$, $\cos ax$, polynomials inx, $e^{ax}V(x)$ and x^m $V(x)$ – Method of Variation of parameters. Applications : L-C-R circuits andL-C circuits

Unit-III:IterativeMethods **12 hours**

Introduction– Bisection method– Method of false position– Iteration method – Newton-Raphson method (One variable) for finding solutions of algebraic and transcendental equations– Gauss Jacobi and Gauss- Seidel methods for solving system of equations numerically.

Unit-IV:Interpolation and Numerical Differentiation **12hours**

Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences –Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula – Numerical differentiation using interpolating polynomial.

Unit-V:Numerical Integration and Numerical Solution of ordinary differentialequations withinitial conditions **10hours**

Numerical Integration by Trapezoidal rule– Simpson's 1/3rd and 3/8th rule - Numerical Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method –Modified Euler's method – Runge - Kutta method (fourth order).

Textbooks:

1.B.S.Grewal,HigherEngineeringMathematics,44thEdition,KhannaPublishers.
2.R. K. Jain and S. R. K. Iyengar Advanced Engineering Mathematics, Fifth Edition NarosaPublishingHouse

References:

1.ErwinKreyszig,AdvancedEngineeringMathematics,10thEdition,Wiley&Sons,2011
2.**V.RavindranathandP.Vijayalaxmi**,MathematicalMethods,HimalayaPublishingHouse.
3.B.V.Ramana, HigherEngineeringMathematics,2007Edition,TataMc.GrawHill Education.
4.EngineeringMathematics,**Dr.T.K.V.Iyengar**,S. Chandpublications

APPLIED CHEMISTRY
(For CSE, AI & ML, ECE and EEE)

	L	T	P	C
I-B.Tech-II-Sem.				
Subject Code : 21B00203	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. develop polymer composites, synthetic polymers, plastic materials and their use in design.
2. apply the principles and applications of batteries and fuel cells.
3. identify different types of corrosion and categorize the reasons for corrosion .
4. Synthesize commonly used industrial materials and understand the principles of Green synthesis
5. design models for energy by different natural sources.

Unit-I: Polymer Technology **8hours**

Polymerisation: Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Thermo plastics &Thermosetting plastics, Compounding of plastics,Compounding, fabrication (compression, injection, extrusion and Transfer), preparation, properties and applications (PVC, Bakelite and polycarbonates), recycling of e-plastic waste (waste to wealth).

Elastomers: Natural rubber, Processing of natural rubber,Compounding, Vulcanisation, preparation, properties and applications (Buna-S, thiokol and Poly urethanes).

Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers with examples

Unit-II:Electro chemical Cells and Corrosion **10 hours**

Galvanic cells, Single electrode potential, Concentration cells, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode

Batteries: Dry cell, Li- ion battery, Lead-acid battery

Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, pitting corrosion, galvanic series, factors influencing rate of corrosion,

corrosion control methods: proper designing and cathodic protection, cathodic coatings, anodic coatings, electroplating and electroless plating, Paints (constituents and functions).

Unit-III: Chemistry of Advanced Materials **8 hours**

Nano materials: Introduction – Carbon nanotubes and fullerenes- Sol-gel method, BET and TEM methods Carbon nanotubes and fullerenes: Types, preparation, properties and applications

Green synthesis: Principles, 2 methods of synthesis with examples

Liquid crystals: Introduction-types-applications.

Super conductors: Type –I, Type II, Characteristics and applications

Unit-IV:Non Conventional Energy Sources and Storage Devices **10hours**

Solar Energy: Construction and working of Photovoltaic cell, applications

Non-conventional energy sources:

i) Hydropower - Hydropower plant (schematic diagram)

ii) Geothermal energy: Introduction-schematic diagram of a geothermal power plant

iii) Tidal and wave power: Introduction- Design and working

iv)Ocean thermal energy: Introduction, ocean thermal energy conversion (OTEC), open cycle OTEC, closed-cycle OTEC, hybrid OTEC- schematic diagram and explanation.

v) Biomass and biofuels

Fuel cells: Introduction, Cell representation, Design and working, advantages and limitations.

Types of fuel cells: H2-O2 Fuel cell, CH3OH-O2

Fuel cell, Phosphoric acid fuel cell, moltencarbonate fuel cells.

Unit-V:Material Chemistry & Computational Chemistry8hours

Non-elementalsemiconducting Materials: Stoichiometric, controlled valency& Chalcogen photo/semiconductors, Preparation of Semiconductors
Semiconductor Devices: p-n junction diode as rectifier
Magnetic materials: Ferro and Ferri magnetic materials, Hall Effect and its applications.
Computational chemistry: Introduction, Ab Initio studies

Textbooks:

1.Engineering Chemistry by Jain and Jain; DhanpatRaiPublicatingCo.
2.Applied Chemistry by Dr. BharathiKumariYalamanchili; VGSPublishers

References:

1.Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition(second).
2.Engineering Chemistry by PrasanthRath, Cengage Learning, 2015edition
3. Applied Chemistry by H.D. Gesser, SpringerPublishers
4. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press,IIM

BASICS OF CIVIL & MECHNICAL ENGINEERING
(For EEE)

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E03203 **3 0 0 3**
Pre Requisite: Nil

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

1. apply the concepts of Civil Engineering & Construction Materials
2. make use of Mechanics of Solids fundamentals
3. apply basics concept of I.C. engines.& Boilers
4. solve simple Hydraulic Turbines & Pumps problems
5. describe the principles of refrigeration and air conditioning

Unit-I: Civil Engineering & Construction Materials **10hours**

What is Civil Engineering, Different disciplines of civil engineering, Types and classification of buildings as per NBC, Site Selection for Residential Building, Components of a Building and their functions.

Cement: Portland cement- Chemical Composition – Hydration, Grades of Cement, Setting and fineness of cement. Various types of cement and their properties.Various Field Tests.

Stones: Properties of building stones,classification of stones, stone quarrying, precautions in blasting, dressing of stone

Bricks: Composition of good brick earth, various methods of manufacturing of bricks and Other Building Materials.

Unit-II:Basics of Mechanics of Solids **8hours**

Simple Stresses and Strains: Elasticity and plasticity – Types of stresses & strains – Hooke's law – stress & strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic module & the relationship between them.

Shear force Bending Moment; Simple problems on Shear force Diagram and Bending moment Diagram for cantilever and simply supported beam.

Unit-III:I.C Engines & Boilers **8 hours**

I.C Engine: Heat Engine Types of Heat Engine Classification of I.C. Engine-Valve Timing Diagram, Port Timing Diagram- Comparison of 2S & 4S Engines- Comparisonof Petrol Engine and Diesel Engine-Fuel System of a Petrol Engine-Ignition Systems.

Boilers: Classification of Boilers Simple Vertical Boiler Cochran Boiler Babcock and Wilcox Boiler Benson Boiler Difference between Fire Tube and Water Tube Boilers Boiler Mountings and Accessories

Unit-IV:Hydraulic Turbines and Pumps **10 hours**

Introduction to Power transmission tools, Hydraulic Turbines: Classification Difference between Impulse and Reaction Turbine.

Pumps: Classification of Pumps, Centrifugal Pump-Applications-Priming Reciprocating Pumps, Single Acting & Double acting-Comparison with Centrifugal Pump

Unit-V:Refrigeration and Air Conditioning System8hours

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

Textbooks:

1. Basic Civil and Mechanical Engineering, by Prof. V. Vijayan, Prof. M. Prabhakaran and Er. R. Viashnavi, 2 nd edition, S. Chand Publication, 2010
2. Elements of Mechanical Engineering, Fourth Edition, S. Trymbaka Murthy, University Press, 2014

References:

1. Seetharaman S., "Basic Civil Engineering", Anuradha Agencies, (2005).
2. Venugopal K. and Prahu Raja V., "Basic Mechanical Engineering", Anuradha Publishers, Kumbakonam, (2000).
3. Er. R. Vaishnavi, Basic Civil and Mechanical Engineering, 2/e, S.Chand Publications (2003)
4. Ramamrutham S., Basic Civil Engineering, DhanpatRai Publishing Co. (P) Ltd. (1999).

ELECTRICAL CIRCUIT ANALYSIS –I

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E02202 **3 1 0 3**
Pre Requisite: Mathematics-1

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

1.apply basic concepts of circuits and elements, different circuit solving methods
2.analyze the alternating current principles and different types of powers related with a.c.
3.illustrate the concepts of magnetic circuits, self and mutual inductance coupling coefficient and analyze the circuits for resonance conditions and locus diagrams.
4.analyse the resonance phenomenon and its parameters in R-L-C circuits
5.apply different network theorems to dc and ac networks

Unit-I: Introduction to Electrical Circuits **9hours**

Basic Concepts of passive elements of R, L, C and their V-I relations, Sources (dependent and independent), Kirchhoff's laws, Network reduction techniques (series, parallel, series - parallel, star-to-delta and delta-to-star transformation), source transformation technique, nodal analysis and mesh analysis to DC networks with dependent and independent voltage and current sources.,Super node and Super mesh analysis.

Unit-II:Single Phase A.C Systems **9hours**

Periodic waveforms (determination of rms, average value and form factor), concept of phasor, phase angle and phase difference – waveforms and phasor diagrams for lagging, leading networks, complex and polar forms of representations. node and mesh analysis. Steady state analysis of R, L and C circuits, power factor and its significance, real, reactive and apparent power, waveform of instantaneous power and complex power.

Unit-III:Magnetic Circuits **9 hours**

Basic definition of MMF, flux and reluctance, analogy between electrical and magnetic circuits, Faraday's laws of electromagnetic induction – concept of self and mutual inductance, Dot convention – coefficient of coupling and composite magnetic circuit, analysis of series and parallel magnetic circuits.

Unit-IV:Resonance **8hours**

Series and parallel resonance, selectively band width and Quality factor, locus diagram- RL, RC,RLC with R, L and C variables

Unit-V:Network Theorems (DC & AC Excitations) **8hours**

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

Textbooks:

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, 6th edition McGraw Hill Company, 2012.
2. Network Analysis: Van Valkenburg; Prentice-3rd edition, Hall of India Private Ltd, 2015.

References:

1. Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O.Sadiku, 5th edition, McGraw Hill Education (India), 2013.
2. Electric Circuits – (Schaum's outlines) by MahmoodNahvi& Joseph Edminister, Adapted by KumaRao, 5th Edition – McGraw Hill, 2017.
3. Introductory Circuit Analysis by Robert L Boylestad, 13th edition, Pearson, 2015
4. Circuit Theory (Analysis and Synthesis) by A. Chakrabarthi, 7th edition, DhanpatRai&Co., 2018.

COMMUNICATIVE ENGLISH LABORATORY

	L	T	P	C
I-B.Tech-II-Sem.				
Subject Code : 21H00211	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1.demonstrate nuances of language through audio-visual experience and Groupactivities.
2.identify accent forintelligibility.
3.demonstrate in conversation, jams and public speaking.Make use of the concepts to communicate confidently and competently in English Language in allspheres.

List of Experiments

PRACTICE 1: Greeting, Introducing, and takingleave ---PureVowel

PRACTICE 2: Giving Information and Asking forInformation –Diphthongs

PRACTICE 3: Inviting, Accepting and DecliningInvitations –Consonants

PRACTICE 4:Commands, Instructions andRequests--Accent andRhythm

PRACTICE 5: Suggestions andOpinions –Intonation

APPLIED CHEMISTRY LABORATORY

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00213 **0 0 3 1.5**
Pre Requisite: Nil

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

1.execute instrumental methods of chemical analysis and measuring,
2. demonstrate operating and testing of chemical instruments for determing chemical attributes
3.demonstrate complexometric and other techniques to determine the presence of ingredients

List of Experiments

Introduction to Chemistry Laboratory- Molarity, Normality, Primary and Secondary standard solutions,Volumetric titrations, Quantitative analysis and Qualitative analysis

1. Determination of HCl using standard Na_2CO_3 solution
2. Estimation of $KMnO_4$ by Oxalic acid
3. Estimation of Ferrous Iron by $K_2Cr_2O_7$
4. Determination of total hardness of water by EDTA method.
5. Determination of Alkalinity of watersample.
6. Determination of Chlorides present in water sample.
7. Determination of pH of water and soil samples
8. Conductometric titration of strong acid Vs strongbase.
9. Conductometric titration of strong acid Vs Weakbase.
10. Potentiometric titration of strong acid Vs strongbase.
11. Potentiometric titration of strong acid Vs weakbase.
12. Preparation of Phenol formaldehyde resin.
13. Preparation of Urea formaldehyde resin.
14. Determination of Mg+2 present in Antacid
15. Determination of Zinc by complexometric method

BASIC CIVIL AND MECHANICAL ENGINEERING LABORATORY

	L	T	P	C
I-B.Tech-II-Sem.				
Subject Code :21E03213	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. solve to arrive at finding constant speed and variable speed on IC engines and interpret their performance.
2. determine flow discharge measuring device used in pipes, channels and tanks.
3. test for the performance of pumps and turbines

List of Experiments

Part-A

List of Experiments:

Thermal Engineering Lab:

1. Valve time timing diagram on 4-S Diesel engine.
2. Valve time timing diagram on 4-S Petrol engine.
3. Port timing diagram on 2-S Petrol engine.
4. Study on Boiler models.
5. COP determination of Refrigeration tutor.
6. COP determination of Air conditioner tutor.

Part-B

Hydraulic machinery Lab:

1. Determination of coefficient of discharge on Impact of Jets on Vanes apparatus.
2. Performance test on Pelton wheel.
3. Performance test on Francis turbine.
4. Performance test on Kaplan turbine.
5. Performance test on Single stage Centrifugal pump.
6. Performance test on Reciprocating pump.

List of Augmented Experiments:

(Student can perform any one of the following experiments)

1. Heat balance sheet on VCR engine
2. Determination of Loss of head due to sudden contraction and sudden enlargement.
3. Heat balance sheet on Multi cylinder Petrol engine.
4. Heat balance sheet on 4-S diesel engine.
5. Determination of coefficient of discharge on Venturimeter.
6. Determination of coefficient of discharge on Orificemeter.

ENVIRONMENTAL SCIENCE

	L	T	P	C
I-B.Tech-II-Sem.				
Subject Code : 21M00201	**2**	**0**	**0**	**0**

Pre Requisite: Nil

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

1.articulate the interconnected and interdisciplinary nature of environmental studies.
2.demonstrate an integrative approach to environmental issues with a focus on sustainability.
3.use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.
4.adopt sustainability as a practice in life, society and industry through rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
outline the effect of value education and welfare programmes.
5.understand the population effect on environment and also role of information technology in environment

Unit-I: Multidisciplinary Nature of Environmental Studies 8hours

Multidisciplinary nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.

Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide
problems, water logging, salinity, case studies. – Energy resources.

Unit-II:Ecosystems & Biodiversity and Its Conservation 12hours

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystemAquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity And Its Conservation :Introduction, Definition: genetic, species and ecosystem diversity–Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega- diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation,

Unit-III:Environmental Pollution & Solid Waste Management 8 hours

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

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management:floods, earthquake, cyclone and landslides.

Unit-IV:Social Issues and the Environment 10hours

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies.

Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit-V:Human Population and The Environment 8hours

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field Work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

Textbooks:

1. Text book of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission, Universities Press.
2. Palaniswamy, “Environmental Studies”, Pearson education.

References:

1. Deeksha Dave and E.Sai Baba Reddy, “Textbook of Environmental Science”, Cengage Publications.
2.M.Anji Reddy, “Text book of Environmental Sciences and Technology”, BS Publication.
3.J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4.J. Glynn Henry and Gary W. Heinke, “Environmental Sciences and Engineering”, Prentice hall of India Private limited

II-B.TECH.-I-SEMESTER SYLLABUS

MATHEMATICS–III

(Integral Transforms, Vector Calculus and PDE)

(Common to CE, ME, EEE & ECE)

II-B.Tech-I-Sem. **L T P C**
Subject Code :21B00301 **4 1 0 3**
Pre Requisite: Nil

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

1.apply the Laplacetransformfor solving ordinary differentialequations
2. find the Fourier series of periodic signals and apply integral expressions for the forward and inverse Fourier transform to arrange of non-periodic waveforms
3. interpret different operators such as gradient, curl and divergenc e., estimate the workdone against a field, circulation and fluxusingvector calculus
4. solve the first order partial differential equations related to various engineering fields.
5. identify the methods for solving higher order partial differentialequations in different physical processes

Unit-I: LaplaceTransforms **12 hours**

Laplace transforms – Definition and Laplace transforms of some certain functions– Shifting theorems –Transforms of derivatives and integrals – Unit step function –Multiplied by t and Divided by t – Dirac's delta function –Periodic function –InverseLaplacetransforms – Partial fractions – Convolution theorem (without proof) . Applications:Solvingordinarydifferentialequations(initialvalueproblems)usingLaplacetransforms

Unit-II:Fourier Series And Fourier Transforms **12hours**

Fourier Series: Introduction– Periodic functions – Fourier series of periodic functions – Dirichlet'sconditions– Even andodd functions–Changeof interval– Half-rangesineand cosineseries. – Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sineand cosine transforms– inverse transforms – Finite Fourier transforms.

Unit-III:Vector Calculus **8 hours**

VectorDifferentiation:Gradient–Directionalderivative–Divergence–Curl–ScalarPotentialVector Integration: Line integral – Work done – Area– Surface and volume integrals – Vector integraltheorems: Problems on Greens, Stokes and Gauss Divergence theorems (without proof)

Unit-IV:Partial Differential Equations of First Order **10 hours**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –Solutions of first order linear (Lagrange)equation and nonlinear(standardtypes) equations.

Unit-V:Second order Partial Differential Equations and Applications **12hours**

SecondorderPDE:Solutions of linear partial differential equations with constant coefficients–-homogeneous-terms of the typee^{ax+by}, $\sin(ax+by)$, $\cos(ax+by)$,$x^m y^n$Applications of PDE:Method of separation of Variables–Solution of one dimensional Wave,Heatandtwo - dimensional heat equation (Cartesian form).

Textbooks:

1. B. S.Grewal,HigherEngineeringMathematics,44thEdition,KhannaPublishers.
2. R. K. Jain and S. R. K. Iyengar Advanced Engineering Mathematics, Fifth Edition NarosaPublishingHouse

References:

1.ErwinKreyszig, AdvancedEngineeringMathematics,10thEdition,Wiley & Sons, 2011
2.EngineeringMathematics,**Dr.T.K.V.Iyengar**,S. Chandpublications
3.B.V.Ramana, Higher EngineeringMathematics,2007Edition,TataMc.GrawHill Education.
4.N.P.Bali& Manish Goyal, Engineering Mathematics, Lakshmi Publications.

ELECTRICAL CIRCUIT ANALYSIS –II

II-B.Tech-I-Sem. **L T P C**
Subject Code :21P02301 **3 1 0 3**
Pre Requisite: Mathematics-I, II

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

1. explain the importance of 3-Phase circuits with star and delta connected balanced and unbalanced loads.
2. analyze the transient behavior of electrical networks with DC excitations
3. analyze the transient behavior of electrical networks with AC excitations.
4. determine various network parameters of given two port network.
5. generalize the significance of filters in electrical networks

Unit-I: PolyphaseCiruits **9 hours**

Phase sequence, star and delta connection of sources and loads, relation between line and phase voltages and currents, analysis of balanced three phase circuits, measurement of active and reactive power.

Analysis of three phase unbalanced circuits:

Loop method, Star-Delta transformation technique, two-wattmeter method for measurement of three phase power

Unit-II: Transient Analysis in DC Circuits **9 hours**

Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using differential equations.

Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

Unit-III:Transient Analysis in AC Circuits **9 hours**

Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using differential equations.

Transient response of First order (R-L, R-C) and second order (R-L-C) circuits using Laplace transforms.

Unit-IV:Two Port Network **8 hours**

Two port network parameters – Z, Y, ABCD and Hybrid parameters and their relations, cascaded networks

Unit-V:Filters **8 hours**

Need of Filters – Classification -Characteristic impedance- Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop or Band Elimination Filter, m-Derived Filter, Composite filters– Design of Filters.

Textbooks:

1. Engineering Circuit Analysis by William Hayt and Jack E. Kemmerley, 6th edition McGraw Hill Company, 2012.
2. Network Analysis: Van Valkenburg; Prentice-3rd edition, Hall of India Private Ltd, 2015.

References:

1. Fundamentals of Electrical Circuits by Charles K. Alexander and Mathew N.O.Sadiku, 5thedition, McGraw Hill Education (India), 2013.
2. Electric Circuits – (Schaum's outlines) by MahmoodNahvi& Joseph Edminister, Adapted by KumaRao, 5thEdition – McGraw Hill, 2017.
3. Introductory Circuit Analysis by Robert L Boylestad, 13thedition, Pearson, 2015
4. Circuit Theory (Analysis and Synthesis) by A. Chakrabarthi, 7thedition, DhanpatRai&Co., 2018

ELECTRICAL MACHINES - I

II-B.Tech-I-Sem. **L T P C**
Subject Code :21P02302 **3 1 0 3**
Pre Requisite: Electrical Circuits

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

1.mitigate the ill-effects of armature reaction and commutation in dc machines.
2.determine the torque production mechanism and control the speed of dc motors.
3.analyze the performance of single phase transformers by regulation, losses and efficiency of single phase transformers.
4.analyze the performance of Parallel transformers, control voltages with tap changing methods
5.apply the concept of three-phase to two-phase transformation and electromechanical energy conversion

Unit-I: Construction and Operation of DC Machines **9 hours**
Construction and principle of operation of DC machine – EMF equation for generator – classification of DC machines based on excitation – OCC of DC shunt generator –applications of DC Generators

Unit-II:Performance of DC Machines **9 hours**
Torque and back-emf equations of dc motors – Armature reaction and commutation – characteristics of separately-excited, shunt, series and compound motors – losses and efficiency – applications of dc motors

Unit-III:Starting, Speed Control and Testing of DC Machines **9 hours**
Necessity of a starter – starting by 3 point and 4 point starters – speed control by armature voltage and field control – testing of DC machines – brake test, Swinburne's method – principle of regenerative or Hopkinson'smethod – retardation test – separation of losses.

Unit-IV:Single-Phase Transformers **8 hours**
Types and constructional details – principle of operation –emf equation – operation on no load and on load –lagging, leading and unity power factors loads –phasor diagrams of transformers – equivalent circuit –regulation – losses and efficiency – effect of variation of frequency and supply voltage on losses – all day efficiency.

Unit-V:Testing of Transformers and 3-Phase Transformers **8hours**
Tests on single phase transformers – open circuit and short circuit tests – Sumpner's test – separation of losses– parallel operation with equal voltage ratios – auto transformer – equivalent circuit – comparison with two winding transformers.

Textbooks:

1. The Performance and Design of Direct Current Machines by A.E. Clayton&N.N. Hancock, Pitman Publishers
2. Electrical Machines by D. P.Kothari, I .J .Nagarth,McGraw Hill Publications, 4th edition

References:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald,Charles kingsley,StephenD.Umans, TMH
3. 4. Electrical Machines by R.K.Rajput, Lakshmi publications, 5thedition.
4. Theory & Performance of Electrical Machines by J.B.Guptha. S.K.Kataria&Sons .

ELECTRO MAGNETIC FIELDS

II-B.Tech-I-Sem. **L T P C**
Subject Code :21P02303 **3 1 0 3**
Pre Requisite: Mathematics-I & Physics

Course Outcomes: At the end of the course, the student will be able to
1. apply the laws of Electrostatics to compute electric field Intensity
2.analyze the behaviour of conductors, dielectrics and capacitors.
3.apply the laws of Magneto statics to calculate magnetic field intensity
4.determine self and mutual inductances and the energy stored in the magnetic field.
5.apply the concepts of faradays laws, displacement current and Poynting vector.

Unit-I: Electrostatics **9 hours**
Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge,work done in moving a point charge in an electrostatic field, electric potential – potential gradient, Gauss's law – Maxwell's first law (div(D)=ρv), Electric dipole – dipole moment – potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field. Laplace's and Poison's equations and solution of Laplace's equation in one variable.

Unit-II:Conductors – Dielectrics and Capacitance **9 hours**
Current density, conduction and convection current densities, Ohm's law in point form – equation of continuity-conductors and Insulators – their behavior in electric field.-Polarization- boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space. Capacitance of parallel plates, spherical dielectrics, energy stored and energy density in a static electric field.

Unit-III:Magneto Statics **9 hours**
Biot-Savart's law, Magnetic Field Intensity (MFI) – MFI due to a straight current carrying filament, MFI due to circular, square and solenoid current – carrying wire – relation between magnetic flux, magnetic flux density and MFI. Maxwell's second Equation, div(B)=0, Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long filament carrying conductor, point form of Ampere's circuital law,Maxwell's third equation, Curl (H)=J. , magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – force and Torque on a current loop placed in a magnetic field.

Unit-IV:Forces in Magnetic Field and Inductance **8 hours**
Magnetic force, moving charges in a magnetic field – Lorentz force equation, force on a current element in a magnetic field, force on a straight and a long current carrying conductor in a magnetic field, force between two straight long and parallel current carrying conductors.
Boundary conditions on H and B, Self and mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field

Unit-V:Time Varying Fields **8hours**
Faraday's laws of electromagnetic induction – integral and point forms, Maxwell's fourth equation (Curl(E)=-∂B/∂t), statically and dynamically induced EMF – modification of Maxwell's equations for time varying fields, displacement current, Poynting theorem and Poynting vector

Textbooks:
1."Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill,7th Editon.2006.
2. "Principles of Electro Magnetics" by Sadiku, Oxford Publications, 6th edition, 2015.

References:

1. Introduction to Electro Dynamics by D J Griffiths, Prentice-Hall of India Pvt. Ltd,2nd edition
2.Electromagnetic Field Theory by Yaduvir Singh, Pearson India, 1st edition, 2011.
3.Fundamentals of Engineering Electromagnetics by Sunil Bhooshan, Oxford UniversityPress,2012.
4. Electromagnetics by Joseph A. Edminister, Schaum's Outline,4th Edition,2014.

ELECTRONIC DEVICES AND CIRCUITS

II-B.Tech-I-Sem. **L T P C**
Subject Code :21P02303 **3 0 0 3**
Pre Requisite: Nil

Course Outcomes: At the end of the course, the student will be able to
1. understand the formation of p-n junction and its different modes of operation.
2. know the construction, working principle of rectifiers with and without filters with relevant expressions.
3.understand the construction, principle of operation of transistors, BJT with their V-I characteristics in different configurations.
4.understand the construction, principle of operation of transistors, FET with their V-I characteristics in different configurations.
5.understand the formation of various special semiconductor and its different modes of operation. Perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

Unit-I: Semiconductor Diodes **9hours**
PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.
Rectifiers and Filters: Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Stunt inductor).

Unit-II:Conductors – Dielectrics and Capacitance **9 hours**
Npn-pnp construction and operation –early effect,-current equations-CE,CB,CC configurations,pitchoff voltages and its signifinace –MOSFET-characteristics-thresold voltages-channel length modulation-D-MOSFET,E-MOSFET-characteristics-comparision of MOSFET with JFET.

Unit-III:Magneto Statics **9 hours**
FETs – CG, CS and CD configuration and Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.

Unit-IV:Forces in Magnetic Field and Inductance **8 hours**
Zener Diode, Breakdown mechanisms, Zener diode applications, LED, Varactor Diode, Photodiode, Tunnel Diode, UJT, PN-PN Diode, SCR. Construction, operation and V-I characteristics. LASER diode, LDR.

Unit-V:Time Varying Fields8hours
BJT: Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.
FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Textbooks:

1.Hayt JackKemmerly, Steven Durbin, "Engineering Circuit Analysis",McGraw Hill education, 9th Edition, 2018.
2.Robert.L. Boylestead, "Introductory Circuit Analysis", Pearson Education India, 12th Edition, 2014.

References:

1. Charles K. Alexander & Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", McGraw-Hill, 2nd Edition, 2003.
2.D.R.Cunningham, J.A. Stuller, "Basic Circuit Analysis", Jaico Publishing House, 2005.
3. David Bell, "Fundamentals of Electric Circuits", Oxford University press, 7thEdition, 2009.
4.Charles.K.Alexander, Mathew N.O.Sadiku," Fundamentals of Electric Circuits", McGraw Hill, 5th Edition, 2012.

ELECTRICAL CIRCUITS LABORATORY

II-B.Tech-I-Sem. **L T P C**
Subject Code :21P02311 **0 0 3 1.5**
Pre Requisite: Nil

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

1. apply various Network theorems
2. determine theself and mutual inductances and Draw locus diagrams
3. analyse two port parameters of a given electric circuit and Draw Waveforms and phasor diagrams for lagging and leading networks.

List of Experiments

Any 10 of the following experiments are to be conducted:

1) Verification of Thevenin's and Norton's Theorems
2) Verification of superposition theorem and maximum power transfer theorem
3) Verification of compensation theorem
4) Verification of reciprocity, Millmann's Theorems
5) Locus diagrams of RL and RC series circuits
6) Series and parallel resonance
7) Determination of self, mutual inductances and coefficient of coupling
8) Determination of impedance (Z) and Admittance (Y) Parameters
9) Determination of Transmission and hybrid parameters.
10) Determination of Parameters of a choke coil.
11) Determination of cold and hot resistance of an electric lamp.
12) Measurement of 3-phase power by two Wattmeter method for unbalanced loads

ELECTRICAL MACHINES –I LABORATORY

II-B.Tech-I-Sem. **L T P C**
Subject Code :21P02312 **0 0 3 1.5**
Pre Requisite: Nil

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

1. plot the magnetizing characteristics of DC shunt generator and understand the mechanism of self-excitation.
2. determine the losses and efficiency and performance Characteristics of a DC motor
3. obtain the conversion of three phase supply to two phase supply by using transformers and Predetermine the efficiency, regulation and equivalent circuit of transformers and assess their performance.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Brake test on DC shunt motor. Draw the performance characteristics
3. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
4. Swinburne's test and Predetermination of efficiencies as Generator and Motor.
5. Speed control of DC shunt motor by Field and Armature Control.
6. Retardation test on DC shunt motor. Determination of losses at rated speed.
7. Separation of losses in DC shunt motor.
8. OC & SC test on single phase transformer.
9. Sumpner's test on single phase transformer.
10. Scott connection of transformers
11. Parallel operation of Single-phase Transformers
12. Separation of core losses of a single-phase transformer
13. Heat run test on a bank of 3 Nos. of single-phase Delta connected transformers

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

	L	T	P	C
II-B.Tech-I-Sem.				
Subject Code :21P04311	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. understand the formation of p-n junction , various special semiconductor and its different modes of operation.
2. know the construction, working principle of rectifiers with and without filters with relevant expressions.
3. understand the construction, principle of operation of transistors, BJT, FET with their V-I characteristics in different configurations.

List of Experiments

1.P-N Junction Diode Characteristics
A. Part A: Germanium Diode (Forward bias& Reverse bias)
B. Part B: Silicon Diode (Forward Bias only)

2. Zener Diode Characteristics

a.Part A: V-I Characteristics
b.Part B: Zener Diode as Voltage Regulator

3. Rectifiers (without and with c-filter)
A.Part A: Half-wave Rectifier
B.Part B: Full-wave Rectifier

4. BJT Characteristics (CE Configuration)
a.PartA: Input Characteristics
B.Part B: Output Characteristics

5. FET Characteristics (CS Configuration)
A.Part A: Drain Characteristics
B.Part B: Transfer Characteristics

6. SCR Characteristics

7. UJT Characteristics

8. Transistor Biasing

9. CRO Operation and its Measurements

10. BJT-CE Amplifier

11. Emitter Follower-CC Amplifier

12. FET-CS Amplifier

DESIGN OF ELECTRICAL CIRCUITS USING ENGINEERING SOFTWARE TOOLS

II-B.Tech-I-Sem. **L T P C**
Subject Code :21S02311 **1 0 2 2**
Pre Requisite: Nil

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

1. write the MATLAB programs to simulate the electrical circuit problems
2. simulate various circuits for electrical parameters
3. Simulate RLC series and parallel resonance circuits for resonant parameters

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Generation of various signals and sequences (Periodic and Aperiodic), such as unit Impulse, Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp.
2. Operations on signals and sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy, and Average Power
3. Verification of Kirchhoff's current law and voltage law using simulation tools.
4. Verification of mesh analysis using simulation tools.
5. Verification of nodal analysis using simulation tools.
6. Determination of average value, rms value, form factor, peak factor of sinusoidal wave, square wave using simulation tools.
7. Verification of super position theorem using simulation tools.
8. Verification of reciprocity theorem using simulation tools.
9. Verification of maximum power transfer theorem using simulation tools.
10. Verification of Thevenin's theorem using simulation tools.
11. Verification of Norton's theorem using simulation tools.
12. Verification of compensation theorem using simulation tools.
13. Verification of Milliman's theorem using simulation tools.
14. Verification of series resonance using simulation tools.
15. Verification of parallel resonance using simulation tools.
16. Verification of self inductance and mutual inductance by using simulation tools.

BASICS OF INDIAN CONSTITUTION

II-B.Tech-I-Sem. **L T P C**
Subject Code :21M02301 **3 0 0 3**
Pre Requisite: Nil

Course Outcomes: At the end of the course, the student will be able to
1.understand the evolution of Constitution of India
2.understand the functioning of the Union Government
3.understand the functioning of the State and local self Government.
4. understand the functioning of Local administration
5. understand the functioning of Election Comission

Unit-I: Introduction to Indian Constitution **9hours**
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution – Sourcesandconstitutional history, Features – Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

Unit-II: Union Government and its Administration **9 hours**
Union Government and its Administration Structure of the Indian Union: Federalism, Centre-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;Learning outcomes:-After completion of this unit student will.

Unit-III: State Government and its Administration **9 hours**
State Government and its Administration Governor – Role and Position – CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

Unit-IV: Local Administration **8 hours**
A.Local Administration – District's Administration Head – Role and Importance, Municipalities – Mayor and role of Elected Representative – CEO of Municipal Corporation PachayatiRaj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level OrganizationalHierarchy – (Different departments), Village level – Role of Elected and Appointed officials – Importance of grass root democracy.

Unit-V: Election Commission **8hours**
Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women.

Textbooks:

1.M.V.Pylee,Indian Constitution DurgaDas Basu,Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi.
2.Subash Kashyap, Indian Constitution, National BookTrust

References:

1.DurgaDasBasu, Introduction to the Constitution of India,Prentice–HallofIndia Pvt. Ltd.. NewDelhi
2.J.A. Siwach, Dynamics of Indian Government &Politics
3.D.C. Gupta, Indian Government andPolitics
4.H.M.Sreevai, Constitutional Law of India,4thedition in 3volumes (UniversalLaw Publication)

II-B.TECH.-II-SEMESTER SYLLABUS

MATHEMATICS–IV
(ComplexVariablesand StatisticalMethods)
(Common to EEE, ME)

II-B.Tech-II-Sem. **L T P C**
Subject Code :21B00401 **4 1 0 3**
Pre Requisite: Nil

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

1. apply Cauchy-Riemann equations to complex functions in order to determine whether a given continuous function is analytic
2. find the differentiation and integration of complex functions used in engineering problems make use of the Cauchy residue theorem to evaluate certain integrals
3. apply discrete and continuous probability distributions to determine the mean and variance of a sampling distribution of means
4. design the componentsofa classicalhypothesistest for large samples
5. develop the use of small sample tests neededbyengineers for practical applications

Unit-I: FunctionsOfa Complex Variable and ComplexIntegration **12 hours**

Introduction – Continuity – Differentiability – Analyticity –Cauchy-Riemann equations inCartesian and polar coordinates – Harmonic and conjugate harmonic functions – Milne – Thompsonmethod. Complexintegration: Line integral–Cauchy'sintegraltheorem– Cauchy-Goursattheorem-Cauchy'sintegralformula – Generalizedintegralformula(allwithoutproofs)andproblemsonabovetheorems.

.Unit-II:Series Expansions and Residue Theorem **12 hours**

Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series.Types ofSingularities: Isolated– Essential– Poleoforderm–Residues–Residue theorem (withoutproof). Evaluation of real integral of the types $\int_{-\infty}^{\infty} f(x)dx$

and $\int_{0}^{+2} f(Cos\theta, Sin\theta)d\theta$.

Unit-III:Random Variables, Distributions and Sampling Theory **12 hours**

Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance–Binomial,PoissonandNormal distributions.Sampling Theory: Introduction – Population and samples – Sampling distribution of Means andVariance(definitiononly)–Centrallimittheorem(withoutproof)

Unit-IV:Estimation and Test of Hypothesis (Large Samples) **10 hours**

Point and Interval estimations–Maximum error of estimate – Confidence interval – Test of Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One-tail and two-tail tests – Z-Testsconcerning one proportion and two proportions – Z-Test concerning one mean and twomeans(Largesamples)

Unit-V:Time Varying Fields **10 hours**

Hypothesis concerning one mean and two means (Small Samples) using t -Test – Tests concerning difference of two variances (Small samples) using -test – $\square^2$ -test for goodness of fit and independence of attributes

Textbooks:

1. **J. W.BrownandR.V.Churchill**, ComplexVariablesandApplications, 9th edition,Mc-Graw Hill,2013.
2. **MillerandFreund's,**ProbabilityandStatisticsforEngineers, Pearson,7th edition,2008.

References:

1.B.S.Grewal, HigherEngineeringMathematics,KhannaPublishers,44th Edition,2017.
2.S.C.GuptaandV.K.Kapoor,FundamentalsofMathematicalStatistics,11th edition,SultanChand&Sons Publications,2012.
3.Jayl.Devore,Probability and Statistics for Engineering and the Sciences,8th Edition,Cengage.
4.Sheldon,M.Ross,Introductiontoprobabilityandstatistics EngineersandtheScientists,4th Edition,AcademicFoundation,2011

ELECTRICAL MACHINES–II

II-B.Tech-II-Sem. **L T P C**
Subject Code :21B00401 **3 1 0 3**
Pre Requisite: Electrical machines-I, Mathematics & Electrical Circuits

Course Outcomes: At the end of the course, the student will be able to
1. explain the operation and performance of three phase induction motor.
2.analyze the performance of induction motor and induction generator.
3.implement different methods of starting of three phase and single phase induction motors.
4.develop winding design and predetermine the regulation of synchronous generators.
5.explain hunting phenomenon, implement methods of staring and correction of power factor with synchronous motor.

Unit-I: 3-Phase Induction Motors **9 hours**

Construction details of squirrel cage and slip ring induction motors – production of rotating magnetic field – principle of operation Equivalent circuit –phasor diagram- slip speed-rotor e.m.f and rotor frequency – rotor current and p.f at standstill and during running conditions – rotor power input, rotor copper loss and mechanical power developed and their interrelationship

.Unit-II:Characteristics and Testing Methods of Induction Motors **9 hours**

Torque equation – expressions for maximum torque and starting torque – torque slip characteristic – double cage and deep bar rotors – crawling and cogging – speed control of induction motor with V/f control method – no load and blocked rotor tests – circle diagram for predetermination of performance – induction generator operation (Qualitative treatment only)

Unit-III:Starting Methods of 3-Phase Induction Motors And Single Phase Induction Motors **9 hours**

Methods of starting of three phase Induction motors: DOL, Auto transformer, Star-Delta and rotor resistance methods.
Constructional features- equivalent circuit- problem of starting-double revolving field theory-Methods of starting. AC series motors

Unit-IV:Construction, Operation,VoltageRegulation and Parallel Operation of Alternators **8 hours**

Constructional features of non-salient and salient pole machines –types of armature windings– distribution, pitch and winding factors – E.M.F equation –improvements of waveform and armature reaction –phasor diagrams- voltage regulation by synchronous impedance method – MMF method and Potier triangle method– two reaction analysis of salient pole machines and phasor diagram. Parallel operation with infinite bus and other alternators – synchronizing power – load sharing – control of real and reactive power – numerical problems

Unit-V:Synchronous Motor – Operation, Starting And Performance8hours

Synchronous motor principle and theory of operation – phasor diagram – starting torque – variation of current and power factor with excitation – capability curves – synchronous condenser – mathematical analysis for power developed – hunting and its suppression –methods of starting – applications

Textbooks:

1. Electrical Machines by P.S. Bhimbra, Khanna Publishers
2. Electric Machinery by A.E.Fitzgerald, Charles Kingsley, Stephen D.Umans, TMH.

References:

1. Performance and design of AC machines – M.G.Say
2. Alternating Current Machines by A.F.Puchstein, T.C. Lloyd, A.G. Conrad, SIA PublishingHouse
3. Electrical Machinery Fundamentals by Stephen J Chapman McGraw Hill education, 2010.
4. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th edition

ELECTRICAL POWER GENERATION, TRANSMISSION AND ECONOMIC ASPECTS

II-B.Tech-II-Sem. **L T P C**
Subject Code :21P02402 **4 1 0 3**
Pre Requisite: Electrical Machines-I & II

Course Outcomes: At the end of the course, the student will be able to
1.identify the different components of thermal and nuclear powerplants
2.identify the different components of air, gas insulatedsubstations. single core and three core cables with different insulatingmaterials
3. analyse the different economic factors of power generation andtariffs
4.understand parameters of various types of transmission lines during different operating conditions
5.understand various factors related to charged transmission lines –understand sag/tension of transmission lines and performance of line insulators.

Unit-I: Power Stations: Hydroelectric, Thermal and Nuclear Power Stations 9 hours

Selection of site, general layout of a hydroelectric power plant with brief description of major components and principle of operation

Selection of site, general layout of a thermal power plant. Brief description of components:boilers, super heaters, economizers and electrostatic precipitators.

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor components: moderators, control rods, reflectors and coolants.

.Unit-II:Economic Aspects of Power Generation & Tariff 9 hours

Load curve, Load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor and plant use factor, base and peak loadplants.

costs of generation and their division into fixed, semi-fixed and running costs, desirable characteristics of a tariff method, tariff methods: simple rate, flat rate, block- rate, two-part, three–part, and power factor tariff methods.

Unit-III:Sub-Station Layout and Cables 9 hours

Indoor & outdoor substations, substations layouts of 33/11 kV showing the location of all the substation equipment.

Bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus barsystem, Ring- main system with relevant diagrams.

Types of cables, construction, types of insulating materials, calculation of insulation resistance, stress in insulation and power factor of cable.

Capacitance of single and 3-Core belted Cables. Grading of cables: capacitance grading and intersheath grading.

Unit-IV:Transmission Line Parameters 8 hours

Conductor materials - Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Single and double circuit lines– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors – Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and three phase–Single and double circuit lines- Bundled conductors.

Unit-V:Sag And Tension Calculations of Overhead Transmission Lines and Insulators 8hours

Skin and Proximity effects –Ferranti effect – Charging Current – Corona – Description of the phenomenon–Factors affecting corona– Critical voltages and power loss.

Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice on weight of Conductor – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement - Voltage distribution–Calculation of string efficiency – Capacitance grading and Static Shielding

Textbooks:

1. Electrical Power systems – by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa, New age International (P) Limited, Publishers, 3rd edition.

References:

1.Elements of Electrical Power Station Design by M V Deshpande, PHI, New Delhi,2009
2.Modern Power System Analysis by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 2ndEdition
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A. Chakrabarti, DhanpatRai& Co. Pvt. Ltd, 2016.

CONTROL SYSTEMS

II-B.Tech-II-Sem. **L T P C**
Subject Code :21P02402 **3 1 0 3**
Pre Requisite: Mathematics, Physics & Electrical Circuits

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

1. derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
2. determine time response specifications of second order systems and to determine error constants.
3. analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
4. analyze the stability of LTI systems using frequency response methods.
5. design Lag, Lead, Lag-Lead compensators to improve system performance from Bode diagrams, to represent physical systems as state models and determine the response.

Unit-I: Mathematical Modeling of Control Systems **9 hours**

Classification of control systems, open loop and closed loop control systems and theirdifferences, Feedback characteristics, transfer function of linear system, differential equations ofelectrical networks, translational and rotational mechanical systems, transfer function of DCservo motor – AC servo motor – synchro, transmitter and receiver – block diagram algebra –representation by signal flow graph – reduction using Mason's gain formula

.Unit-II:Time Response Analysis and Stability and Root Locus Technique **9 hours**

Standard test signals – time response of first and second order systems – time domain specifications, steady state errors and error constants, P, PI, The concept of stability – Routh's stability criterion –limitations of Routh's stability, Root locus concept – construction of root loci (simple problems).Effect of addition of poles and zeros root locus

Unit-III:Frequency Response Analysis **9 hours**

Introduction to frequency domain specifications – Bode diagrams – transfer function from theBode diagram – phase margin and gain margin – stability analysis from Bode plots.Polar plots, Nyquist stability criterion.

Unit-IV:Classical Control Design Techniques **8 hours**

Lag, lead, lag-lead compensators, design of compensators using Bode plots.

Unit-V:State Space Analysis of LTI System8hours

Concepts of state, state variables and state model, state space representation of transfer function,diagonalization, solving the time invariant state equations, State Transition Matrix and it'sProperties, concepts of controllability and observability.

Textbooks:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India,2nd Edition

References:

1. Control Systems principles and design by M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
2. Control Systems by ManikDhanesh N, Cengage publications.
3.Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition.
4. Control Systems Engineering by S.Palani,TataMcGraw Hill Publications

DIGITAL ELECTRONICS

II-B.Tech-II-Sem. **L T P C**
Subject Code :21P02404 **3 0 0 3**
Pre Requisite: Nil

Course Outcomes: At the end of the course, the student will be able to
1 use Boolean algebra and simplification procedures relevant to digital logic.
2 design various combinational digital circuits using logic gates.
3 analyze and design synchronous sequential circuits.
4 analyze and design asynchronous sequential circuits.
5 build logic gates and use programmable devices

Unit-I: Review Of Number Systems, Codes and Boolean Theorems and Logic Operations 9 hours

Representation of numbers of different radix, conversion from one radix to another radix, r- 1's complements and r's complements of signed members. Gray code,4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc., Error detection & correction codes: parity checking, even parity, odd parity, Hamming code\Boolean theorems, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations.

Unit-II:Minimization Techniques and Combinational Logic Circuits Design 9 hours

Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4- bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit.

Unit-III:Combinational Logic Circuits Design Using MSI,LSI and Introduction of PLD's 9 hours

Design of encoder, decoder, multiplexer and demultiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder.

PLDs: PROM, PAL, PLA -Basics structures, realization of Boolean functions

Unit-IV:Sequential Circuits-I 8 hours

Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip- flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register

Unit-V:Sequential Circuits-II8hours

Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator and sequence detector circuits, Races and Hazards.

Textbooks:

1. Switching and finite automata theory:ZviKohavi, Niraj K. Jha,Cambridge University Press, 3rd Edition, 2009.
2. Digital Design by Morris Mano, Prentice Hall India, 5th Edition

References:

1. Digital Principles and Applications by Leach , Malvino, Saha, Mc-Graw Hill, 8th Edition,2014.
2. Switching Theory and Logic Design by A. Anand Kumar, PHI learning, 3rdedition.
3. Introduction to Switching Theory and Logic Design – Fredriac J Hill, GeraldR Peterson, 3rdEdition, John Willey and Sons Inc,
4. Fundamentals ofLogic Design by Charles H. RothJr., Cengage Learning, 7thedition,2013.

ELECTRICAL MACHINES – II LABORATORY

II-B.Tech-II-Sem. **L T P C**
Subject Code :21P02411 **0 0 3 1.5**
Pre Requisite: Nil

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

1. assess the performance of single phase and three phase induction motors and Control the speed of three phase induction motor
2. predetermine the regulation of three–phase alternator by various methods.
3. find the xd/xq ratio of alternator and asses the performance of three–phase synchronous motor.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Brake test on three phase Induction Motor
2. Equivalent circuit diagram of three phase Induction motor
3. circle diagram of three phase induction motor
4. Regulation of a three –phase alternator by synchronous impedance method
5. Regulation of a three –phase alternator by m.m.f method
6. Regulation of three–phase alternator by Potier triangle method
7. V and Inverted V curves of a three-phase synchronous motor.
8. Determination of X_d and X_q of a salient pole synchronous machine
9. Equivalent circuit of single-phase induction motor
10. Speed control of induction motor by V/f method.
11. Determination of efficiency of three phase alternator by loading with three phase induction motor.
12. Power factor improvement of single-phase induction motor by using capacitors and load test on single phase induction motor.
13. Heat run test on three phase transformers.

CONTROL SYSTEMS LABORATORY

II-B.Tech-II-Sem. **L T P C**
Subject Code :21P02412 **0 0 3 1.5**
Pre Requisite: Nil

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

1. analyze the performance and working Magnetic amplifier, D.C and A.C.servo motors and synchros, transfer function of D.C Motor
2. design P,PI,PD and PID controllers, lag, lead and lag–lead compensators
3. determine the stability in time and frequency domain.

List of Experiments

Any 10 of the following experiments are to be conducted:

1.Time response of Second order system

2.Characteristics of Synchros

3.Effect of P, PD, PI, PID Controller on a second order systems

4.Design of Lag and lead compensation – Magnitude and phase plot

5.Transfer function of DC motor

6. Bode Plot, Root locus, Nyquist Plots for the transfer functions of systems up to 5thorderusing MATLAB.

7. Controllability and Observability Test using MAT LAB.

8.Temperature controller using PID

9.Characteristics of magnetic amplifiers

10.Characteristics of AC servo motor

11.Characteristics of DC servo motor

12.Block Diagram Representation of Field Controlled DC servo Motor Using Simulink.

DIGITAL ELECTRONICS LABORATORY

	L	T	P	C
II-B.Tech-II-Sem.				
Subject Code :21P0441	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1.to understand the concepts of Logic gates
2. to understand concepts of combinational circuits.
3.to understand sequential circuits by learning flip-flops and their applications.

List of Experiments

Any 10 of the following experiments are to be conducted:

1. Verification of truth tables of Logic gates: Two input (i) OR (ii) AND (iii)NOR (iv) NAND (v) Exclusive OR (vi) Exclusive NOR
2. Design a simple combinational circuit and obtain minimal SOP expression andverify the truth table using Digital TrainerKit
3. Verification of functional table of 3 to 8 line Decoder /De-multiplexer
4.Variable logic function verification using 8 to 1multiplexer.
5. Design full adder circuit and verify its functionaltable.
6. Design full Subtractorcircuit and verify its functionaltable.
7. Verification of functional tables ofFlip-Flops
8. Design a four bit ring counter using D Flip – Flops / JK Flip Flop and verifyoutput
9. Design a four bit Johnson's counter using D Flip-Flops / JK Flip Flops and verify output
10. Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T- Flip-Flops and Test it with a low frequency clock and Sketch the outputwaveforms.
11. Design MOD – 10 ripple counter using T- Flip-Flop and verify the result and Sketch the outputwaveforms
12. Design MOD – 8 synchronous counter using D Flip-Flop and verify the result and Sketch the outputwaveforms.

ELECTRICAL WIRING LABORATORY

(SKILL ORIENTED COURSE)

	L	T	P	C
II-B.Tech-II-Sem.				
Subject Code :21S02411	**1**	**0**	**2**	**2**

Pre Requisite: Nil

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

1. understand the accessories & tools used in electrical wiring
2. analyse and design wring lay outs for different houses &godowns
3. estimate the quantity & cost of house wiring

List of Experiments

Any 10 of the following experiments are to be conducted

1. Study of different wiring tools & accessories
2. Study of main switches & MCB
3. Estimate the quantity of material for a building for light loads
4. One lamp controlled by 2 different places (staircase wiring)
5. Two lamps & socket controlled by 3 switches (house wiring)
6. Godown wiring circuit
7. Florescent lamp connection circuit
8. Over hauling of ceiling fan
9. Over hauling of energy meter
10. Hostel wiring circuit
11. Practice bright & dim light arrangement
12. Make an electromagnet & testing it on a dc power supply.

III-B.TECH.-I-SEMESTER SYLLABUS

POWER SYSTEM ANALYSIS

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P02501 **3 1 0 3**

Pre Requisite: Electrical Ciruit Analysis -I, II, Electrical Machines-I, II

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

1. draw impedance diagram for a power system network and calculate per unit quantities.
2. apply the load flow solution to a power system using different methods.
3. form Z_{bus} for a power system networks and analyse the effect of symmetrical faults.
4. find the sequence components for power system Components and analyse its effects of unsymmetrical faults.
5. analyse the stability concepts of a power system.

Unit-I: Circuit Topology & Per Unit Representation **9 hours**

Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y_{bus} matrix by singular transformation and direct inspection methods – Per Unit Quantities–Single line diagram – Impedance diagram of a power system – Numerical Problems.

Unit-II: Power Flow Studies **9 hours**

Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) – Decoupledand Fast Decoupled methods – Algorithmic approach – Numerical Problems on 3–bus system only.

Unit-III: Z-Bus Algorithm & Symmetrical Fault Analysis **9 hours**

Formation of Z_{bus}**:** Algorithm for the Modification of Z_{bus} Matrix (without mutual impedance) – Numerical Problems.

Symmetrical Fault Analysis:

Reactance's of Synchronous Machine – Three Phase Short Circuit Currents - Short circuit MVA calculations for Power Systems – Numerical Problems.

Unit-IV: Symmetrical Components **8 hours**

Definition of symmetrical components – symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances and Sequence networks: Synchronous generator – Transmission line and transformers – Numerical Problems.

Unsymmetrical Fault analysis

Various types of faults: LG– LL– LLG and LLL on unloaded alternator-Numerical problems.

Unit-V: Power System Stability Analysis **8hours**

Elementary concepts of Steady state – Dynamic and Transient Stabilities – Swing equation – Steady state stability – Equal area criterion of stability – Applications of Equal area criterion – Factors affecting transient stability – Methods to improve steady state and transient stability – Numerical problems.

Textbooks:

1. Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.2003
2. Modern Power system Analysis – by I.J.Nagrath & D .P.Kothari: Tata McGraw–HillPublishing Company - 3rd edition - 2007.

References:

1.Power System Analysis – by A.R.Bergen - Prentice Hall - 2nd edition - 2009.
2.Power System Analysis by HadiSaadat – Tata McGraw–Hill 3rd edition - 2010.
3.Power System Analysis by B.R.Gupta - A H Wheeler Publishing Company Limited – 1998
4.Power System Analysis and Design by J.Duncan Glover - M.S.Sarma - T.J.Overbye – CengageLearning publications - 5th edition - 2011.

POWER ELECTRONICS

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P02502 **3 1 0 3**
Pre Requisite: Electrical Ciruit Analysis -I, II

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

1. illustrate the static and dynamic characteristics of SCR, Power-MOSFET and Power-IGBT.
2. analyse the operation of phase-controlled rectifiers.
3. analyse the operation of three-phase full–wave converters, AC Voltage Controllers andCycloconverters.
4. examine the operation and design of different types of DC-DC converters.
5. analyse the operation of PWM inverters for voltage control and harmonic mitigation.

Unit-I: Power Semi-Conductor Devices **9 hours**

Silicon controlled rectifier (SCR) – Two transistor analogy - Static and Dynamic characteristics – Turnon and Turn off Methods - Triggering Methods (R, RC and UJT) – Snubber circuit design. Static and Dynamic Characteristics of Power MOSFET and Power IGBT– Gate Driver Circuits forPower MOSFET and IGBT - Numerical problems.

Unit-II: Single-phase AC-DC Converters **9 hours**

Single-phase half-wave controlled rectifiers - R and RL loads with and without freewheeling diode - Single-phase fully controlled mid-point and bridge converter with R load, RL load and RLE load - Continuous and Discontinuous conduction - Effect of source inductance in Single-phase fully controlled bridge rectifier – Expression for output voltages – Single-phase Semi-Converter with R load-RL load and RLE load – Continuous and Discontinuous conduction - Harmonic Analysis – Dual converter and its mode of operation - Numerical Problems.

Unit-III: Three-phase AC-DC Converters & AC – AC Converters **9 hours**

Three-phase half-wave Rectifier with R and RL load - Three-phase fully controlled rectifier with R and RL load - Three-phase semi converter with R and RL load - Expression for Output Voltage - Harmonic Analysis - Three-phase Dual Converters - Numerical Problems.

Single-phase AC-AC power control by phase control with R and RL loads - Expression for rms output voltage – Single-phase step down and step up Cycloconverter - Numerical Problems.

Unit-IV: DC–DC Converters **8 hours**

Operation of Basic Chopper – Analysis of Buck, Boost and Buck-Boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) - Output voltage equations using volt-sec balance in CCM & DCM – Expressions for output voltage ripple and inductor current ripple – control techniques – Introduction to PWM control -Numerical Problems.

Unit-V: DC–AC Converters **8hours**

Introduction - Single-phase half-bridge and full-bridge inverters with R and RL loads – Phase Displacement Control – PWM with bipolar voltage switching, PWM with unipolar voltage switching - Three-phase square wave inverters - 120^0 conduction and 180^0 conduction modes of operation - Sinusoidal Pulse Width Modulation - Current Source Inverter (CSI) - Numerical Problems.

Textbooks:

1. Power Electronics: Converters, Applications and Design by Ned Mohan, Tore M Undeland,William P Robbins, John Wiley & Sons.
2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India,2nd edition, 1998

References:

1.Elements of Power Electronics–Philip T.Krein. Oxford University Press; Second edition
2.Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3.Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha,New Age International (P) Limited Publishers, 1996.
4.Power Electronics: by Daniel W.Hart, Mc Graw Hill.

CYBER SECURITY IN ENGINEERING

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21E02501 **3 1 0 3**
Pre Requisite: Nil

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

1. understand the basics and need for information security
2. identify, analyze, and evaluate infrastructure and network vulnerabilities.
3. understand and analyze different access control and authentication methods.
4. identify and assess current and anticipated security risks and vulnerabilities with vulnerability assessmen
5. learn the fundamentals of cryptography and how cryptography serves as the central language of information security

Unit-I: **9 hours**

Introduction to Security: Challenges of Securing Information, Definition of Information Security, Attackers, Attacks and Defenses.

Systems Threats and Risks: Software-Based Attacks, Hardware-Based Attacks, Attacks on Virtualized Systems, Hardening the Operating System, Preventing Attacks that Target the Web Browser, Hardening WebServers, Protecting Systems from Communications-Based Attacks, Applying Software Security Applications

Unit-II: **9 hours**

Network Vulnerabilities and Attacks: Network Vulnerabilities, Categories of Attacks, Methods of Network Attacks.

Network Defences: Crafting a Secure Network, Applying Network Security Devices, Host and Network Intrusion Prevention Systems (HIPS/NIPS), Protocol Analyzers, Internet Content Filters, Integrated Network Security Hardware.

Unit-III: **9 hours**

Access Control: Access Control Models and Practices, Logical Access Control Methods, Physical Access Control.

Authentication: Definition of Authentication, Authentication Credentials, Extended Authentication Protocols, Remote Authentication and Security

Unit-IV: **8 hours**

Vulnerability Assessment: Risk Management, Assessment, and Mitigation, Identifying Vulnerabilities.

Security Audit: Privilege Auditing, Usage Auditing, Monitoring Methodologies and Tools.

Unit-V: **8hours**

Cryptography: Introduction to Cryptography, Cryptographic Algorithms, Using Cryptography on Files and Disks, Digital Certificates, Public Key Infrastructure, Key Management, Applications of Cyber Security.

Textbooks:

1.Security+ Guide to Network Security Fundamentals, Third Edition, Mark Ciampa, Cengage Learning

References:

1. Principles of Information Security, Michael E. Whitman and Herbert J. Mattord, Cengage Learning.
2. Information Security: The Complete Reference, Rhodes-Ousley, Mark, Second Edition, McGraw-Hill.
3. Information Security: Principles and Practices, Mark S. Merkow, Jim Breithaupt, 2nd Edition, Pearson Education.

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

(PROFESSIONAL ELECTIVE – I)

III-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21P02501	**3**	**1**	**0**	**3**

Pre Requisite: Nil

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

1. know the construction and working of various types of analog instruments.
2. describe the construction and working of wattmeter and power factor meters
3. know the construction and working various bridges for the measurement resistance – inductance and capacitance
4. know the operational concepts of various transducers
5. know the construction and operation digital meters

Unit-I:Analog Ammeter and Voltmeters **9 hours**

Classification – deflecting - control and damping torques - – PMMC - moving iron type and electrostatic instruments - Construction - Torque equation - Range extension - Errors and compensations - advantages and disadvantages. Instrument transformers: Current Transformer andPotential Transformer-construction - theory - errors-Numerical Problems.

Unit-II: Analog Wattmeters and Power Factor Meters **9 hours**

Electrodynamometer type wattmeter (LPF and UPF) - Power factor meters: Dynamometer and M.I type (Single phase and Three phase) - Construction - theory - torque equation - advantages and disadvantages.

Potentiometers: Introduction to DC and AC Potentiometers – Construction-working – Applications - Numerical Problems.

Unit-III: Measurements of Electrical Parameters **9 hours**

DC Bridges: Method of measuring low - medium and high resistance - sensitivity of Wheat stone's bridge - Kelvin's double bridge for measuring low resistance - Loss of charge method for measurement of high resistance - Megger – measurement of earth resistance - Numerical Problems.

AC Bridges: Measurement of inductance and quality factor - - Maxwell's bridge - - Hay's bridge - - Anderson's bridge. Measurement of capacitance and loss angle - - Desauty's bridge - Schering Bridge - Wien's bridge - Wagner's earthing device - - Numerical Problems.

Unit-IV: Transducers **8 hours**

Definition - Classification - Resistive - Inductive and Capacitive Transducer - LVDT - Strain Gauge - Thermistors - Thermocouples - Piezo electric and Photo Diode Transducers - Hall effect sensors- Numerical Problems.

Unit-V: Digital meters **8 hours**

Digital Voltmeters – Successive approximation DVM - Ramp type DVM and Integrating type DVM – Digital frequency meter - Digital multimeter - Digital tachometer - Digital Energy Meter - Q meter - Power Analyzer. CRO- measurement of phase difference & Frequency using lissajious patterns - Numerical Problems.

Textbooks:

1. Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis - 5th Edition - Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D. Helfrick and W.D.Cooper - PHI - 5th Edition - 2002.

References:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications - 19th revised edition - 2011.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput -S.Chand -3rd edition.
3. Electrical Measurements by Buckingham and Price - Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons

ADVANCED CONTROL SYSTEMS

(PROFESSIONAL ELECTIVE – I)

III-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21L02502	**3**	**1**	**0**	**3**

Pre Requisite: Comtrol Systems

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

1. analyse different canonical forms - solution of State equation.
2. design of control system using the pole placement technique is given after introducing theconcept of controllability and observability.
3. analyze nonlinear system using describing function technique and phase plane analysis.
4. examine the stability analysis using Lyapunov method.
5. illustrate the Minimization of functional using calculus of variation - state and quadratic regulatorproblems.

Unit-I:State Space Analysis **9 hours**

State Space Representation – Canonical forms – Controllable canonical form – Observable canonical form - Jordan Canonical Form - Solution of state equation – State transition matrix.

Unit-II: Controllability and Observability **9 hours**

Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms.

Unit-III: Nonlinear Systems **9 hours**

Introduction to nonlinear systems - Types of nonlinearities. Introduction to phase–plane analysis - Singular points; Describing function - basic concepts - Describing functions of non- linearities.

Unit-IV: Stability Analysis by Lyapunov Method **8 hours**

Stability in the sense of Lyapunov – Lyapunov's stability and Lyapunov's instability theorems – Direct method of Lyapunov for the linear and nonlinear continuous time autonomous systems.

Unit-V: Applications of Control Systems in Electrical Engineering **8 hours**

Taffic Control System, Control of Electical Machines, Robotics, Object and Position Control Systems, Servo Motor Apllications

Textbooks:

1.Modern Control Engineering – by K. Ogata - Prentice Hall of India - 3rd edition - 1998.
2.Automatic Control Systems by B.C. Kuo - Prentice Hall Publication.

References:

1. Modern Control System Theory – by M. Gopal - New Age International Publishers - 2nd edition- 1996
2. Control Systems Engineering by I.J. Nagarath and M.Gopal - New Age International (P) Ltd.
3.Digital Control and State Variable Methods – by M. Gopal - Tata Mc Graw–Hill Companies -1997.
4.Systems and Control by Stainslaw H. Zak - Oxford Press - 2003.

ENERGY AUDITING AND DEMAND SIDE MANAGEMENT

(PROFESSIONAL ELECTIVE – I)

III-B.Tech-I-Sem. **L T P C**

Subject Code : 21L02503 **3 1 0 3**

Pre Requisite: Nil

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

1. explain energy efficiency, conservation and various technologies.
2. design energy efficient lighting systems.
3. calculate power factor of systems and propose suitable compensation techniques.
4. explain energy conservation in HVAC systems.
5. calculate life cycle costing analysis and return on investment on energy efficient technologies

Unit-I:Energy sources **9 hours**

Energy consumption – world energy reserves – prices – alternative sources – power – energy policies – choice of fuels.

Energy Auditing

Energy conservation schemes: Short term - Medium term - Long term energy conservation schemes – Industrial energy use - Energy index – Cost index .

Representation of energy consumption: Pie charts - Sankey diagrams – Load Profile. Energy auditing: General Auditing, Detailed Energy Audit

Unit-II: Heat Transfer Theory **9 hours**

Heat – Heat content – Rate of heat transfer – Heat transfer coefficient - Conduction – Convention and radiation. Thermal insulation & its importance - space heating – HVAC system – Heating of Buildings – District heating – Factors & affecting the choice of district heating.

Unit-III: Energy Efficient Instruments **9 hours**

Digital Energy Meter – Data loggers – Thermo couples – Pyranometer – Lux meters – Tong testers – Power analyzers – Power factor – effects with non-linear loads – effect of harmonics on power factor – Power Factor Improvement – Capacitor rating - Effects of power factor improvements - Electric lighting – Types of lighting – Luminaries – Energy efficient lighting.

Unit-IV: Economic Aspects and Financial Analysis **8 hours**

Understanding energy cost: Depreciation methods – time value of money – rate of return –present worth method. Basic payback calculations –depreciation – net present value calculations. Taxes and tax credit – numerical problems.

Unit-V: Demand Side Management **8 hours**

Introduction to DSM - concept of DSM - benefits of DSM - different techniques of DSM – time of day pricing - multi-utility power exchange model - time of day models for planning. Load management - load priority technique - peak clipping - peak shifting - valley filling - strategic conservation - energy efficient equipment. Management and organization of energy conservation awareness programs.

Textbooks:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill

References:

1. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi
2.Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition,1998.
3. Energy management hand book by W.C.Turner, John wiley and sons.
4. Energy management and conservation –k v Sharma and pvenkataseshaiah-I KInternational Publishing House pvt.ltd,2011

IC APPLICATIONS
(OPEN ELECTIVE -I)

L	T	P	C
3	0	0	3

Subject Code: 21N04502
Pre Requisite: NIL

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

1. Explain the operational amplifiers with linear integrated circuits.
2. attain the knowledge of functional diagrams and applications of ic 555 and ic 565
3. acquire the knowledge about the data converters.
4. acquire the knowledge of active filters & oscillators:
5. compare of DAC and ADC techniques

Unit-1 Integrated Circuits **08 hours**

Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Unit-2 Op-amp and Applications **08 hours**

Basic information of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723

Unit-3 Active Filters & Oscillators **08 hours**

Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien and quadrature type, waveform generators - triangular, sawtooth, square wave and VCO.

Unit-4 Timers & Phase Locked Loops: **08 hours**

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

Unit-5 D-A and A-D Converters: **08 hours**

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC dual slope integration type ADC, DAC and ADC specifications.

Text Books:

1. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.
2. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

.References Books:

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.

2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGraw Hill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education.

BASICS OF CIVIL ENGINEERING
(OPEN ELECTIVE - I)

L T P C
3 0 0 3

Subject Code: 21N01501
Pre Requisite: Nil

Course Outcomes: At the end of the course, the students will be able to
1. illustrate the fundamental aspects of Civil Engineering
2. plan and set out a building
3. explain the concepts of surveying for making horizontal and vertical measurements.
4. illustrate the uses of various building materials and explain the method of construction of different components of a building.
5. discuss about various services in a building.

Unit-I: **9 hours**
General introduction to Civil Engineering - Introduction to types of buildings, Components of a residential building, Introduction to industrial buildings; Introduction to planning of residential buildings - Simple
building plans.

Unit-II: **9 hours**
Introduction to the various building area terms; Setting out of a building; Surveying – Principles, Objectives, Horizontal measurements with tapes, Ranging.

Unit-III: **9 hours**
Levelling – Instruments, Reduction of levels; Modern surveying instruments; Building materials – Bricks, cement blocks, Cement, Cement mortar, Steel.

Unit-IV: **9 hours**
Building construction – Foundations, Brick masonry, Roofs, Floors, Decorative finishes, Plastering, Paints and Painting.

Unit-V: **9 hours**
Basic infrastructure and services – Elevators, Escalators, Ramps, Air conditioning, Sound proofing, Towers, Chimneys, Water Tanks; Intelligent buildings.

Textbooks:
1. Chudley, R., Construction Technology, Vol. I to IV, Longman Group, England
2. Chudley, R. and Greeno, R., Building Construction Handbook, Addison Wesley, Longman Group, England

References:
1. Gopi, S., Basic Civil Engineering, Pearson Publishers
2. Kandya, A. A., Elements of Civil Engineering, Charotar Publishing house
3. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers.

OPERATING SYSTEMS
(OPEN ELECTIVE - I)

	L	T	P	C
Subject Code:	**3**	**0**	**0**	**3**

Pre Requisite: Nil

Course Outcomes: At the end of the course, the students will be able to
1.describe various generations of Operating System and functions of Operating System
2.describe the concept of program, processs and thread and analyze various CPU
3.scheduling Algorithms and compare their performance
4.solve Inter Process Communication problems using Mathematical Equations by various methods
5.outline File Systems in Operating System like UNIX/Linux and Windows.

UNIT-I: **9 hours**

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing Environments, Open-Source Operating Systems. System Structures: Operating System Services, User and Operating-System Interface, System calls, Types of System Calls, Operating System debugging, System Boot.

UNIT-II: **11 hours**

Process Concept: Process scheduling, Operations on processes, Inter-process communication,
Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, threading issues. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy Waiting,
Sleep and wakeup, Semaphores, Monitors, Message passing, Barriers. Classical IPC Problems
Dining philosopher's problem, Readers and writers problem.

UNIT-III: **10 hours**

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation. Virtual Memory Management: Introduction, Demand paging Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation

UNIT-IV: **9 hours**

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock Detection and recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization.
Secondary - Storage Structure:Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT-V: **9 hours**

Multivariable calculus (Partial Differentiation and applications) System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, implementing security defenses, Firewalling to protect systems and networks, Computer security classification.
Case Studies: Linux, Microsoft Windows

Textbooks:

1.Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2.Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008.

References:

1.Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2.Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009.

INTRODUCTION TO ADDITIVE MANUFACTURING
(OPEN ELECTIVE - I

	L	T	P	C
Subject Code : *	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. explain the concepts of AM
2. differentiate liquid and solid based rapid prototyping systems
3. illustrate powder based rapid prototyping and tooling systems
4. apply various data file formats in 3D printing
5. summarize various RP applications

Unit-I **9 hours**

Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages, and Limitations of Rapid Prototyping, commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.

Unit-II **10 hours**

Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA), Models and specifications, Process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, Applications,

Unit-III **10 hours**

Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Case studies.Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Case studies.

Unit-IV **9 hours**

Part-A: Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Case studies. **Rapid Tooling:** Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, need for RT. Rapid Tooling Classification; Indirect Rapid Tooling Methods: Spray Metal Deposition,

Unit-V **10 hours**

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution,

RP Applications: Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.

Textbooks:

1. Rapid prototyping; Principles and Applications, Chua C.K., Leong K.F. and LIM C.S, WSP.
2. Rapid Manufacturing, D.T. Pham and S.S. Dimov/Springer.

References:

1. Terry Wohlers, Wholers Report 2000, Wohlers Associates.
2. Rapid Prototyping and Manufacturing, PaulF.Jacobs, ASME.

POWER ELECTRONICS LABORATORY

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P02511 **0 0 3 1.5**
Pre Requisite: Nil

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

1.analyse characteristics of various power electronic devices and design firing circuits for SCR.
2.analyse the performance of single–phase dual, three–phase full–wave bridge converters and dualconverter with both resistive and inductive loads.
3.examine the operation of Single-phase AC voltage regulator and Cycloconverter with resistive and inductive loads.
4.differentiate the working and control of Buck converter and Boost converter.
5.differentiate the working & control of Square wave inverter and PWM inverter

List of Experiments

Any 10 of the following experiments are to be conducted:

1.Characteristics of SCR - Power MOSFET & Power IGBT.
2.R - RC & UJT firing circuits for SCR.
3.Single -Phase semi-converter with R & RL loads.
4.Single -Phase full-converter with R & RL loads.
5.Three- Phase full-converter with R & RL loads.
6.Single-phase dual converter in circulating current & non circulating current mode of operation.
7.Single-Phase AC Voltage Regulator with R & RL Loads.
8.Single-phase step down Cycloconverter with R & RL Loads.
9.Boost converter in Continuous Conduction Mode operation.
10.Buck converter in Continuous Conduction Mode operation.
11.Single -Phase square wave bridge inverter with R & RL Loads.
12.Single - Phase PWM inverter.
13.Three-phase bridge inverter with 120^0 and 180^0 conduction mode
14.SPWM control of Three-phase bridge inverter

ELECTRICAL MEASUREMENTS AND INSRUMENTATION LABORATORY

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21P02512 **0 0 3 1.5**
Pre Requisite: Nil

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

Know about the phantom loading.
1. Learn the calibration process and Measure the electrical parameters voltage - current - power - energy and electrical characteristics of resistance - inductance and capacitance.
2. Gain the skill knowledge of various brides and their applications and Learn the usage of CT's - PT's for measurement purpose.
3. Know the characteristics of transducers and Measure the strains - frequency and phase difference

List of Experiments

Any 10 of the following experiments are to be conducted

1. Calibration of dynamometer wattmeter using phantom loading
2. Measurement of resistance using Kelvin's double Bridge and Determination of its tolerance.
3. Measurement of Capacitance using Schering Bridge.
4. Measurement of Inductance using Anderson Bridge.
5. Calibration of LPF Wattmeter by direct loading.
6. Measurement of 3 phase reactive power using single wattmeter method for a balanced load.
7. Testing of C.T. using mutual inductor – Measurement of % ratio error and phase angle of given C.T. by Null deflection method.
8. P.T. testing by comparison – V.G as Null detector – Measurement of % ratio error and phase angle of the given P.T.
9. Determination of the characteristics of a Thermocouple.
10. Determination of the characteristics of a LVDT.
11. Determination of the characteristics for a capacitive transducer.
12. Measurement of strain for a bridge strain gauge.
13. Measurement of Choke coil parameters and single phase power using three voltmeter and three ammeter methods.
14. Calibration of single phase Energy Meter.
15. Dielectric oil Test using HV Kit.
16. Calibration of DC ammeter and voltmeter using Crompton DC Potentiometer.
17. AC Potentiometer: Polar Form / Cartesian Form - Calibration of AC voltmeter - Parameters of choke

EMPLOYABILITY SKILLS -I

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21S00511 **1 0 2 2**
Pre Requisite: Nil

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

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

1. demonstrate verbal and written skills effectively
2. develop professional correspondence skills
3. build proficiency in quantitative reasoning
4. improve critical thinking skills
5. exhibit confidence in facing the interview process

Unit–I **06 Hours**

Verbal Ability: Fundamentals of Grammar - Sentence Structure - Parts of Speech.
Analytical Skills: **Averages -** Basic Concepts, combined mean, average principles, wrong values taken, number added or deleted, average speed.
Percentages - Basic Concepts, conversions, finding percentages from given numbers, quantity increases or decreases by given percentage, population increase by given percentage, comparisons, consumption when a commodity price increase or decrease and applications.
Data Interpretation - Introduction to Data Interpretation, quantitative and qualitative data, Tabular Data, Line Graphs, Bar Chart, Pie Charts, X-Y Charts.

Unit–II **06 Hours**

Verbal Ability: Synonyms and Antonyms, Homonyms and Homophones, Word Formation, Idioms and Phrases, Analogy, One-word Substitutes.
Analytical Skills: **Reasoning -** Number Series, Letter Series, Series completion and correction, Coding and Decoding.

Unit–III **08 Hours**

Part-A: Verbal Ability: Exercises on Common Errors in Grammar.
Analytical Skills: Word analogy-Applied analogy.

Part-B: Verbal Ability: Vocabulary Enhancement, Study skills and using a Dictionary.
Analytical Skills: Classifications, verbal classification.

Unit–IV **10 Hours**

Verbal Ability: Paragraph writing, Picture description, Text Completion, Essay writing.
Analytical Skills: **Reasoning Logical Diagrams -** Simple diagrammatic relationship, Multi diagrammatic relationship, Venn-diagrams, Analytical reasoning.

Unit–V **10 Hours**

Verbal Ability: Sentence Equivalence, Comparison and Parallelism, Letter writing and e-mail writing.
Analytical Skills: **Reasoning Ability -** Blood Relations, Seating arrangements, Directions, Decision making.

Activities List:

1. Regular cumulative practice tests.
2. Quiz, Crossword, Word-search and related activities.
3. Picture Description including Description of Photos/Images/Posters/Advertisement Analysis etc.,

COMMUNITY SERVICE PROJECT

	L	T	P	C
III-B.Tech-I-Sem.				
Subject Code : 21P02531	**0**	**0**	**0**	**1.5**

Pre Requisite: Nil

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

PROFESSIONAL ETHICS & HUMAN VALUS

III-B.Tech-I-Sem. **L T P C**
Subject Code : 21M00501 **3 0 0 0**
Pre Requisite: Nil

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

1. identify and analyze an ethical issue in the subject matter under investigation or in arelevant field
2. identify the multiple ethical interests at stake in a real-world situation or practice
3. articulate what makes a particular course of action ethically defensible
4. assess their own ethical values and the social context of problems
5. identify ethical concerns in research and intellectual contexts, including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
6. demonstrate knowledge of ethical values in non-classroom activities, such as service learning, internships, and field work
7. integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.

Unit-I: Human Values: **9 hours**

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Learning outcomes:

1. Learn about morals, values & work ethics.
2. Learn to respect others and develop civic virtue.
3. Develop commitment
4. Learn how to live peacefully

Unit-II: Engineering Ethics: **9 hours**

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's Theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Learning outcomes:

1. Learn about the ethical responsibilities of the engineers.
2. Create awareness about the customs and religions.
3. Learn time management
4. Learn about the different professional roles.

Unit-III: Engineering as Social Experimentation: **9 hours**

Engineering As Social Experimentation –Framing the problem –Determining the facts – Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles – Utilitarian thinking respect for persons.

Learning outcomes:

1. Demonstrate knowledge to become a social experimenter.
2. Provide depth knowledge on framing of the problem and determining the facts.
3. Provide depth knowledge on codes of ethics.
4. Develop utilitarian thinking

Unit-IV: Engineers Responsibility for Safety and Risk: **8 hours**

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).

Learning outcomes:

1. Create awareness about safety, risk & risk benefit analysis.
2. Engineer's design practices for providing safety.
3. Provide knowledge on intellectual property rights.

Unit-V: Global Issues: **8 hours**

Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the

instrument of Unethical behavior –Computers as the object of Unethical acts – Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Learning outcomes:

1. Develop knowledge about global issues.
2. Create awareness on computer and environmental ethics
3. Analyze ethical problems in research.
4. Give a picture on weapons development.

Textbooks:

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and,V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

References:

1. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
3. "Professional Ethics and Human Values" by A.Alavudeen, R.KalilRahman and M.ayakumaran, Laxmi Publications.
4. "Professional Ethics and Human Values" by Prof.D.R.Kiran-"Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

III-B.TECH.-II-SEMESTER SYLLABUS

SWITCHGEAR AND PROTECTION

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P02601 **3 1 0 3**
Pre Requisite: Nil

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

1. illustrate the principles of arc interruption for application to high voltage circuit breakers of air -oil - vacuum - SF_6 gas type.
2. analyse the working principle and operation of different types of electromagnetic protectiverelays.
3. acquire knowledge of protective schemes for generator and transformers for different fault conditions.
4. classify various types of protective schemes used for feeders and bus bar protection and Types ofstatic relays.
5. analyse the operation of different types of over voltages protective schemes required for insulationco–ordination and types of neutral grounding.

Unit-I: Circuit Breakers **9 hours**

Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restriking Voltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max. RRRV– Current chopping and Resistance switching–Oil Circuit Breakers–Air Circuit Breakers– Vacuum and SF_6 Circuit Breakers– Circuit Breaker ratings and specifications.

Unit-II: Electromagnetic Protection **9 hours**

Relay connection – Balanced beam type attracted armature relay - induction disc and induction cup relays–Torque equation - Relays classification–Instantaneous– DMT and IDMT types– Applications of relays**:** Over current and under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays**:** Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.

Static Relays: Introduction – Classification of Static Relays – Basic Components of Static Relays-Applications of Static Relays in Instantaneous and inverse over current Relays.

Unit-III: Protection of Generator, Transformer and Feeder **9 hours**

Generator Protection: Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth faultand inter turn fault protection– Numerical examples.

Transformer Protection

Percentage differential protection– Design of CT's ratio– Buchholz relay protection– Numericalexamples.

Feeder Protection: Over current Protection schemes – PSM - TMS – Numerical examples – Carrier current and three zone Protection using impedance relays.

Unit-IV: Protection against over voltage and grounding **8 hours**

Protection against lightning over voltages– Valve typeand zinc oxide lighting arresters.
Methods of neutral grounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

Unit-V: Numerical Over Current Protection **8 hours**

Introduction-Numerical Distance Protection- Numerical Differential Protection- Microprocessor based Overcurrent Relays- Numerical Impedance Relay- Numerical Directional Realy- Numerical Reactance Relay.

Textbooks:

1. Power System Protection and Switchgear by Badri Ram and D.N Viswakarma - Tata McGrawHill Publications - 2nd edition - 2011.
2. Power system protection- Static Relays with microprocessor applications by T.S.Madhava Rao -Tata McGraw Hill - 2nd edition.

References:

1.Fundamentals of Power System Protection by Paithankar and S.R.Bhide. - PHI - 2003.
2.Art & Science of Protective Relaying – by C R Mason - Wiley Eastern Ltd.
3.Protection and SwitchGear by BhaveshBhalja - R.P. Maheshwari - Nilesh G.Chothani - OxfordUniversity Press - 2013.

POWER SYSTEM OPERATION AND CONTROL

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P02602 **3 1 0 3**
Pre Requisite: Nil

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

1. compute optimal load scheduling of Generators.
2. formulate hydrothermal scheduling and unit commitment problem..
3. analyse effect of Load Frequency Control for single area systems
4. analyse effect of Load Frequency Control for two area systems
5. describe the effect of reactive power control for transmission lines.

Unit-I: Economic Operation of Power Systems **9 hours**

Optimal operation of Generators in Thermal power stations - – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

Unit-II: Hydrothermal Scheduling **9 hours**

Mathematical Formulation – Solution Technique.

Unit Commitment

Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solutionmethods – Priority ordering – Dynamic programming.

Unit-III: Load Frequency Control-I **9 hours**

Modelling of steam turbine – Generator – Mathematical modelling of speed governing system – Transfer function – Necessity of keeping frequency constant. Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation – Steady state response.

Unit-IV: Load Frequency Control-II **8 hours**

Block diagram development of Load Frequency Control of two area system uncontrolled case andcontrolled case – Tie-line bias control – Load Frequency Control and Economic dispatch control.

Unit-V: Compensation in Power Systems **8 hours**

Overview of Reactive Power control – Reactive Power compensation in transmission systems – Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation – Specifications of load compensator – compensated transmission lines. Introduction of FACTS devices – Need of FACTS controllers – Types of FACTS devices.

Textbooks:

1. Electric Energy systems Theory – by O.I.Elgerd - Tata McGraw–hill Publishing Company Ltd. -Second edition.
2. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill PublishingCompany Ltd - 2nd edition.

References:

1. Power System Analysis and Stability by S.S.Vadhera - Khanna Publications - 4th edition - 2005.
2. Power System Analysis by Grainger and Stevenson - Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – – Tata McGraw–Hill 3rd edition - 2010.
4. Power System stability & control - Prabha Kundur - TMH - 1994.

MICROPROCESSORS AND MICROCONTROLLERS

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P02603 **3 1 0 3**
Pre Requisite: Nil

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

1. know the concepts of the Microprocessor capability in general and explore the evaluation ofmicroprocessors.
2. analyse the instruction sets - addressing modes - minimum and maximum modes operations of8086 Microprocessors
3. analyse the Microcontroller and interfacing capability
4. describe the architecture and interfacing of 8051 controller
5. know the concepts of PIC micro controller and its programming.

Unit-I: Introduction to Microprocessor Architecture **9 hours**

Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086.

Instruction Sets of 8086: Data Copy / Transfer Instructions - Arithmetic and Logical Instructions -Shift and Rotate Instructions-Loop Instructions - Branch Instructions - String Instructions -Flag Manipulation Instructions -Machine Control Instructions

Unit-II: Minimum and Maximum Mode Operations **9 hours**

Addressing modes – Assembler directives - General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.

Unit-III: Microprocessors I/O interfacing **9 hours**

8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255– Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086.

Unit-IV: 8051 and Advanced Micro Controllers **8 hours**

Overview of 8051 Microcontroller – Architecture– Memory Organization – Register set – I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals- Instruction set- Applications Using Arduino Board.

Unit-V: PIC Architecture **8 hours**

Block diagram of basic PIC 18 micro controller – registers I/O ports – Programming in C for PIC: Data types - I/O programming - logical operations - data conversion.

Textbooks:

1. Ray and Burchandi - “Advanced Microprocessors and Interfacing” - Tata McGraw–Hill - 3rd edition - 2006.
2. Kenneth J Ayala - “The 8051 Microcontroller Architecture - Programming and Applications” -Thomson Publishers - 2nd Edition.

References:

1. Microprocessors and Interfacing - Douglas V Hall - Mc–Graw Hill - 2nd Edition.
2. R.S. Kaler - “A Text book of Microprocessors and Micro Controllers” - I.K. International PublishingHouse Pvt. Ltd.
3. Ajay V. Deshmukh - “Microcontrollers – Theory and Applications” - Tata McGraw–Hill Companies–2005.
4. PIC Microcontrollers By Lucio Di Jasio

SMART GRID TECHNOLOGIES

(PROFESSIONAL ELECTIVE – II)

III-B.Tech-II-Sem. **L T P C**

Subject Code : 21L02601 **3 1 0 3**

Pre Requisite: Nil

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

1. know the concept of smart grid and analyse the smart grid policies and developments in smart grids.
2. develop concepts of smart grid technologies in hybrid electrical vehicles etc.
3. know the concepts of smart substations - feeder automation - Battery Energy storage systems etc.
4. analyse micro grids and distributed generation systems.
5. analyse the effect of power quality in smart grid and to understand latest developments in ICT for smart grid.

Unit-I: Introduction to Smart Grid 9 hours

Evolution of Electric Grid - Concept of Smart Grid - Definitions - Need of Smart Grid - Functions of Smart Grid - Opportunities & Barriers of Smart Grid - Difference between conventional & smart grid -Concept of Resilient & Self-Healing Grid - Present development & International policies on Smart Grid.Case study of Smart Grid.

Unit-II: Smart Grid Technologies: Part 1 9 hours

Introduction to Smart Meters - Real Time Pricing - Smart Appliances - Automatic Meter Reading(AMR) - Outage Management System(OMS) - Plug in Hybrid Electric Vehicles(PHEV) - Vehicle to Grid - Smart Sensors - Home & Building Automation - Phase Shifting Transformers – Net Metering.

Unit-III: Smart Grid Technologies: Part 2 9 hours

Smart Substations - Substation Automation - Feeder Automation. Geographic Information System (GIS) - Intelligent Electronic Devices (IED) & their application for monitoring & protection.Smart storage like Battery Energy Storage Systems (BESS) - Super Conducting Magnetic Energy Storage Systems (SMES) - Pumped Hydro - Compressed Air Energy Storage (CAES) - Wide Area Measurement System (WAMS) - Phase Measurement Unit (PMU).

Unit-IV: Micro grids and Distributed Energy Resources 8 hours

Concept of micro grid - need & applications of microgrid - formation of microgrid - Issues of interconnection - protection & control of microgrid - Integration of renewable energy sources – Demand Response.

Unit-V: Power Quality Management in Smart Grid 8 hours

Power Quality & EMC in Smart Grid - Power Quality issues of Grid connected Renewable Energy Sources - Power Quality Conditioners for Smart Grid - Web based Power Quality monitoring - Introduction to Power Quality Audit.

Textbooks:

1. Smart Grids by Jean-Claude Sabonnadière - NouredineHadjsaïd - Wiley publishers - 2013.
2. The Smart Grid: Enabling Energy Efficiency and Demand Response - by Clark W. Gellings - Fairmont Press - 2009.

References:

1. The Advanced Smart Grid: Edge Power Driving Sustainability:1 by Andres Carvallo - John Cooper - Artech House Publishers July 2011
2. Control and Automation of Electric Power Distribution Systems (Power Engineering) by James Northcote - Green - Robert G. Wilson - CRC Press - 2017.
3. Substation Automation (Power Electronics and Power Systems) by MladenKezunovic - Mark G. Adamiak - Alexander P. Apostolov - Jeffrey George Gilbert - Springer - 2010.
4. Electrical Power System Quality by R. C. Dugan - Mark F. McGranghan - Surya Santoso - H. Wayne Beaty - McGraw Hill Publication - 2nd Edition.

VLSI DESIGN

(PROFESSIONAL ELECTIVE – II)

III-B.Tech-II-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21L02602	**3**	**1**	**0**	**3**

Pre Requisite: Nil

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

1.understand the insights of the MOS devices and its characteristics.
2.appreciate the different VLSI process technologies.
3.design the CMOS combinational logic circuits and its layout.
4.develop the sequential circuits and clocking schemes.
5. realize the Design flow of application-specific Integrated circuit.

Unit-I: Introduction to MOS Devices **9 hours**

MOS characteristics: NMOS characteristics, inverter action – CMOS characteristics, inverter action - models and second order effects of MOS transistors – Current equation – MOSFET Capacitances - MOS as Switch, Diode/ resistor – current source and sink – Current mirror.

Unit-II: MOS Fabrication **9 hours**

CMOS Fabrication – n-well, p-well, twin-tub processes – fabrication steps – crystal growth – photolithography – oxidation – diffusion – Ion implantation – etching – metallization.

Unit-III: CMOS Logic Circuits **9 hours**

CMOS Logic Circuits: Implementation of logic circuits using nMOS and CMOS, Passtransistor and transmission gates – Implementation of combinational circuits – parity generator–magnitude comparator – stick diagram – Design rules and layout design.

Unit-IV: Higher order digital Logic Circuits **8 hours**

Memory design – SRAM cell – 6T SRAM – DRAM – 1T, 3T, 4T cells, CMOS Sequentialcircuits: Static and Dynamic circuits – True Single-phase clocked registers – Clocking schemes.

Unit-V: Application Specific Integrated Circuits **8 hours**

ASIC - Types of ASICs - Design flow – Design Entry – Simulation – Synthesis – Floor planning – Placement – Routing - Circuit extraction – Programmable ASICs

Textbooks:

1.Neil Weste, David Harris, ‘CMOS VLSI Design: A Circuits and Systems Perspective’, AddisonWesley, 4th Edition, 2020.
2. Debaprasad Das, ‘VLSI Design’, Oxford University Press, 2010.

References:

1. M. J. S. Smith, ‘Application Specific Integrated Circuits’, Addison Wesley, 1997.
2. Uyemura, ‘Introduction to VLSI Circuits and Systems’, Wiley, 1st Edition, 2012.

HYBRID ELECTRIC VEHICLES

(PROFESSIONAL ELECTIVE – II)

III-B.Tech-II-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21L02603	**3**	**1**	**0**	**3**

Pre Requisite: Power Electronics, Electrical Machines-I,II

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

1.know the concept of electric vehicles and hybrid electric vehicles.
2.familiar with different configuration of hybrid electric vehicles.
3.understand the power converters used in hybrid electric vehicles
4.know different batteries and other energy storage systems

Unit-I: Introduction **9 hours**

Fundamentals of vehicle, components of conventional vehicle and propulsion load; Drive cycles and drive terrain; Concept of electric vehicle and hybrid electric vehicle; History of hybrid vehicles, advantages and applications of Electric and Hybrid Electric Vehicles, different Motors suitable for of Electric and Hybrid Electric Vehicles.

Unit-II: Hybridization of Automobile **9 hours**

Architectures of HEVs, series and parallel HEVs, complex HEVs.Plug-in hybrid vehicle, constituents of PHEV, comparison of HEV and PHEV; Fuel Cell vehicles and its constituents.

Unit-III: Plug-in Hybrid Electric Vehicle **9 hours**

PHEVs and EREVs blended PHEVs, PHEV Architectures, equivalent electric range of blended PHEVs; Fuel economy of PHEVs, power management of PHEVs, end-of-life battery for electric power grid support, vehicle to grid technology, PHEV battery charging.

Unit-IV: Power Electronics in HEVs **8 hours**

Rectifiers used in HEVs, voltage ripples; Buck converter used in HEVs, non-isolated bidirectional DC-DC converter, voltage source inverter, current source inverter, isolated bidirectional DC-DC converter, PWM rectifier in HEVs, EV and PHEV battery chargers.

Unit-V: Battery and Storage Systems **8 hours**

Energy Storage Parameters; Lead–Acid Batteries; Ultra capacitors; Flywheels - Superconducting Magnetic Storage System; Pumped Hydroelectric Energy Storage; Compressed Air Energy Storage - Storage Heat; Energy Storage as an Economic Resource.

Textbooks:

1. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.

References:

1. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.
2. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
3. H. Partab: Modern Electric Traction - DhanpatRai& Co, 2007.

PRINCIPLES OF COMMUNICATION
(OPEN ELECTIVE - II)

	L	T	P	C
Subject Code: 21N04601	**3**	**0**	**0**	**3**

Pre Requisite: NIL

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

1. analyze the power and transmission bandwidth of amplitude and frequency modulated signals.
2. familiarize the process of reproduction of base band signal.
3. demonstrate various pulse analog modulation techniques
4. analyze various pulse pulse digital modulation techniques.
5. explain the transmission of binary data in communication systems

Unit-1 Amplitude Modulation: **08 hours**

Introduction to Modulation, Need for Modulation, Ordinary Amplitude Modulation – Modulation index, Side bands, AM Power, Double Side Band Suppressed Carrier Modulation, Single Side Band Modulation, Vestigial Side Band Modulation, AM demodulation, Applications of AM.

Unit-2 Angle Modulation: **08 hours**

Angle Modulation fundamentals, Frequency Modulation – Modulation index and sidebands, Narrowband FM, Wideband FM, Principles of Phase Modulation, Frequency Modulation verses Amplitude Modulation, FM demodulation, Frequency Division Multiplexing, Applications of FM.

Unit-3 Signal Sampling and Analog Pulse Communication: **08 hours**

Ideal Sampling, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation.

Unit-4 Digital Communication Techniques: **08 hours**

Quantization, Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Time Division Multiplexing, Pulse Code Modulation, Delta Modulation.

Unit-5 Transmission of Binary Data in Communication Systems: **08 hours**

Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction.

Text Books:

1. Louis E. Frenzel, Principles of Electronic Communication Systems, 3rd Edition. Tata Mcgraw Hill.
2. Wayne Tomasi, Electronic Communications Systems, 5th Edition, Pearson Education

.References Books:

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3 rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004

AIR POLLUTION AND CONTROL
(OPEN ELECTIVE-II)

. **L T P C**

Subject Code: 21N01601 **3 0 0 3**

Pre Requisite: Nil

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

1. identify the major sources of air pollution and understand their effects on health and environment.
2. evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
3. ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
4. choose and design control techniques for particulate and gaseous emissions.
5. demonstrates the knowledge about Air pollution control which is essential for environmental protection and it gives a particular solution to the life threatening problem.

Unit-I: **9 hours**

Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.

Unit-II: **9 hours**

Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths.

Unit-III: **9 hours**

Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3). Development of air quality models-Gaussian dispersion model-Including Numerical problems.

Unit-IV: **9 hours**

Air pollution due to automobiles, standards and control methods. Noise pollution- causes, effects and control, noise standards. Environmental issues, global episodes. Environmental laws and acts.

Unit-V: **9 hours**

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

Textbooks:

1. M. N. Rao and H V N Rao,“Air pollution”, Tata Mc-G raw Hill Publication.
2. H. C. Perkins, “Air pollution”. Tata McGraw Hill Publication.

References:

1. Noel De Nevers, “Air Pollution Control Engineering”, Waveland Pr Inc.
2. Anjaneyulu Y, “Text book of Air Pollution and Control Technologies”, Allied Publishers.

MACHINE LEARNING
(OPEN ELECTIVE-II)

L T P C
3 0 0 3

Course Outcomes: After the completion of the course, student will be able to
1. explain the fundamental usage of the concept Machine Learning system
2. demonstrate on various regression Technique
3. analyze the Ensemble Learning Methods
4. illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
5. discuss the Neural Network Models and Fundamentals concepts of Deep Learning

UNIT I: **10 hours**

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning. Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

UNIT II: **10hours**

Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass /Structured outputs, MNIST, Ranking.

UNIT III: **10hours**

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification,Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

UNIT IV: **10hours**

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures.Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

UNIT V: **10hours**

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. Hands-On Machine Learning with Scikit-Learn, Keras, and Tensor Flow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods ,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:

2. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

NANOTECHNOLOGY
(OPEN ELECTIVE-II)

	L	T	P	C
Subject Code : *	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. classify nanostructured materials
2. illustrate the characteristics and properties of nano-materials.
3. identify the synthesis routes of nano-materials
4. make use of the tools to characterize the nano-materials.
5. utilize the nano-materials for various applications

Unit-I: **10 hours**

Introduction

History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges, and Future Prospects.

Unit-II **10 hours**

Unique Properties of Nanomaterials

Microstructure and Defects in Nanocrystalline Materials: Dislocations, Twins, stacking faults and voids, Grain Boundaries, triple and declinations, Effect of Nano-dimensions on Materials Behavior: Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, enhanced solid solubility. Magnetic Properties: Soft magnetic nano crystalline alloy, Permanent magnetic nano-crystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties, and Mechanical Properties.

Unit-III **10 hours**

Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Solgel method, Self-assembly, Top down approaches: Mechanical alloying, Nano-lithography, Consolidation of Nanopowders: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing, Spark plasma sintering.

Unit-IV **10 hours**

Tools to Characterize Nano Materials

X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional Atom Probe (3DAP), Nanoindentation.

UNIT V: APPLICATIONS OF NANOMATERIALS **10 hours**

Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, WaterTreatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Défense and Space Applications, Concerns and challenges of Nanotechnology.

Text books:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

References :

1. Nano: The Essentials by T. Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L. Schodek.

ELECTRICAL SIMULATION LABORATORY

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P02611 **0 0 3 1.5**
Pre Requisite: Nil

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

List of Experiments

Any 10 of the following experiments are to be conducted:

1.Study of Single Phase Half Wave Controlled Rectifier with R and RL Load

2 To Study the simulation of Single Phase semi converter with R and RL Load using Simulink.

3 Study of Single Phase Bridge Controlled Rectifier with R and RL load

4 Study of Three Phase Semi-Converter with R and RL load

5 Study of Three Phase Full Bridge Converter with R and RL load

6 Study of Three Phase Inverter With 1800 Conduction Mode By Using Matlab Programming

7 Study of Three Phase Inverter With 1200 Conduction Mode By Using Matlab Programming

8 Study of Load and Load Duration Curve

9 Performance Evaluation of short Transmission Line

10 Performance Evaluation of long Transmission Line

11. Symmetrical Fault Analysis in Transmission Lines with single end feedingUsing MATALB

12. Symmetrical Fault Analysis in Transmission Lines with two end feedingUsing MATALB

13. Unsymmetrical Fault Analysis in Transmission Lines with single end feedingUsing MATALB

14. Unsymmetrical Fault Analysis in Transmission Lines with two end feedingUsing MATALB

POWER SYSTEMS AND SIMULATION LABORATORY

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P02612 **0 0 3 1.5**
Pre Requisite: Nil

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

1.Estimate the sequence impedances of 3-phase Transformer and Alternators
- Evaluate the performance of transmission lines
- Analyse and simulate power flow methods in power systems
- Analyse and simulate the performance of PI controller for load frequency control.
- Analyse and simulate stability studies of power systems

List of Experiments

Any of 5 experiments are to be conducted from each section:

Section I: Power Systems Lab:

1. Estimation of sequence impedances of 3-phase Transformer
2. Estimation of sequence impedances of 3-phase Alternator by Fault Analysis
3. Estimation of sequence impedances of 3-phase Alternator by Direct method
4. Estimation of ABCD parameters on transmission line model
5. Performance of long transmission line without compensation
6. Performance of long transmission line with shunt compensation
7. Analyze the Ferranti effect on long transmission line

Section II: Simulation Lab

1. Determination of Y_{bus} using direct inspection method
2. Load flow solution of a power system network using Gauss-Seidel method
3. Load flow solution of a power system network using Newton Raphson method.
4. Formation of Z_{bus} by building algorithm.
5. Economic load dispatch with & without losses
6. Load frequency control of a two area Power System without & with PI controller
7. Transient Stability analysis of single machine connected to an infinite bus (SMIB) using equal areacriterion.

MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21P02613 **0 0 3 1.5**
Pre Requisite: Nil

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

1. Write assembly language program using 8086 microprocessor based on arithmetic -Logical -number systems and shift operations.
2. Write assembly language programs for numeric operations and array handling problems.
3. Write a assembly program on string operations.
4. Interface 8086 with I/O and other devices.
5. Do parallel and serial communication using 8051 & PIC 18 micro controllers.
6. Program microprocessors and microcontrollers for real world applications.

List of Experiments

Any 10 of the following experiments are to be conducted:

8086 Microprocessor Programs:

1. Arithmetic operations – Two 16-bit numbers and multibyte addition - subtraction – multiplication and division – Signed and unsigned arithmetic operations - ASCII – Arithmetic operations.
2. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD - BCD to ASCIIconversion.
3. Arrange the given array in ascending and descending order
4. Determine the factorial of a given number
5. By using string operation and Instruction prefix**:** Move block - Reverse string Sorting - Inserting -Deleting - Length of the string - String comparison.
6. Find the first and n^{th} number of 'n' natural numbers of a Fibonacci series.
7. Find the number and sum of even and odd numbers of a given array
8. Find the sum of 'n' natural numbers and squares of 'n' natural numbers
9. Arithmetic operations on 8051
10. Conversion of decimal number to hexa equivalent and hexa equivalent to decimal number
11. Find the Sum of elements in an array and also identify the largest & smallest number of a givenarray using 8051.

Programs on Interfacing:

1. Interfacing 8255–PPI with 8086.
2. Stepper motor control using 8253/8255.
3. Reading and Writing on a parallel port using 8051
4. Timer in different modes using 8051
5. Serial communication implementation using 8051
6. Understanding three memory areas of 00 – FF Using 8051 external interrupts.
7. Traffic Light Controller using 8051.

EMPLOYABILITY SKILLS – II

III-B.Tech-II-Sem.	L	T	P	C
Subject Code : 21S02611	**2**	**1**	**0**	**2**

Pre Requisite: Nil

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

1. make use of soft skills to become a professional team member
2. demonstrate quantitative aptitude concepts
3. apply knowledge of decision making, leadership, motivation
4. adapt principles of quantitative aptitude to achieve qualitative results
5. exhibit confidence in facing the interview process

Unit–I **08 Hours**

Soft Skills: Self awareness and Self esteem, Discipline, Integrity, Attitude, Change and Adaptability.

Quantitative Aptitude:Number Systems: Basic Concepts, Number Systems: Natural numbers, whole numbers, integers, fractions, Rational Numbers, Irrational Numbers, Real Numbers, Divisibility Rules, Logic Equations, Remainder theorem, Unit digit calculation

Unit-II **08 Hours**

Soft Skills:People Skills: Relationships - Personal & Professional Relationships – Rapport Building – Personal Space; Definition of Motivation –Motivation – Self-motivation; Time Management – Stephen Covey's time management.

Quantitative Aptitude:

Profit and Loss: Basic Concepts, discounts, marked price and list price, dishonest shopkeeper with manipulated weights, successive discounts etc.

Interest (Simple and Compound): Basic Concepts, Yearly, Half-yearly, and quarterly calculations, multiples, differences between simple and compound interest.

Ratio and Proportion: Basic Concepts of ratio and proportion, continued or equal proportions, mean proportions, invest proportion, alternative proportion, division proportion, compound proportion,

Unit–III **08 Hours**

Soft Skills: Teamwork: Definition of Team, Team Dynamics – Specialization and Teamwork – Rewards of Teamwork. **Leadership:** Definition of Leadership, Leading a Team, Leadership Qualities – Leader vs Manager – Leadership Styles.

Quantitative Aptitude: Speed, Time and Distance: Basic Concepts, Single train problems, two train problems: **Time and Work:** Basic Concepts, comparative work, mixed work, alternative work, middle leave and middle join, ratio efficiency.

Unit IV **08 Hours**

Soft Skills: Problem Solving and Decision Making: Definitions –Problem Solving and Decision Making – Hurdles in Decision Making - Case studies.**Quantitative Aptitude: Permutations and combinations:** Basic Concepts, differences between permutations and combinations, always together-never together, alternative arrangement

Unit – V **09 Hours**

Soft Skills: Preparation for Interviews: Body Language – Posture - Dressing and Grooming – Researching the Industry and the Organization- Types of Interviews – First Impressions – Dos and Don'ts of an Interview. **Quantitative Aptitude: Geometry and Mensuration:** Basic concepts, types of angles. **Plane figures:** rectangles, squares, triangles, quadrilateral, areas, perimeters, etc. **Solid figures:** cubes, cuboids, cylinders-area (total surface area and lateral surface area), volumes, perimeters.**Others:** Parallelogram, Rhombus, Trapezium, Circle, Sector, Segment, Cone, Sphere, Hemisphere, etc.

INTELLECTUAL PROPERTY RIGHTS & PATENTS

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21M00601 **3 0 0 0**
Pre Requisite: Nil

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

1.know the concept of electric vehicles and hybrid electric vehicles.
2. familiar with different configuration of hybrid electric vehicles.
3. understand the power converters used in hybrid electric vehicles
4.know different batteries and other energy storage systems

Unit-I: **9 hours**

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics – Types of Intellectual Property – Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement – Regulatory – Over use or Misuse of Intellectual Property Rights – Compliance and Liability Issues

Unit-II: **9 hours**

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act

Unit-III: **9 hours**

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

Unit-IV: **8 hours**

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

Unit-V: **8 hours**

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law

Textbooks:

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal “Fundamentals of IPR for Engineers”, BS Publications (Press)

References:

1.M. Ashok Kumar and Mohd. Iqbal Ali: “Intellectual Property Right” Serials Pub
2.Prabhuddha Ganguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
3.Richard Stim: “Intellectual Property”, Cengage Learning, New Delhi.
4.R. Radha Krishnan, S. Balasubramanian: “Intellectual Property Rights”, Excel Books. New Delhi.

IV-B.TECH.-I-SEMESTER SYLLABUS

RENEWABLE ENERGY SYSTEMS

(PROFESSIONAL ELECTIVE – III)

IV-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21L02701	**3**	**1**	**0**	**3**

Pre Requisite: Nil

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

- analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.
- design solar thermal collectors, solar thermal plants.
- design solar photo voltaic systems.
- develop maximum power point techniques in solar PV and wind energy systems.
- explain wind energy conversion systems, wind generators, power generation.
- explain basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

Unit-I: Fundamentals of Energy Systems and Solar Energy **9 hours**

Energy conservation principle – Energy scenario (world and India) – various forms of renewable energy - Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

Unit-II: Solar Photovoltaic Systems **9 hours**

Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Equivalent circuit of solar cell – Series resistance – Shunt resistance – Applications and systems – Balance of system components - System design: storage sizing – PV system sizing – Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique.

Unit-III: Wind Energy **9 hours**

Sources of wind energy - Wind patterns – Types of turbines –Horizontal axis and vertical axis machines - Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking – wind farms – Power generation for utility grids.

Unit-IV: Hydro and Tidal Power Systems **8 hours**

Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Turbines for tidal power - Numerical problems – Wave power – Basics – Kinetic energy equation – Wave power devices – Linear generators.

Unit-V: Biomass, Fuel Cells and Geothermal Systems **8 hours**

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing.

Fuel cell: Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics.

Geothermal: Classification – Dry rock and hot acquifer – Energy analysis – Geothermal based electric power generation.

Textbooks:

1. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition,2013.

2. Non Conventional sources of Energy by G.D.Rai, Kanna Publications

References:

1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press.
2. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
3. Renewable Energy- Edited by Godfrey Boyle-oxford university.press,3rd edition,2013.
4. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.

ELECTRICAL DISTRIBUTION SYSTEMS

(PROFESSIONAL ELECTIVE – III)

IV-B.Tech-I-Sem. **L T P C**

Subject Code : 21L02702 **3 1 0 3**

Pre Requisite: Electrical Power Systems-I

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

1.understand various factors of distribution system.
2.design the substation and feeders.
3.determine the voltage drop and power loss
4.understand the protection and its coordination.
5.understand the effect of compensation forp.f improvement and the effect of voltage control.

Unit-I: General Concepts **9 hours**

Introduction to distribution systems - Distribution system losses – Coincidence factor – Contribution factor loss factor – Numerical Problems – Load Modeling and Characteristics – Relationship between the load factor and loss factor – Classification and charcteristics of loads (Residential, commercial, Agricultural and Industrial).

Unit-II: Substations **9 hours**

Location of substations: Rating of distribution substation – Service area with'n'primary feeders – Benefits and methods of optimal location of substations.

Distribution Feeders

Design Considerations of distribution feeders: Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

Unit-III: Voltage Control **9 hours**

Voltage drop and power–loss calculations: Derivation for voltage drop and power loss in lines – Uniformly distributed loads and non-uniformly distributed loads – Numerical problems – Three phase balanced primary lines.

Voltage Control: Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR – Line drop compensation – Numerical problems.

Sub Station Automation: Substation control background, Modern substations, Digital substation, autoconfiguration and standards, Substation information collection, Substation technologies: Redundancy, time stamping, time synchronization, logs.

Unit-IV: Protection, Coordination & Automation **8 hours**

Objectives of distribution system protection –Time current characteristics – Protective devices: Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers, Modulated case circuit breakers, Earth leakage circuit breakers – Protection schemes of parallel & Ringmain feeders.

Coordination of protective devices: General coordination procedure –Various types of co-ordinated operation of protective devices - Residual Current Circuit Breaker Automation: Block diagram approach of SCADA.

Unit-V: Energy Management Systems **8 hours**

Energy Management – Definitions and significance – objectives –Characterising of energy usage – Energy Management program – Energy strategies and energy planning Energy Audit – Types and Procedure – Optimum performance of existing facilities – Energy management control systems – Computer applications in Energy management.

Textbooks:

1."Electric Power Distribution system, Engineering" – by TuranGonen,McGraw–hill Book Company.

References:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo,CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing,Company, 4th edition, 1997.
3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.

HIGH VOLTAGE ENGINEERING

(PROFESSIONAL ELECTIVE – III)

IV-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21L02703	**3**	**1**	**0**	**3**

Pre Requisite: Nil

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

1.Recognise the dielectric properties of gaseous materials used in HV equipment.

2.Differentiate the break down phenomenon in liquid and solid dielectric materials.

3.Acquaint with the techniques of generation of high AC and DC voltages

4.Acquaint with the techniques of generation of high Impulse voltages and currents.

5.Getting the knowledge of measurement of high AC - DC - Impulse voltages and currents.

Unit-I: **9 hours**

Break down phenomenon in Gaseous:

Insulating Materials: Types - applications and properties. Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases and its limitations – Streamers Theory of break down – Paschen's law- Paschens curve.

Unit-II: **9 hours**

Break down phenomenon in Liquids:

Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquids.

Break down phenomenon in Solids:

Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of compositesolid dielectrics.

Unit-III: **9 hours**

Generation of High DC Voltages:

Voltage Doubler Circuit - Voltage Multiplier Circuit – Vande- Graaff Generator.

Generation of High AC Voltages:

Cascaded Transformers – Resonant Transformers –Tesla Coil

Unit - IV

Generation of Impulse Voltages:

Specifications of impulse wave – Analysis of RLC circuit only- Marx Circuit.

Generation of Impulse Currents:

Definitions – Circuits for producing Impulse current waves – Wave shape control -Tripping and controlof impulse generators.

Unit-V: **8 hours**

Measurement of High DC & AC Voltages:

Resistance potential divider - Generating Voltmeter - Capacitor Voltage Transformer (CVT) -Electrostatic Voltmeters – Sphere Gaps.

Measurement of Impulse Voltages & Currents:

Potential dividers with CRO - Hall Generator - Rogowski Coils.

Textbooks:

1.High Voltage Engineering: Fundamentals by E.Kuffel - W.S.Zaengl - J.Kuffel by Elsevier - 2nd Edition.

2.High Voltage Engineering and Technology by Ryan - IET Publishers - 2nd edition.

Reference Books:

1.High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications - 3rd Edition.

2.High Voltage Engineering by C.L.Wadhwa - New Age Internationals (P) Limited – 1997.

3.High Voltage Insulation Engineering by RavindraArora - Wolfgang Mosch - New Age International (P) Limited - 1995.

UTILIZATION OF ELECTRICAL ENERGY

(PROFESSIONAL ELECTIVE – IV)

IV-B.Tech-I-Sem. **L T P C**

Subject Code : 21L02704 **3 1 0 3**

Pre Requisite: Electrical Machines-I,II

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

1.Identify various illumination methods produced by different illuminating sources.

2.Identify a suitable motor for electric drives and industrial applications

3.Identify most appropriate heating and welding techniques for suitable applications.

4.Distinguish various traction system and determine the tractive effort and specific energy consumption.

5.Validate the necessity and usage of different energy storage schemes for different applications and comparisons.

Unit-I: **9 hours**

Illumination fundamentals

Introduction - terms used in illumination–Laws of illumination–Polar curves–Integrating sphere–Lux meter–Sources of light.

Various Illumination Methods

Discharge lamps - MV and SV lamps – Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Types and design of lighting and flood lighting–LED lighting - Energy conservation.

Unit-II: **9 hours**

Electrical Motor Drives

Choice of Motor - Type of Electric Drives - Starting And Running Characteristics – Speed Control– Temperature Rise – Applications of Electric Drives–Types of Industrial Loads–Continuous–Intermittent And Variable Loads–Load Equalization - Introduction To Energy Efficient Motors.

Unit-III: **9 hours**

Electric Heating

Advantages and methods of electric heating–Resistance heating induction heating and dielectric heating.

Electric Welding

Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding.

Unit-IV: **8 hours**

Electric Traction

System of electric traction and track electrification– Review of existing electric traction systems in India–Special features of traction motor– Mechanics of train movement–Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves. Calculations of tractive effort– power – Specific energy consumption for given run–Effect of varying acceleration and braking retardation– Adhesive weight and braking retardation adhesive weight and coefficient of adhesion-Numericalproblems.

Unit-V: **8 hours**

Introduction to Energy Storage Systems

Need For Energy Storage - Types of Energy Storage-Thermal - Electrical - Magnetic And ChemicalStorage Systems - Comparison of Energy Storage Technologies-Applications.

Textbooks:

1. Utilization of Electric Energy – by E. Openshaw Taylor - Orient Longman.
2. A First Course On Electrical Drives – by S.K. Pillai- New Age International Publishers.

References:

1. Utilization ofElectrical Power including Electric drivesand Electric traction –by N.V.Suryanarayana - New Age International (P) Limited - Publishers - 1996.
2. Generation -Distribution and Utilization of electrical Energy – by C.L. Wadhwa -

New AgeInternational (P) Limited - Publishers - 1997.
3.“Thermal energy storage systems and applications”-by Ibrahim Dincer and Mark A.Rosen. JohnWiley and Sons 2002.

POWER QUALITY

(PROFESSIONAL ELECTIVE – IV)

IV-B.Tech-I-Sem. **L T P C**

Subject Code : 21L02705 **3 1 0 3**

Pre Requisite: Nil

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

1.differentiate between different types of power quality problems.

2.explain the sources of voltage sag, voltage swell, interruptions, transients, long duration over voltages and harmonics in a power system.

3.analyze power quality terms and power quality standards.

4.explain the principle of voltage regulation and power factor improvement methods.

5.demonstrate the relationship between distributed generation and power quality.

Unit-I: **9 hours**

Introduction

Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long–duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations

Unit-II: **9 hours**

Voltage Imperfections in Power Systems

Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag,swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

Unit-III: **9 hours**

Voltage Regulation and Power Factor Improvement:

Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application –Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

Unit-IV: **8 hours**

Harmonic Distortion and Solutions

Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices –Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers,motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

Unit-V: **8 hours**

Distributed Generation

Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts.

Power Quality Monitoring and Compensation :

Power quality monitoring and considerations – Historical perspective of Power quality measuring instruments – Power quality measurement equipment – Assessment of Power quality measuring data.

Static VAR compensators-SVC and STATCOM - series active power filtering techniques for harmonic cancellation and isolation, Dynamic Voltage Restorers for sag , swell and flicker problems.

Textbooks:

1.Electrical Power Systems Quality, Dugan R C, Mc Granaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.

2. Electric power quality problems –M.H.J.Bollen IEEE series-Wiley India publications,2011.

Reference Books:

1. Power Quality Primer, Kennedy B W, First Edition, Mc Graw–Hill, 2000.
2. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ,First Edition, IEEE Press; 2000.
3. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley &Sons, 2003.
4.Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad Reinhold, New York.

ANN AND FUZZY-LOGIC

(PROFESSIONAL ELECTIVE – IV)

IV-B.Tech-I-Sem. **L T P C**

Subject Code : 21L02706 **3 1 0 3**

Pre Requisite: Nil

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

1. Analyse different models of artificial neuron & Use learning methods of ANN.
2. Evaluate different paradigms of ANN.
3. Classify between classical and fuzzy sets.
4. Illustrate different modules of Fuzzy logic controller.
5. Apply Neural Networks and fuzzy logic for real-time applications.

Unit-I: **9 hours**

Introduction

Artificial Neural Networks (ANN) – Humans and computers – Biological neural networks – ANN Terminology – Models of Artificial neuron – activation functions – typical architectures – biases and thresholds – learning strategy(supervised - unsupervised and reinforced) – Neural networks learning rules. Single layer feed forward neural networks: concept of pattern and its types - perceptron training and classification using Discrete and Continuous perceptron algorithms– linear separability- XOR function.

Unit-II: **9 hours**

Multi-layer feed forward networks

Generalized delta rule– Back Propagation algorithm– Radial Basis Function (RBF) network - Kohonen's self- organizing feature maps (KSOFM) - Learning Vector Quantization (LVQ) – Bidirectional Associative Memory (BAM) – Hopfield Neural Network.

Unit-III: **9 hours**

Classical Sets and Fuzzy Sets

Introduction to classical sets- properties - Operations and relations - Fuzzy sets - Operations - Properties - Fuzzy relations - Cardinalities - Membership functions.

Unit-IV: **8 hours**

Fuzzy Logic Modules

Fuzzification - Membership value assignment - development of rule base and decision making system - Defuzzification to crisp sets - Defuzzification methods.

Unit-V: **8 hours**

Applications

Neural network applications: Load flow studies - load forecasting - reactive power control.

Fuzzy logic applications: Economic load dispatch - speed control of DC motors - single area and twoarea load frequency control.

Textbooks:

1. Introduction to Artificial Neural Systems - Jacek M. Zuarda - Jaico Publishing House - 1997.
2. NeuralNetworks-Fuzzylogic -Geneti algorithms:synthesis and applications by Rajasekharan and Pai – PHI Publication.

Reference Books:

1. Artificial Neural Network – B.Yegnanarayana - PHI - 2012.
2. Fuzzy logic with Fuzzy Applications – T.J Ross – Mc Graw Hill Inc - 1997.
3. Introduction to Neural Networks using MATLAB 6.0 – S N Sivanandam - SSumathi - S N DeepaTMGH
4. Introduction to Fuzzy Logic using MATLAB – S N Sivanandam - SSumathi - S N Deepa Springer- 2007.

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS

(PROFESSIONAL ELECTIVE – V)

IV-B.Tech-I-Sem. **L T P C**

Subject Code : 21L02707 **3 1 0 3**

Pre Requisite: Nil

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

1.Know the concepts of facts controller and power flow control in transmission line.
2.Demonstrate operation and control of voltage source converter and know the concepts currentsource converter.
3. Analyse compensation by using different compensators to improve stability and reduce poweroscillations in the transmission lines.
4. Know the concepts methods of compensations using series compensators.
5. Analyse operation of Unified Power Flow Controller (UPFC) and Interline power flow controller(IPFC).

Unit-I: **9 hours**

Introduction to FACTS

Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.

Unit-II: **9 hours**

Voltage source and Current source converters

Voltage source converter (VSC) – Single phase full-wave bridge converter – Square wave voltage harmonics for a single–phase bridge converter – Three–phase full-wave bridge converter - Transformer connections for 12 pulse operation.

Current Source Converter (CSC)-Three–phase current source converter – Comparison of current source converter with voltage source converter.

Unit-III: **9 hours**

Shunt Compensators

Objectives – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

Variable Impedance Type VAR Generator: Thyristor Switched/Controlled Reactor (TSR/TCR) – Thyristor Switched Capacitor (TSC) – Fixed Capacitor–Thyristor Controlled Reactor (FC-TCR) - Thyristor Switched Capacitor and Thyristor Controlled Reactor (TSC–TCR) - Switching Converter type VAR generator.

Principle of operation and comparison of SVC and STATCOM.

Unit - IV

Series Compensators

Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. Variable Impedance type series compensators – GTO Thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC) - Switching Converter type Series Compensation – Static Synchronous Series Compensator.

Unit-V: **8 hours**

Combined Compensators

Schematic and basic operating principles of unified power flow controller (UPFC) and Interline powerflow controller (IPFC) – Controller applications of transmission lines and UPQC.

Textbooks:

1.“Understanding FACTS” N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition isavailable:––Standard Publications, 2001.

Reference Books:

1.“Flexible ac transmission system (FACTS)” Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.

2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R. Mohan Mathur and Rajiv K.Varma, Wiley.

SPECIAL ELECTRICAL MACHINES

(PROFESSIONAL ELECTIVE – V)

IV-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21L02708	**3**	**1**	**0**	**3**

Pre Requisite: Electrical Machines-I,II

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

1. distinguish between brush dc motor and brush less dc motor.
2. explain the performance and control of stepper motors, and their applications.
3. explain theory of operation and control of switched reluctance motor.
4. explain the theory of travelling magnetic field and applications of linear motors.
5. understand the significance of electrical motors for traction drives.

Unit-I: Permanent Magnet Materials and PMDC Motor **9 hours**

Introduction-classification of permanent magnet materials used in electrical machines-minor hysteresis loop and recoil line-Stator frames of conventional dc machines-Development of electronically commutated dc motor from conventional dc motor-Permanent-magnet materials and characteristics-B-H loop and demagnetization characteristics-high temperature effects-reversible losses-Irreversible losses-Mechanical properties, handling and magnetization-Application of permanent magnets in motors-power density-operating temperature range-severity of operation duty.

Unit-II: Stepper Motors **9 hours**

Principle of operation of Stepper Motor – Constructional details - Classification of stepper motors – Different configuration for switching the phase windings - Control circuits for stepper motors – Open loop and closed loop control of two phase hybrid stepping motor.

Unit-III: Switched Reluctance Motors **9 hours**

Construction and Principle of operation of Switched Reluctance Motor – Comparison of conventional and switched reluctance motors – Design of stator and rotor pole arcs – Torque producing principle and torque expression – Different converter configurations for SRM – Drive and power circuits for SRM – Position sensing of rotor – Applications of SRM.

Unit-IV: Permanent Magnet Brushless DC Motor **8 hours**

Principle of operation of BLDC motor - Types of constructions - Surface mounted and interior type permanent magnet DC Motors - Torque and EMF equations for Square wave & Sine wave for PMBLDC Motor – Torque - Speed characteristics of Square wave & Sine wave for PMBLDC Motor - Merits & demerits of Square wave & Sine wave for PMBLDC Motor - Performance and efficiency – Applications.

Unit-V: Linear Induction Motors (LIM) **8 hours**

Construction– principle of operation–Double sided LIM from rotating type Induction Motor – Schematic of LIM drive for traction – Development of one sided LIM with back iron- equivalent circuit of LIM.

Textbooks:

1. Brushless Permanent magnet and reluctance motor drives, Clarenden press,T.J.E. Miller, 1989, Oxford.
2. Special electrical Machines, K.VenkataRatnam, University press, 2009, NewDelhi.

ELECTRIC DRIVES

(PROFESSIONAL ELECTIVE – V)

IV-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21L02709	**3**	**1**	**0**	**3**

Pre Requisite: Power Electronics, Electrical Machines-I,II

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

1. Explain the fundamentals of electric drive and different electric braking methods.
2. Analyze the operation of three-phase converter fed dc motors and four quadrant operations of dcmotors using dual converters.
3. Describe the DC-DC converter fed control of dc motors in various quadrants of operation
4. Know the concept of speed control of induction motor by using AC voltage controllers andvoltage source inverters and differentiate the stator side control and rotor side control.
5. Learn the concepts of speed control of synchronous motor with different methods.

Unit-I: 9 hours

Fundamentals of Electric Drives

Electric drive and its components– Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic – Plugging – Regenerative methods.

Unit-II: 9 hours

Controlled Converter Fed DC Motor Drives

3-Phase half and fully-controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Dual converter fed DC motor drives -Numerical problems.

Unit-III: 9 hours

DC–DC Converters Fed DC Motor Drives

Single quadrant, two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current mode of operation - Output voltage and current waveforms – Speed– torque expressions and characteristics – Closed loop operation (qualitative treatment only).

Unit - IV

Stator and Rotor Side Control of 3-Phase Induction Motor Drive 8 hours

Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – Closed loop V/f control of induction motor drives (qualitative treatment only). Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics.

Unit-V: 8 hours

Control of Synchronous Motor Drives

Separate control of synchronous motor – self-control of synchronous motor employing load commutated thyristor inverter - closed loop control of synchronous motor drive (qualitative treatment only)– PMSM (Basic operation only).

Textbooks:

1. Fundamentals of Electric Drives – by G K Dubey - Narosa Publications - 2nd edition – 2002.
2. Power Semiconductor Drives - by S.B.Dewan - G.R.Slemon - A.Straughen -Wiley India -1984.

Reference Books:

1. Electric Motors and Drives Fundamentals - Types and Apllications - by Austin Hughes and BillDrury - Newnes.4th edition - 2013.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications -1987.
3. Power Electronic Circuits - Devices and applications by M.H.Rashid - PHI - 3rd edition - 2009.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (OPEN ELECTIVE -III)

	L	T	P	C
Subject Code: 21N04702	**3**	**0**	**0**	**3**

Pre Requisite: NIL

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

1. measure electrical parameters with different meters and understand the basic definition of measuring parameters
2. use various types of signal generators, signal analyzers for generating and analyzing various real- time signals.
3. operate an Oscilloscope to measure various signals.
4. measure various physical parameters by appropriately selecting the transducers.
5. identify the usage of Various types of bridges

Unit-1: Measuring Instruments **06 hours**

DC Voltmeters, D"Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

Unit-2: Signal Analyzers **08 hours**

AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.

Unit-3: Signal Generators **08 hours**

AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

Unit-4: Oscilloscopes **08 hours**

CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Unit-5: Special Purpose Oscilloscopes **08 hours**

Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

Text Books:

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D. Cooper: PHI 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

References Books:

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, DhanpatRai & Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.

GREEN BUILDINGS
(OPEN ELECTIVE- III)

L T P C

Subject Code: **3 0 0 3**

Pre Requisite: Nil

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

1. understand the concepts of green buildings
2. explain the sustainability.
3. define renewable energy conservation through material usage.
4. explain the Eco House system
5. designing green buildings.

Unit-I: INTRODUCTION **9 hours**

A historical perspective. General premises and strategies for sustainable and green design, objectives and basis. Bio-mimicry as a design tool based on ecosystem analogy.

Unit-II: GREEN CONSTRUCTION AND ENVIRONMENTAL QUALITY **9 hours**

Sustainable architecture and Green Building: Definition, Green building evaluation systems; LEED Certification; Green Globe Certification; Case studies which look at the environmental approach; Renewable Energy; Controlling the water cycle, Impact of materials on environment; Optimizing construction; Site management; Environmental management of buildings.

Unit-III: PASSIVE DESIGN IN MATERIALS **9 hours**

Passive Design and Material Choice – Traditional Building Materials – Importance of envelope material in internal temperature control – Specification for walls and roofs in different climate –Material and Humidity Control.

Unit-IV: ECO HOUSE **9 hours**

The form of the house, the building as an analogy. Building concepts: energy loss, insulation, passive solar gain, active solar gain, health benefits, and sustainable materials. Small scale wind and hydro power systems.

Case study of eco house.

Unit-V: SUSTAINABLE AND GREEN BUILDING DESIGN **9 hours**

This studio will explore collaborative learning to explore, investigate and apply various parameters of sustainability for design development of projected building/ urban scenarios.

Textbooks:

1. Ken Yeang: Eco Design- A manual for Ecological design; Wiley Academy, 2006.
2. Sue Roaf et all: Ecohouse, A design guide; Elsevier Architectural Press, 2007.

References:

1.Thomas E Glavinich: Green Building Construction; Wiley, 2008.
2. Brenda and Robert Vale: Green Architecture, Design for a Sustainable Future; Thames and Hudson, 1996.

Web Reference:

1. https://igbc.in/

INTRODUCTION TO INTERNET OF THINGS
(OPEN ELECTIVE- III)

L T P C
3 0 0 3

Course Outcomes: By the end of the course, the student will be able to
1. describe the usage of the term 'the internet of things' in different contexts
2. discover the various network protocols used in IoT and familiar with the key wireless technologies used in IoT systems, such as Wi-Fi, 6LoWPAN, Bluetooth and ZigBee
3. define the role of big data, cloud computing and data analytics in a typical IoT system
4. design a simple IoT system made up of sensors, wireless network connection, data analytics and display/actuators, and write the necessary control software
5. build and test a complete working IoT system

UNIT-I: **9 hours**

The Internet of Things: An Overview of Internet of Things, Internet of Things Technology, behind IoTs Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices.

UNIT-II: **10hours**

Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

UNIT-III: **10hours**

Design Principles for the Web Connectivity for connected - Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

UNIT-IV: **10hours**

Data link layer of IoT, Wireless Communication Technologies, Wired Communication Technologies, Manet Networks: Network Layer of IoT, 6lowPAN adaptation layer for devices with limited resources, Dynamic routing protocols for wireless adhoc networks
Communication protocols for IoT, Service oriented protocol(COAP),Communication protocols based on the exchange of messages(MQTT), Service discovery protocols.

UNIT-V: **9hours**

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/ Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

TextBooks:

1) Internet of Things: Architecture, Design Principles And Applications, Raj kamal, McGraw Hill Higher Education.
2) Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015.

ReferenceBooks:

1) An Introduction to Internet of Things, Connecting devices, Edge Gateway and Cloud with Applications, Rahul Dubey, Cengage, 2019.
2) IoT Fundamentals, Networking Technologies, Protocols and Use Cases for the Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetette, rob Barton, Jerome Henry, CISCO,Pearson,2018.
3) Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley

FUNDAMENTALS OF ROBOTICS
OPEN ELECTIVE- III

IV-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : *	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. illustrate principles and functioning of the robot
2. perform kinematic analysis for end-effector positioning
3. integrate mechanical and electrical hardware for robot with feedback control
4. design control laws for a robot
5. develop robot programming for various applications

Unit-I **10 hours**

Introduction to Robotics: Types and components of a robot, Classification of robots, classification with respect to geometrical configuration (anatomy), closed-loop and open- loop control systems. Social issues and safety.

Unit-II **09 hours**

Robot Kinematics: Kinematics systems, Definition of mechanisms and manipulators, Kinematic Modelling: Translation and Rotation Representation, Coordinate transformation, Homogeneous Coordinate representation, DH parameters.

Unit-III **09 hours**

Sensors and Vision System: Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc., Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations Vision applications in robotics.

Robot Actuation Systems: Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators.

Unit –IV **10 hours**

Robot Control: Basics of control: Transfer functions, Control laws: P, PD, PID, Non-linear and advanced controls.

Unit-V **09 hours**

Control Hardware and Interfacing: Embedded systems: Architecture and integration with sensors, actuators, components, Programming for Robot Applications.

Textbooks:

1. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi.
2. Mittal R.K. and Nagrath I.J., “Robotics and Control”, Tata McGraw Hill.

References:

1. Saha, S.K., “Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, 2014.
2. Ghosal, A., “Robotics”, Oxford, New Delhi, 2006.

SUSTAINABILITY CONCEPTS IN CIVIL ENGINEERING
(OPEN ELECTIVE-IV)

L T P C

Subject Code: **3 0 0 3**

Pre Requisite: Nil

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

1. able to understand the component of building with their function
2. learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.
3. quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.
4. understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.
5. make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

Unit-I: **9 hours**

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.

Unit-II: **9 hours**

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking.

Unit-III: **9 hours**

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport

Unit-IV: **9 hours**

Clean Technology and Energy: Energy sources: Basic Concepts- Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting.

Unit-V: **9 hours**

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

Textbooks:

1. Allen, D.T. and S honnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo, A. O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

References:

1. Mackenthun, K. M. Basic Concepts in Environmental Management, Lewis Publication.
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications Rating System, TERI Publications - GRIHA Rating System.
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English

DATA SCIENCE
(OPEN ELECTIVE-IV)

L T P C
3 0 0 3

Course Outcomes: By the end of the course, the student will be able to
1.describe what Data Science is and the skill sets needed to be a data scientist
2.illustrate in basic terms what Statistical
Inference means. Identify probability
distributions commonly used as foundations for statistical modelling, Fit a model to data
3.use R to carry out basic statistical modeling and analysis
4.apply basic tools (plots, graphs, summary statistics) to carry out EDA
5. describe the Data Science Process and how its components interact

UNIT-I: **10hours**

Introduction, The Ascendance of Data, Motivating Hypothetical: Data Sciencester, Finding Key Connectors, The Zen of Python, Getting Python, Virtual Environments, White space Formatting, Modules, Functions, Strings, Exceptions, Lists, Tuples, Dictionaries defaulted , Counters, Sets, Control Flow, Truthiness, Sorting, List Comprehensions, Automated Testing and assert, Object Oriented Programming, Iterables and Generators, Randomness, Regular Expressions, Functional Programming, zip and Argument Unpacking, args and kwargs, Type Annotations, How to Write Type Annotations.

UNIT-II: **10hours**

Visualizing Data: matplotlib, Bar Charts, Line Charts, Scatterplots. Linear Algebra: Vectors,
Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some
Other Correlational Caveats, Correlation and Causation. Gradient Descent: The Idea Behind Gradient Descent, Estimating the Gradient, Using the Gradient, Choosing the Right Step Size, Using Gradient Descent to Fit Models, Minibatch and Stochastic Gradient Descent.

UNIT-III: **10hours**

Getting Data: stdin and stdout, Reading Files, Scraping the Web, Using APIs,Working with Data: Exploring Your Data Using Named Tuples, Data classes, Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction. Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem

UNIT-IV: **9hours**

Machine Learning: Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance
Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naïve Bayes, Simple Linear
Regression, Multiple Regression, Digression, Logistic Regression

UNIT-V: **10hours**

Clustering: The Idea, The Model, Choosing k, Bottom-Up Hierarchical Clustering.
Recommender Systems: Manual Curation, Recommending What's Popular, User-Based
Collaborative Filtering, Item-Based Collaborative Filtering, Matrix Factorization
Data Ethics, Building Bad Data Products, Trading Off Accuracy and Fairness,
Collaboration, Interpretability, Recommendations, Biased Data, Data Protection
IPython, Mathematics, NumPy, pandas, scikit-learn, Visualization,

Text books:

1) Joel Grus, "Data Science From Scratch", OReilly.
2) Allen B.Downey, "Think Stats", OReilly.

Reference Books:

1)Doing Data Science: Straight Talk From The Frontline, 1st Edition, Cathy O'Neil and
Rachel Schutt, O'Reilly, 2013
2)Mining of Massive Datasets, 2nd Edition, Jure Leskovek, Anand Rajaraman and Jeffrey
Ullman, v2.1, Cambridge University Press, 2014

ENGINEERING MATERIALS
(OPEN ELECTIVE-IV)

IV-B.Tech-I-Sem. **L T P C**
Subject Code : * **3 0 0 3**

Pre Requisite: Nil

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

1. explain the concepts of structure of metals and constitution of alloys
2. analyze the material properties of ferrous alloys
3. classify the materials based on properties
4. explain steels and classification of steels
5. outline the properties and applications of ceramic and composite materials

Unit – I **9 hours**

Structure of Metals: Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.
Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

Unit –II **10 hours**

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons.

Unit–III **09 hours**

Classification of steels, structure and properties of plan carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

Unit – IV **10 hours**

Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

Unit – V **10 hours**

Ceramic materials: Crystalline ceramics, glasses, cermets, abrasive materials, nonomaterials – definition, properties and applications of the above.
Composite materials: Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal – matrix composites.

Textbooks:

1. Introduction to Physical Metallurgy, Sidney H. Avener.
2. Material science & Metallurgy, Kodgire

References:

1. Science of Engineering Materials, Agarwal
2. Elements of Material science, V. Rahghavan
3. Callister's Materials Science and Engineering adopted by R. Balasubramaniam

FUNDAMENTALS OF AUTOMOBILE ENGINEERING
(Open Elective IV)

IV-B.Tech-I-Sem. **L T P C**
Subject Code : * **3 0 0 3**

Pre Requisite: Nil

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

1. identify power generation, transmission and control mechanisms in an automobile
2. manipulate the chemical, thermal, mechanical and electrical energies in an automobile
3. infer the interaction between subsystems
4. analyze how transmission system works
5. learn different components of suspension systems.

Unit-I **10 hours**

Introduction: Components of four-wheeler automobile – chassis and body – power unit – power transmission rear wheel drive, front wheel drive, 4-wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, re boring, decarburization.

Unit-II **10 hours**

Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps – Carburetor – types – air filters – petrol injection. **C.I. Engines:** Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel, pumps.**Cooling System:** Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

Unit-III **10 hours**

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Unit-IV **10 hours**

Transmission System: Clutches, principle, types- cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter.

Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types – wheels and tyres.

Steering System: Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism

Unit-V **10 hours**

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system. **Braking System:** Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

Text books

1. Automobile Engineering, Vol. 1 & Vol. 2/ Kripal Singh
2.Automobile Engineering, Vol. 1 & Vol. 2 ,by K.M Gupta,Umesh publication

References

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing Pvt Ltd.
2. Automobile Engineering / William Crouse

HUMANITIES AND SOCIAL SCIENCES
(ELECTIVE)

IV-B.Tech-I-Sem.	L	T	P	C
Subject Code : 21H03701	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

SUMMER INTERNSHIP

IV-B.Tech-I-Sem.	L	T	P	C
Subject Code : 21P02721	**0**	**0**	**0**	**1.5**

Pre Requisite: Nil

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

PYTHON PROGRAMMING LABORATORY

IV-B.Tech-I-Sem. **L T P C**
Subject Code : 21S02711 **0 0 3 1.5**
Pre Requisite: Nil

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

Write, Test and Debug Python Programs
Use Conditionals and Loops for Python Programs
Use functions and represent Compound data using Lists, Tuples and Dictionaries Use various applications using python

List of Experiments

1. Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2. Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and averageof the three numbers and print out the values of total and average.
3. Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86,89.
4. Writeaprogram that asks theuserfortheirnameandhowmanytimestoprintit.The program should print out the user's name the specified number of times.
5. Use a *for* loop to print a triangle like the one below. Allow the user to specify howhigh the triangle should be.

```
*
**
***
****
```

6. Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7. Write a program that asks the user for two numbers and prints *Close* if the numbersare within .001 of each other and Not close otherwise.
8. Write a program that asks the user to enter a word and prints out whether that wordcontains any vowels.
9. Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out*AaBbCcDdEe*.
10. Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be1,000,000.
11. In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4yor 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
12. Write a program that generates a list of 20 random numbers between 1 and100.

a.Print the list.
b.Print the average of the elements in the list.

c.Print the largest and smallest values in the list.
d.Print the second largest and second smallest entries in the list
e.Print how many even numbers are in the list.

13. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.

14. Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is4.

15. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become[1,2,3,4,0].

16. Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimeters, centimeters, meters, or kilometers. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, itis much shorter with lists and it is also easier to add new conversions if you use lists.

17. Write a function called *sum_digits* that is given an integer num and returns the sumof the digits of num.

18. Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return-1.

19. Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.

20Write a function called *is_sorted* that is given a list and returns True if the list issorted and False otherwise.

21. Write a function called root that is given a number x and an integer n andreturns $x^{1/n}$. In the function definition, set the default value of n to2.

22. Write a function called primes that is given a number n and returns a list of the firstn primes. Let the default value of n be100.

23. Write a function called merge that takes two already sorted lists of possiblydifferent lengths, and merges them into a single sorted list.
a.Do this using the sort method.
(b) Do this without using the sort method.

24)Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in asmaller word can't exceed the number of occurrences of the letter in the user's word.

25. Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.

26. Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.

27. Write a class called Product. The class should have fields called name, amount, and holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns a the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.

28. Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called *convert_to_hours* that returns a string of hours, minutes, and seconds formatted analogously to

the previous method.

29. Write a class called Converter. The user will pass a length and a unit whendeclaring an object from the class for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the lengthconverted into those units. For example, using the Converter object created above, the user could call c. feet() and should get 0.75 as the result.
30. Write a Python class to implement pow(x,n).
31. Write a Python class to reverse a string word byword.

32. Write a program that opens a file dialog that allows you to select a text file. Theprogram then displays the contents of the file in a textbox.
33. Write a program to demonstrate Try/except/else.
34. Write a program to demonstrate try/finally and with/as.
35. Determination of Y_{bus} using direct inspection method
36. Load flow solution of a power system network using Gauss-Seidel method
37. Load flow solution of a power system network using Newton Raphson method.

IV-B.TECH.-II-SEMESTER SYLLABUS

SEMINAR

IV-B.Tech-II-Sem.	L	T	P	C
Subject Code : 21P02831	**0**	**0**	**0**	**1**

Pre Requisite: Nil

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

PROJECT WORK

IV-B.Tech-II-Sem.	L	T	P	C
Subject Code : 21P02821	**0**	**0**	**18**	**10**

Pre Requisite: Nil

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