ACADEMIC REGULATIONS & CURRICULUM

Applicable to the students admitted from the Academic Year 2019-2020

ELECTRICAL AND ELECTRONICS ENGINEERING

(B.Tech. Programme)

MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING

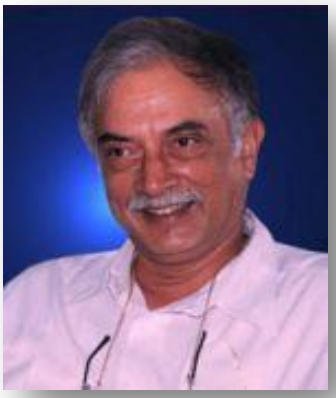
(Autonomous)

(Approved by AICTE, New Delhi, and permanently affiliated to JNTUK, Kakinada)
Listed u/s 2(f) & 12(B) of UGC Act 1956.
Vijayaram Nagar Campus, Chintalavalasa,Vizianagaram-535005, Andhra Pradesh

The visionaries

Late Dr. P V G Raju
Raja Saheb of Vizianagaram
Founder Chairman-MANSAS
Ex-Minister for Education and Health, Govt. of AP
Ex Member of Parliament

Late Dr. P. Anand Gajapathi Raju
Ex-Chairman-MANSAS
Ex-Minister for Education and Health
Govt. of AP
Ex Member of Parliament



P. Ashok Gajapathi Raju
Chairman-MANSAS
Ex-Union Minister for Civil Aviation,
Govt. of India
Ex-Minister for Finance, Govt. of AP

Vision

Maharaj Vijayaram Gajapathi Raj College of Engineering strives to become a centre par excellence for technical education where aspiring students can be transformed into skilled and well-rounded professionals with strong understanding of fundamentals, a flair for responsible innovation in engineering practical solutions applying the fundamentals, and confidence and poise to meet the challenges in their chosen professional spheres.

Mission

The management believes imparting quality education in an atmosphere that motivates learning as a social obligation which we owe to the students, their parents/guardians and society at large and hence the effort is to leave no stone unturned in providing the same with all sincerity. Towards that end, the management believes special focus has to be on the following areas:

M1: Have on-board staff with high quality experience and continuously updating themselves with latest research developments and sharing that knowledge with students.

M2: Having a well stream-lined teaching learning process that is continuously assessed for effectiveness and fine-tuned for improvement.

M3: Having state-of-the-art lab and general infrastructure that gives students the necessary tools and means to enhance their knowledge and understanding.

M4: Having a centralized department focused on improving placement opportunities for our students directly on campus and coordinating the training programs for students to complement the curriculum and enhance their career opportunities.

M5: Having advanced research facilities and more importantly atmosphere to encourage students to pursue self-learning on advanced topics and conduct research.

ABOUT THE INSTITUTION:

Maharajah Alak Narayan Society of Arts and Science (MANSAS) is an Educational Trust founded by Dr. (late) P.V.G Raju, Raja Saheb of Vizianagaram in the hallowed memory of his father Maharajah Alak Narayan Gajapati with a view to confound socio-economic inequalities in the Vizianagaram principality executing a trust deed on 12-11-1958 duly established Maharajah's College and other educational institutions in and around Vizianagaram. The Trust is a charitable one published under Section 6 a (1) of A.P Charitable and Hindu Religious Institutions and Endowment Act 30 of 1987.

The object of the Trust is to manage the properties of educational institutions under it and to promote and advance the cause of education in general, besides awarding scholarships to deserving students enabling them to undergo special training in science and industries in and out of India. The Trust has made an uncompromising contribution to the nation by presenting the stalwarts.

Trust offers KG to PhD level education in Arts, Sciences, Law, Pharmacy, Humanities Education, Engineering and Management and presently houses 13 Educational Institutions. MVGR College of Engineering is one of the 13 Institutes.

Other Institutions under MANSAS

1. M.R. HIGH SCHOOL 1857
2. M.R COLLEGE **(NAAC ACCREDITED)** 1879
3. M.R. COLLEGE OF EDUCATION 1950
4. M.R. WOMENS COLLEGE **(NAAC ACCREDITED)** 1962
5. M.R. GIRLS HIGH SCHOOL 1974
6. M.R. MODEL HIGH SCHOOL 1974
7. M.R. ENGLISH MEDIUM SCHOOL 1979
8. M.R.V.R.G.R LAW COLLEGE 1987
9. M.R. P.G. COLLEGE **(NAAC ACCREDITED)** 1987
10. M.R.SCHOOL OF MANAGEMENT STUDIES 1994
11. M.R.V.R.G.R – II MEMORIAL JR. COLLEGE 1994
12. M.R. COLLEGE OF PHARMACY 2004

Maharaj Vijayaram Gajapathi Raj (MVGR) College of Engineering was established in the year 1997 by Maharaj Alak Narayan Society for Arts and Sciences (MANSAS) to impart quality technical education. The Institution is located in lush green, serene and pollution free environment spread over 60 acres of land in Chintalavalasa village situated in the outskirts of Vizianagaram, a fort city in the north coastal region of Andhra Pradesh.

Institution at a glance:

- MVGR is a 23 years old institution, established in 1997
- All eligible UG Programs (CHEMICAL, CIV, CSE, ECE, EEE, IT & MECHANICAL) were reaccredited by NBA.
- MBA program was also re-accredited by NBA.
- Had been re-accredited with Grade 'A' by NAAC of UGC
- Has Permanent affiliation with JN Technological University-Kakinada
- Listed under sections 2(f) & 12(b) of UGC act 1956.
- Approved by AICTE-New Delhi
- EIGHT departments are recognized as RESEARCH CENTERS by JNTU-K
- Granted Autonomy by UGC in 2015
- Campus of 60 acre
- Offering 7 UG and 5 M.Tech., and 1 MBA program
- About 250 faculty of which 84 Ph.D. Degree holders
- 83 Laboratories with an investment of about 13 Crores
- Total built up area of about 7 Lakh Sft
- About 42,000 volumes and Access to 8 international online journal packages like IEEE, SPRINGER, etc.
- 1420 Systems & 395 Mbps band width internet facility
- About Rs. 4 Crore worth of on-going R&D projects
- Actively involved in civil engineering consultancy work as Third Party Quality Auditor for Vizianagaram Municipality
- WIPRO Recognized technology learning center and MISSION 10X partner institution
- Recognized National Instruments Academy for Training in LabView
- SIRO Recognition by DSIR
- Recognized PTC Centre of Excellence for Creo Training
- Identified by MSME as Business Incubation Centre
- APSSDC-Siemens Technical Skill Development Institute
- Recognized CMs SKILL EXCELLENCY CENTER (SEC)
- Microsoft Ed-vantage Platinum Partner
- Institutional member of IUCEE
- Institutional Member of CII
- Member, Chamber of Commerce, Vizianagaram
- Green Campus award by Govt. of AP

MVGR College of Engineering is rated as one among the best engineering colleges in the state of Andhra Pradesh as it set up highest standards in all areas of curricular, co-curricular and extra-curricular activities and in students' placements. Based on industry and expert's feedback, the college is updating the curriculum from time to time. The college offers many value added add-on courses students and conducts training programs to meet the industries' requirements.

Academic Regulations for B.Tech., Program

Applicable to the students admitted from the Academic year 2019-2020 onwards.

1. PROGRAM STRUCTURE:

B.Tech.:

Sl. No	Category	Credits
1	Humanities and Social Sciences including Management courses	12
2	Basic Science courses	25
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	26
4	Professional core courses	54
5	Professional Elective courses relevant to chosen specialization/branch	18
6	Open subjects – Electives from other technical and /or emerging subjects	12
7	Project work, seminar and internship in industry or elsewhere	13
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	0
	Total	160

- Open electives offered by the parent department are listed in the course structure and are offered to students of other programs. The students of parent departments may also opt the course, provided it shall not be listed in the curriculum.
- For audit course a student is deemed to satisfy the minimum contact hours, as prescribed by the department and shall also comply with the requirements for submission of assignments/projects. A student shall also opt for MOOCs and submit the certificate.

1. HSS Courses		
Sl. No.	Subject	Credits
1	English -1	3
2	English -2 (Technical English)	3
3	Elective-1 (Management Related course (MEFA or MS or Operations Research)	3
4	Elective-2 (Professional Ethics and Human Values)	3
	Total	**12**

2. Basic Science Courses		
Sl. No.	Subject	Credits
1	Mathematics-I	3
2	Mathematics-II	3
3	Mathematics-III	3
4	Mathematics-IV	3
5	Applied / Engineering Physics (Theory + Lab)	5
6	Engineering Chemistry (Theory + Lab)	5
7	Biology for Engineers	3
	Total	**25**

3. Engineering Science Courses		
Sl. No.	Subject	Credits
1	Programming for Problem Solving (Theory + Lab)	5
2	Internet of Things (IOT)	3
3	Computer aided Engineering Graphics	3
4	Basic Electrical Engineering (Theory + Lab)	5
5	Department wise Engineering Science Course-I (AI Tools , Techniques & Applications)	5
6	Department wise Engineering Science Course-II (Design thinking and Product Innovation)	3
7	Workshop (Department Specific)	**2**
	Total	**26**

	Subjects	Credits
1	Professional Core Courses	54
2	Professional Elective Courses Relevant to Chosen Specialization/Branch	18
3	Open Subjects – Electives from other Technical and / or Emerging Subjects	12
		84

7. Project		
Sl. No.	Subject	Credits
1	Socially Relevant Project	1
2	Mini Project	2
3	Project Phase - I	2
4	Project Phase - II	8
	Total	**13**

8. Audit Courses (Non Credit Course)		
Sl. No.	Subject	
1	Induction Program	
2	Constitution of India	
3	Indian Traditional Knowledge	
4	Environmental Science	

BOS Chairman shall notify the list of MOOCs offered (Open Elective & Professional Elective) in the beginning of the semester.

2. PROGRAM PATTERN:

B.Tech.: The program is for 4 academic years / 8 semesters.

B.Tech. (Lateral Entry): The program is for 3 academic years / 6 semesters.

3. AWARD OF DEGREE:

B.TECH:

A student will be declared eligible for the award of degree if he/she fulfills the following academic regulations.

a) A student shall be declared eligible for the award of degree, if he/she pursues a course of study for not less than four academic years and not more than eight academic years from the date of admission.

b) The student shall register for **160** credits and secure all **160** credits.

c) The medium of instruction for the entire under graduate program in Engineering & Technology will be in **English** only.

d) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

e) A student on completing 1st year class work may opt for a break of 1 year which shall be deemed as GAP year, as recommended by APSCHE, for undertaking successful entrepreneurial ventures.

f) Students who fail to complete Four Years Course of study within 8 years shall forfeit their seat and their admission shall stand cancelled.

B.TECH (Lateral Entry):

A student will be declared eligible for the award of degree on fulfilling the following academic requirements.

a) A student shall be declared eligible for the award of the degree, if he/she pursues a course of study for not less than three academic years and not more than six academic years.

b) The student shall register for **126** credits and secure all **126** credits.

c) A student shall also register and successfully complete audit programs (Non-credit) as recommended by Academic Council.

d) Students who fail to complete their three Years Course of study within 6 years shall forfeit their seat and their admission shall stand cancelled.

e) Student shall register for bridge programs, if any, as administered by the respective departments at the beginning of 2nd year and successfully complete as per the guidelines of the Institution.

4. CERTIFICATION PROGRAMS:

Sl. No.	Dept.	Name of the Program
1	MECH	Windchill 10.2 PDM by Adroitec Engineering Solutions Pvt. Ltd., Hyderabad
2	MECH	Creo 2.0 by PTC
3	MECH	Edgecam by Verosoft, UK
4	MECH	ANSYS Training and Certification by Mechanical Department
5	MECH	AUTOCAD Training and Certification by Mechanical Department
6	MECH	Catia by APSSDC-Dassault Systems, CM's Center of Excellence
7	MECH	Delmia by APSSDC-Dassault Systems, CM's Center of Excellence
8	MECH	Simulia by APSSDC-Dassault Systems, CM's Center of Excellence
9	MECH	2-Wheeler Automobile Certification by APSSDC-SIEMENS
10	MECH	4-Wheeler Automobile Certification by APSSDC-SIEMENS
11	MECH	Welding Certification by APSSDC-SIEMENS
12	MECH	CNC Certification by APSSDC-SIEMENS
13	MECH	Commercial Electrical Certification by APSSDC-SIEMENS
14	MECH	Solid Edge Certification by APSSDC-SIEMENS
15	CHEM	Chemical Process Design and Simulation by Simtech Simulations, Hyderabad
16	ECE	Embedded Systems by Think LABS, Mumbai
17	ECE	Labview by National Instruments Systems India Pvt. Ltd.
18	ECE	Unified Technology Learning Program (UTLP) by Wipro Mission 10X
19	CSE, IT	PEGA by Virtusa Corporation
20	CSE, IT	Microsoft technologies by Microsoft Corp.
21	CSE, IT	Ethical Hacking by EC-Council Academia
22	CSE, IT	Java and C by Talent Sprint
23	CSE, IT	Network Analyst (CCNA) by Cisco Systems Inc
24	CSE, IT	Java Programming (OCJP) and DBMS by Oracle
25	EEE	PLC, Drives and Automation by Siemens
26	EEE	PLC by New Dawn Automation
27	EEE	Home Electrical Certification by APSSDC-SIEMENS
28	Civil	Remote Sensing and GIS by Indian Institute of Remote Sensing

a) The Institution shall offer the certification programs by itself or in collaboration with industry/such other Institutions deemed to have specialized expertise in the proposed area of training.
b) Only students of the Institution shall be eligible to register on payment of prescribed fee.
c) However, subject to availability of resources and the demand the Institution may offer the program to external candidates meeting the pre-qualification requirements and in the order of the merit.
d) The duration of the course and design of the content shall be done by the respective departments of the Institution by themselves or in collaboration with industry/such other institutions deemed to have specialized expertise in the proposed area of training.
e) If the duration of the course is less than or equal to 40 hours, it can be completed in one semester, otherwise, it can suitably distributed over a number of semesters.
f) Mere enrolment/registration for the program shall not entitle any claim for award of certificate.
g) A candidate shall be deemed eligible for the award of the certificate if he/she
   - Attends at least 75% of scheduled training sessions
   - Complies to all the requirements of submission of the assignments, presentations, seminars, projects, etc., and also appears for periodic tests.
   - Shall attain minimum levels of performance in tests as prescribed.
   - Shall remit such fee as deemed fit for the certification
   - A candidate registered and failed to meet the requirements shall be permitted to repeat the said training one another time after remitting 25% of the fee fixed for the program as re-registration fee.

If the student is absent for the periodic tests, the test shall be re-conducted on payment of 10% of fee.

5. COURSES OFFERED:

Name of the Program	Degree
UG Programs (Engineering & Technology)	B.Tech. (Civil) B.Tech. (EEE) B.Tech. (Mech.) B.Tech. (ECE) B.Tech. (CSE) B.Tech. (CHEM) B.Tech. (IT)
PG Programs (Engineering & Technology)	M.Tech. (Structural Engineering) M.Tech. (Power Systems) M.Tech. (PDM) M.Tech. (VLSI) M.Tech. (CN&IS)
Other PG Programs	MBA
Research Programs	Ph.D. in Civil, EEE, MECH, ECE, CSE, CHEM, MBA and MATHS

6. DISTRIBUTION AND WEIGHTAGE OF MARKS:

B.Tech.:

a). All Theory courses will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment:

Subjective tests - 20 Marks
Objective tests - 10 Marks
Assignments - 10 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Two objective tests (online) shall be conducted each for 20 marks.
- Each objective test shall be conducted for 20 minutes and have 20 Multiple Choice Questions each for 1 mark and the same shall be scaled down to 10 Marks.
- Average of two objective tests shall be considered.
- Assignments shall be assessed for 10 marks.

External Assessment:

- External examination is for 60 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 12 marks. Student shall answer 5 questions (1 question from each unit).

i) Design Thinking and Product Innovation - Evaluation pattern

Internal Assessment: 40 Marks

Project based learning - 20 Marks
Assignments - 20 Marks

Project based learning: The student has to identify a problem and provide a solution by applying design thinking methodologies and submit a report, which is assessed for 20 Marks.

Assignments: The student has to submit 4 assignments (1 for each unit) and assessed for 20 marks. Each assignment shall consist of 4 questions (4X10 = 40 marks) and the same shall be scaled down to 20 marks. Average of 4 assignments shall be considered as final assignment marks.

External Assessment: 60 Marks

External examination is for 60 marks (180 min). Question paper contains 8 questions from first IV units (2 questions from each unit) and each question carries 10 marks. Student shall answer 4 questions from first IV units (1 question from each unit) and case study (20 Marks) from V unit.

ii) Internet of Things (IoT) , Surveying and Geomatics, MAT Lab Programming, Programming with Lab View, Embedded Processor - Evaluation pattern

Internal Assessment: 40 Marks

Subjective Test - 20 Marks

Project based learning - 20 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Project based learning shall be assessed for 20 Marks.
- In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.

External Assessment: 60 Marks

External examination is for 60 marks (180 min). Question paper contains 10 questions (2 questions from each unit) and each question carries 12 marks. Student shall answer 5 questions (1 question from each unit).

b). **Laboratory/Practice:**

All Laboratory/Practice courses are assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment : (40 Marks)

Continuous assessment : 15 Marks
Project based learning : 15 Marks
Internal test : 10 Marks

- Continuous assessment for 15 marks for each experimental session finally averaged to 15 marks.
- Project based learning shall be assessed for 15 Marks.
- In Project based learning, a student has to identify a problem such that at least 3 or 4 modular learning of experiments shall be integrated and submit comprehensive report with solution at the end of the semester.
- An internal assessment test conducted at the end of the semester shall be assessed for 10 marks.

Semester End Assessment:

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.

- Both internal and external examination shall include assessment of the student on
    a) Knowledge of principles/concepts involved
    b) Experimental design
    c) Result interpretation and analysis
    d) Experimental report

c). **Drawing/Design/Estimation:**

i) Computer Aided Engineering Graphics:

Evaluation Procedure:

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment : (40 Marks)

Continuous assessment	: 15 Marks
Project based learning	: 15 Marks
Internal test	: 10 Marks

Semester End Assessment:

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.
- Question paper contains 3 questions (with internal choice). **E**ach question carries 20 marks (5 marks for free hand drawing and list of commands & 15 marks for final drawing prepared in AUTOCAD). A Student shall answer all questions.

ii) Computer Aided Geometric Design and Assembly:

Evaluation Procedure:

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment : (40 Marks)

Continuous assessment	: 15 Marks
Project based learning	: 15 Marks
Internal test	: 10 Marks

Semester End Assessment:

- Semester end examination is for 60 marks (180 min) conducted and assessed by both external and internal examiners.
- Semester End Examination shall include assessment of the student on Final drawings like modeling, assembly and drafting.
- Student is expected to execute one exercise.

- Final drawings like modeling, assembly and drafting hard copies shall be evaluated by both internal and external examiners

iii) Design and Drawing Courses

Evaluation Procedure:

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment:	**40 Marks**
Subjective Test	- 20 Marks
Assignments	- 10 Marks
Design and Drawing reports	- 10 Marks

- Two subjective tests shall be conducted.
- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Design and drawing reports shall be assessed for 10 marks.

External Assessment:

The end examination question paper consists of Part A and Part B.
Part A consists of two questions regarding Design and Drawing (from two clusters clearly mentioned in the syllabus). Each question carries 20 marks. The student shall answer any 1 question.
Part B consists of four questions (from the remaining four clusters) with internal choice and all four are to be answered. Each question carries 10 marks.

iv) Estimation and Costing Courses

The course will have 5 units and assessed for 100 marks, of which, 40 marks for internal assessment and 60 marks for semester end external examination.

Internal Assessment:	**40 Marks**
Subjective Test	- 20 Marks
Assignments	- 10 Marks
Bar bending schedules,	- 10 Marks
Estimation and cost analysis reports	

Two subjective tests shall be conducted.

- Each subjective test shall be conducted for 90 Minutes and have 3 questions each for 7 marks (No choice) and the same shall be scaled down to 20 Marks.
- Average of two subjective tests shall be considered.
- Assignments shall be assessed for 10 marks.
- Bar bending schedules, Estimation and cost analysis reports shall be assessed for 10 marks.

External Assessment:

External examination is for 60 Marks. The question paper consists of 2 questions. Each question carries 60 Marks. The student shall answer 1 question.
In each question, the section, plan and reinforcement drawings of various members of a building will be given and the following items are to be calculated.

- Quantities of all the items (20 Marks).
- Reinforcement tonnage and Bar bending schedule (10 Marks).
- Specifications (10 Marks).
- Rates of all the items as per Standard Schedule of Rates (20 Marks).

Integrated Course (Theory + Lab):

Theory and Lab shall be assessed for 200 Marks (Each 100 marks)

- For Integrated course, the theory shall be assessed for 100 marks, of which 40 marks for internal assessment and 60 marks for semester end external examination.
- The Lab shall be assessed for 100 marks , of which, 40 marks for internal assessment and 60 marks for semester end external examination

Socially Relevant Project:

- A student shall identify and provide a solution to the problem relevant to society/Profession/Industry.
- A student shall engage at least 15 hours on socially relevant project. Socially relevant project shall be evaluated internally for 50 marks by Project Review Committee (PRC). PRC comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress.

Mini Project:

- A student shall undergo internship for a period of 4 weeks/provide solution to the problem relevant to Industry/ Modern tool during the vacation after VI semester and submit comprehensive report.
  - Mini project shall be evaluated internally for 50 marks by Project Review Committee (PRC).
  - PRC shall prepare rubrics for assessment.

Project Evaluation:

Project is divided into 2 phases – Phase I & Phase II

- Evaluation shall comprise of internal and external assessment.

  Internal: 110 (Phase I 50 marks, Phase II 60 Marks)

  External: 90

- A project Review committee (PRC) comprising of HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide shall review the progress once in four weeks.

Project Phase I:

- Project Phase I shall be evaluated internally by PRC for 50 Marks.
- A student shall undertake project phase I during the VII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 2 hours per week.
- Assessment shall be on
  - Literature review
  - Identification and statement of the Problem

Project Phase II:

- A student shall undertake project phase II during the VIII semester.
- A student shall report to the guide/external supervisor and work under his supervision at least 8 hours per week.
- Internal evaluation shall be done by HoD, department Academic Coordinator, R&D member of the department, one senior faculty and guide for 60 marks.
- External evaluation shall be done by HoD, Guide/Internal Examiner and External Examiner for 90 marks.
- Assessment shall be on
  a) Review on fundamental knowledge involved
  b) Inter disciplinary aspect
  c) Experimental/methodology design
  d) Result analysis and interpretations
  e) Report writing
  f) Team work
  g) Presentation
  h) Viva-voce

B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2^{nd}, 3^{rd} and 4^{th} years of study shall be same as applicable to regular B.Tech students.

7. ATTENDANCE REGULATIONS:

B.Tech.:

I. A student shall be eligible to appear for end semester examinations, if he or she acquires a minimum of 75% of attendance in aggregate of all the subjects (Theory & Lab.) for the semester.

II. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the college academic committee.

III. Shortage of attendance below 65% in aggregate of all the subjects (Theory & Lab) for the semester shall not be Condoned.

IV. Detained student shall seek re- admission for that semester when offered within 4 weeks from the date of commencement of class work.

PROMOTION RULE (Based on attendance):

- A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement (75%) of current semester.

PROMOTION RULE (Based on credits):

- A student shall be promoted from IV semester to V semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to IV semester from the following examinations irrespective of whether the candidate takes the examination or not.
    - Two regular and Two supplementary examinations of I semester
    - Two regular and One supplementary examinations of II semester
    - One regular examination and One supplementary examination of III semester
    - One regular examination of IV semester.
- A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to VI semester from the following examinations irrespective of whether the candidate takes the examination or not.
    - Three regular and Three supplementary examinations of I semester
    - Three regular and Two supplementary examinations of II semester
    - Two regular and Two supplementary examinations of III semester
    - Two regular and One supplementary examinations of IV semester
    - One regular and One supplementary examination of V semester
    - One regular examination of VI semester.

B.TECH (Lateral Entry):

PROMOTION RULE (Based on attendance):

A Student shall be promoted to the next semester on fulfillment of minimum attendance requirement of current semester.

PROMOTION RULE (Based on credits):

A student shall be promoted from VI semester to VII semester if he fulfills the minimum attendance requirement (75%) and academic requirement of 40% of credits up to VI semester from the following examinations irrespective of whether the candidate takes the examination or not.

- Two regular and Two supplementary examinations of III semester
- Two regular and one supplementary examinations of IV semester
- One regular and One supplementary examinations of V semester
- One regular examination of VI semester.

B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.

8. MINIMUM ACADEMIC REQUIREMENTS:

B.Tech.: (Theory/Lab)

i. A student is deemed to have satisfied the minimum academic requirements for a course on securing at least 24 marks out of 60 marks at semester end examination and overall minimum of 40 marks out of 100 marks including internal assessment.

ii. **Integrated Course (Theory + Lab):**

- The student shall secure minimum 24 marks out of 60 marks at semester end examination and overall 40 marks out of 100 marks for Theory and Laboratory courses independently. In case of failure in either theory or Laboratory course, the student should re-appear for both theory and laboratory.
- The assessment shall be done independently for both theory and laboratory courses and final marks shall be calculated on weighted average method for converting marks into grade points.

Sample calculation:

Integrated course-5 credits. Theory is for 3 credits and laboratory is for 2 credits.

Total Marks obtained in theory: 70 out of 100 (3 Credits)

Total Marks obtained in Lab : 90 out of 100 (2 Credits)

Final marks of the integrated course is

(70X3 + 90X2) / 5 = 78 Marks

B.Tech. (Lateral Entry):

The rules and regulations for candidates admitted under lateral entry category for 2nd, 3rd and 4th years of study shall be same as applicable to regular B.Tech students.

9. GRADING SYSTEM:

B.Tech. / B.Tech. (Lateral Entry)

Semester Grade Point Average (SGPA) for the current semester which is calculated on the basis of grade points obtained in all courses, except audit courses and courses in which satisfactory or course continuation has been awarded,

SGPA= Σ (course credits earned x Grade points) /
Σ (Total course credits in the semester.

CGPA= Σ (course credits earned x Grade points) up to successfully completed semesters) / Σ (Total course credits up to successfully completed)

The UGC recommends a 10-point grading system with the following letter grades as given below:

O	(Outstanding)	10
A+	(Excellent)	9
A	(Very Good)	8
B+	(Good)	7
B	(Above Average)	6
C	(Average)	5
P	(Pass)	4
F	(Fail)	0
Ab	(Absent)	0

- iii. A student obtaining Grade F shall be considered failed and will be required to reappear in the examination.

Illustration of Computation of SGPA and CGPA and Format for Transcripts

Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 X 8 = 24
Course 2	4	B+	7	4 X 7 = 28
Course 3	3	B	6	3 X 6 = 18
Course 4	3	O	10	3 X10 = 30
Course 5	3	C	5	3 X 5 = 15
Course 6	4	B	6	4 X 6 = 24
	20			**139**

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

Illustration for CGPA

Semester 1	**Semester 2**	**Semester 3**	**Semester 4**	**Semester 5**	**Semester 6**
Credits: 16	Credits: 18	Credits: 25	Credits: 21	Credits: 23	Credits: 22
SGPA: 7.9	SGPA: 7.8	SGPA: 7.6	SGPA: 8.0	SGPA: 8.3	SGPA: 8.6

Semester 7	**Semester 8**
Credits: 21	Credits:14
SGPA: 8.2	SGPA: 8.5

Thus,

CGPA= $\frac{16x7.9 + 18x7.8 + 25x7.6 + 21x8.0 + 23x8.3 + 22x8.6 + 21x8.2 + 14x8.5}{\mathbf{160}}$ = **8.1**

10. ELIGIBILITY FOR AWARD OF DEGREE:

B.Tech:

A student shall be eligible for award of the degree if he/she fulfills the following conditions:

1) Successfully completes all the courses prescribed for the Program.
2) CGPA greater than or equal to 4.5(Minimum requirement for Pass),

11. AWARD OF CLASS:

B.Tech:

Eligible Candidates for the award of B.Tech., Degree shall be placed in one of the following Classes based on CGPA.

Class	CGPA
Distinction	≥ 7.5
First Class	≥ 6.5
Second Class	≥ 5.5
Pass class	≥ 4.5

12. INSTRUCTION DAYS:

A semester shall have a minimum of 90 clear instruction days (including internal examinations).

13. Transfers from other Institutions shall not be permitted.

14. SUPPLEMENTARY EXAMINATIONS:

Supplementary examinations shall be conducted within 4 weeks from the date of announcement of results of regular examinations.

15. WITHHOLDING OF RESULTS: The result of a student shall be withheld

- If the student has not paid the dues, if any, to the institution
- If any case of pending disciplinary action ,
- Involvement in any sort of malpractices etc.
- Involvement in ragging.

16. TRANSITORY REGULATIONS:

a) Detained candidates are eligible for re-admission as and when next offered.

b) The re-admitted candidate will be governed by the rules and regulations under which the candidate has been admitted.

c) In case of transferred students from other Universities, credits shall be transferred to JNTUK as per the academic regulations and course structure of JNTUK.

d) The students seeking transfer to colleges affiliated to JNTUK from various other Universities/ Institutions have to obtain the credits of any equivalent subjects as prescribed by JNTUK. The transferred candidates have to write the backlogs/failed subjects, if any, in the same Institution where he/she was admitted.

17. AMENDMENTS TO REGULATIONS:

The Academic Council of MVGR College of Engineering (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/ or Syllabi or any other such matter relating to the requirements of the program which are compatible to the contemporary/emerging trends effectively meeting the needs of society/industry/stake holding groups.

18. Regulations for MALPRACTICES during the conduct of examinations

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the candidate 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)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him. *

2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work 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. *
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider/candidate not on rolls, he will be handed over to the police and a case is registered against him. *
4	If the candidate mishandles 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. Also if the answer script is mutilated / damaged disturbing the shape, of the script, answers, the bar code intentionally.	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. He shall be debarred from class work and all examinations and be allowed to reregistered for the next subsequent odd or even semester only. 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.	The same should be brought to the notice of CE who in turn in consultation with malpractice committee makes decision for cancellation of the performance in that subject. *
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them. *
7.	Leaves the exam hall taking away answer script or intentionally tears 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 University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. *
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. *

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them. *
10	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. *
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.*

*

19. General :

- Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- The academic regulation should be read as a whole for the purpose of any interpretation.
- In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.
- The University may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the University.

* * *

Ragging

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- **Ragging within or outside any educational institution is prohibited.**
- **Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student**

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	 1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	 2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	 5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	 10 Months	+	Rs. 50,000/-

In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288

LET US MAKE MVGR A RAGGING FREE CAMPUS

Ragging

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.

2. Ragging entails heavy fines and/or imprisonment.

3. Ragging invokes suspension and dismissal from the College.

4. Outsiders are prohibited from entering the College and Hostel without permission.

5. Girl students must be in their hostel rooms by 7.00 p.m.

6. All the students must carry their Identity Cards and show them when demanded

7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

PROGRAM STRUCTURE

B. TECH – ELECTRICAL AND ELECTRONICS ENGINEERING

(A2 Regulation)

SEMESTER-I						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MAT101	Mathematics-I	3	-	0	3
2	A2CYI101	Engineering Chemistry (Integrated Course)	3	-	3	5
3	A2EEI201	Basic Electrical Engineering (Integrated Course)	3	-	3	5
4	A2EEW201	Workshop	0	-	3	2
5	A2EHA701	Constitution of India	2	-	-	0
Total number of Credits:						**15**

SEMESTER-II						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MAT102	Mathematics-II	3	-	-	3
2	A2PYI102	Applied Physics (Integrated Course)	3	-	3	5
3	A2CII201	Programming for Problem Solving (Integrated Course)	3	-	3	5
4	A2MED201	Computer Aided Engineering Graphics	1	-	4	3
5	A2EHL001	Essential Communication in English	1	-	3	3
Total number of Credits:						**19**

SEMESTER-III						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2EHT001	Effective Technical Communication	2	-	2	3
2	A2MAT107	Mathematics-III	3	-	-	3
3	A2EET301	Electromagnetic Field Theory	3	-	-	3
4	A2EET302	Digital Electronics	3	-	-	3
5	A2EEI202	AI Tools, Techniques and Applications (Integrated Course)	3	-	3	5
6	A2EEI301	Electrical Circuit Analysis (Integrated Course)	3	-	3	5
7	A2EEI302	Analog Electronic Circuits (Integrated Course)	3	-	2	4
8	A2EHA702	Essence of Indian Traditional Knowledge	2	-	-	0
Total number of Credits:						**26**

SEMESTER-IV						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CHT101	Biology for Engineers	3	-	-	3
2	A2MAT109	Mathematics-IV	3	-	-	3
3	A2EET202	Design Thinking and Product Innovation	3	-	-	3
4	A2EET303	Power Transmission and Distribution	3	-	-	3
5	A2EEI303	Electrical Machines-I (Integrated Course)	3	-	2	4
6	A2EEI304	Control Systems (Integrated Course)	3	-	2	4
7	A2CHA701	Environmental Science	2	-	-	0
Total number of Credits:						**20**

SEMESTER-V						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2EET201	Internet of Things	2	--	2	3
2 (PE-1)	A2EET401	Signals and Systems	3	-	-	3
	A2EET402	MATLAB Programming	2		2	
	A2EET403	Electrical Wiring Design and Estimation	3		-	
3 (OE-1)	A2MST002	OE-I: Human Resources Development and Organizational Behavior	3	-	-	3
4 (OE-2)	A2XXT5XX		3	-	-	3
5	A2EEI305	Electrical Machines – 2 (Integrated Course)	3	--	3	4.5
6	A2EEI306	Power Electronics (Integrated Course)	3	--	3	4.5
7	A2EEP601	Socially Relevant Project				1
Total number of Credits:						**22**

SEMESTER-VI						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MST001	Managerial Economics and Financial Analysis	3	-	-	3
2	A2EET304	Power System Analysis	3	-	-	3
3 (PE-2)	A2EET404	Utilization of Electrical Energy	3	-	-	3
	A2EET405	Linear System Analysis				
	A2EET406	Advanced Control Systems				
4 (PE-3)	A2EET407	Digital Signal Processing	3	-	-	3
	A2EET408	HVDC Transmission				
	A2EET409	Energy Audit, Conservation and Management				
5	A2EEI307	Microprocessors and Microcontrollers (Integrated Course)	3	--	3	4.5
6	A2EEI308	Electrical Measurements and Instrumentation (Integrated Course)	3	--	3	4.5
7	A2EEP602	Mini Project	-	-	4	2
Total number of Credits:						**23**

SEMESTER-VII						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2EHT002	Professional Ethics and Human Values	3	--	-	3
2	A2EET305	Switchgear and Protection	3	--	-	3
3	A2EEI309	Power Semiconductor Drives (Integrated Course)	3	-	2	4
4 (PE-4)	A2EET410	Programming with Lab VIEW	2	--	2	3
	A2EET411	Renewable Energy Systems and Integration	3		-	
	A2EET412	Special Electrical Machines	3		-	
	A2EET413	Embedded Processor	2		2	
5 (PE-5)	A2EET414	Advanced Power Electronic Converters	3	--	-	3
	A2EET415	FACTS				
	A2EET416	Power System Operation and Control				
6 (PE-6)	A2EET417	Electrical Distribution Systems	3	--	-	3
	A2EET418	Electrical Vehicle Technology				
	A2EET419	Condition Monitoring of Electrical Systems				
7	A2EEP603	Project (Phase – I)				2
Total number of Credits:						**21**

SEMESTER – VIII						
S.No	Course Code	Course Title	L	T	P	Credits
1	A2XXT5XX	Distribution System Planning & Automation	3	--	-	3
		State Estimation: Theory and Applications				
		VLSI Technology				
		MOOCs				
2	A2XXT5XX	Static VAR Compensation and Harmonic Filtering	3	--	-	3
		Smart Grid				
		Power Quality				
		MOOCs				
3	A2EEP604	Project Phase - II	0	--	--	8
Total Number of Credits						14

Note: Each department is offering 4 open elective courses. One elective course is from Humanities (Human Resources Development and Organizational Behavior) which is common to all Engineering departments. 2nd Open elective course should be opted from the other departments (List of Open elective courses offered by various departments are given below). 3rd and 4th Open elective courses (Emerging subjects) should be discipline centric.

OPEN ELECTIVES

OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CIVIL ENGINEERING						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CET501	Remote Sensing and GIS	3	-	-	3
2	A2CET502	Project Planning and Management	3	-	-	3
3	A2CET503	Road Safety Engineering	3	-	-	3
4	A2CET504	Geomatics	3	-	-	3
5	A2CET505	Building Services	3	-	-	3
6	A2CET506	Water Power Engineering	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF EEE						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2EET501	Basic Control Systems				
2	A2EET502	Applied Electrical Engineering				
3	A2EET503	Electrical Safety				
4	A2EET504	Concepts of Electrical Wiring				
5	A2EET505	Basic Automation Course				
6	A2EET506	Illumination Engineering				
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF MECHANICAL ENGINEERING						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MET501	Introduction to Robotics	3	-	-	3
2	A2MET502	Solar and Wind Energy	3	-	-	3
3	A2MET503	Production and Operations Management	3	-	-	3
4	A2MET504	Micro Electromechanical Systems	3	-	-	3
5	A2MET505	Product Lifecycle Management	3	-	-	3
6	A2MET506	Foundation of Computational Fluid Dynamics	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF ECE						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2ECT501	Principles of Communication Engineering	3	-	-	3
2	A2ECT502	Electronic Instrumentation	3	-	-	3
3	A2ECT503	Biomedical Engineering	3	-	-	3
4	A2ECT504	Modern Communication Systems	3	-	-	3
5	A2ECT505	Transducers and Sensors	3	-	-	3
6	A2ECT506	Principles of Mobile Communications	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CSE & IT						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CIT501	Fundamentals of Data Structures	3	-	-	3
2	A2CIT502	Object Oriented Programming with JAVA	3	-	-	3
3	A2CIT503	Web Design and Development	3	-	-	3
4	A2CIT504	Python Programming	3	-	-	3

5	A2CIT505	NoSQL Databases	3	-	-	3
6	A2CIT506	Data Analytics	3	-	-	3
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT OF CHEMICAL ENGINEERING						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CHT501	Computational Fluid Dynamics	3	-	-	3
2	A2CHT502	Non-Conventional Sources of Energy	3	-	-	3
3	A2CHT503	Design & Analysis of Experiments	3	-	-	3
4	A2CHT504	Industrial Waste Water Engineering	3	-	-	3
5	A2CHT505	Green Chemistry & Technology	3	-	-	3
6	A2CHT506	Air Pollution Control and Design of Equipment	3	-	-	3

A2MAT101	SEMESTER - I	L	T	P	C
	MATHEMATICS-I (common to ALL branches)	3	0	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: LINEAR ALGEBRA-1

Rank of a matrix: Elementary row and column transformations, equivalent matrices, Echelon form of a matrix, calculation of rank by reducing the matrix to Echelon form. System of equations: Linear system of equations, homogeneous and non-homogeneous system of equations, consistency criteria, trivial and non-trivial solutions, solving system of equations by Rank method; Eigenvalues and Eigenvectors: Finding Eigenvalues and Eigenvectors, properties of Eigenvalues and Eigenvectors (statements) including spectral mapping theorem.

UNIT- II: LINEAR ALGEBRA-2

Cayley-Hamilton Theorem: Statement of the theorem and its verification. Applications: Finding higher powers of a matrix, finding matrix polynomials, finding inverse of matrix. Diagonal form of a matrix: Reduction to diagonal form, spectral and modal matrices, finding higher powers of a matrix using diagonalisation, Quadratic forms: Matrix form of quadratic forms, orthogonal transformation, canonical form, reduction of quadratic form to canonical form by orthogonal transformation method, rank, index, signature and nature (definiteness) of a quadratic form.

UNIT-III: FIRST ORDER DIFFERENTIAL EQUATIONS & APPLICATIONS

Outlines: Differential Equations(DEs), Order and degree of a DE, Formation of DEs, general solutions of a DE; Solving first order and first degree DEs: linear DEs, Bernoulli's DEs (reducible to linear), exact DEs, integrating factors, non-exact DEs (reducible to exact).

Applications to real world problems: Newton's law of cooling, laws of growth and decay, family of curves, orthogonality of families curves, orthogonal trajectories (Cartesian and polar curves).

UNIT-IV: HIGHER ORDER DIFFERENTIAL EQUATIONS

Differential equations of higher order: Linear differential equations of higher order, its operator form. Solution concepts: General (complete) solution, particular solution. Solution of linear differential equations of higher order: Auxiliary equations, rules for finding complementary functions, rules for finding particular integrals (general and special methods).

UNIT-V: LAPLACE TRANSFORMS

Laplace transformation: Laplace transformation of elementary functions, Properties: Linearity, change of scale, first shifting properties, finding Laplace transformations using properties, Advanced properties: Laplace transformations of derivatives and integrals, multiplication by t^n, division by t (statements), finding Laplace transformations using advanced properties; Inverse Laplace transformations: Finding inverse Laplace transformations using partial fractions, statement of Convolution theorem, finding inverse Laplace transformations by Convolution theorem; Applications: Solving Initial Value Problems by using Laplace transformations.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publishers, Revised edition

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

COURSE OUTCOMES: Learners at the end of this course will be able to

CO 1	Recall the concepts of Linear algebra
CO 2	Recall the solution methods and applicability of first order differential equations
CO 3	Recall the solution methods of higher order differential equations and the concepts of Laplace transforms
CO 4	Use and interpret the concepts of linear algebra
CO 5	Use and interpret solution methods and applicability of first order differential equations
CO 6	Use and interpret solution methods of higher order differential equations and the concepts of Laplace transforms
CO 7	Apply the concepts of linear algebra, differential equations and Laplace transformation to model and solve real world problems

CO/PO Mapping

Course Title:				Mathematics-I (Common to ALL Branches)										
Course Code:				A2MAT101										
Course Designed by				Dept. of Mathematics										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2							2			
CO2	3	3		2							2			
CO3	3	3		2							2			
CO4	3	3		2							2			
CO5	3	3		2							2			
CO6	3	3		2							2			
CO7	3	3		2							2			

Course designed by	DEPARTMENT OF MATHEMATICS
Approval	Approved by: Meeting of Board of Studies held on 06.07.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CYI101	SEMESTER - I	L	T	P	C
	ENGINEERING CHEMISTRY (Common to all branches)	3	--	3	5
	Total Contact Hours – 48				

SYLLABUS

UNIT 1: WATER TECHNOLOGY

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT 2: POLYMERS

Introduction to polymers, functionality of monomers, addition and condensation polymerization, copolymerization, stereospecific polymerization with specific examples. Thermoplastics and Thermo-sets – their differences.

Elastomers – applications with specific examples- Preparation, properties and uses of PVC, Bakelite, Teflon and Nylon-6, 6, Buna-S and Thiokol rubber- Fibre reinforced plastics – carbon fibre, glass fibre and aramids.

UNIT 3: ELECTROCHEMISTRY AND APPLICATIONS

Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations.
Primary cells –dry cell- Secondary cells – lead acid, nickel-cadmium and lithium ion batteries- working of the batteries including cell reactions- Fuel cells, hydrogen-oxygen, and methanol fuel cells – working of the cells.
Corrosion: Introduction to corrosion, mechanism of dry and wet corrosion, Pilling Bedworth ratios and uses, Types of corrosion – Differential aeration corrosion, galvanic corrosion, pitting corrosion, waterline corrosion and stress corrosion, Factors affecting the rate of corrosion – metal based factors and environmental based factors, protection techniques – metal coatings – galvanization and tinning, cathodic protection, inhibitors – cathodic and anodic, organic coatings – paints – constituents and their functions.

UNIT-4: CHEMISTRY OF ADVANCED MATERIALS

NANOMATERIALS: introduction- synthesis of Nano material by sol gel method- CVD- engineering applications of Nano materials
CEMENT: Introduction to ordinary Portland cement- manufacturing of OPC- setting and hardening of cement- decay of cement.
FUELS: Introduction- classification- liquid fuels- cracking- knocking- octane number and cetane number; Lubricants- definition- mechanism and properties of lubricants

UNIT 5: INSTRUMENTAL METHODS AND APPLICATIONS

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. Principle, instrumentation (Block diagram and working), applications of UV, IR and NMR spectroscopic methods. Chromatography- introduction- Ion exchange chromatography- applications

Text books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.

Reference books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. H.Kaur, Instrumental Methods of chemical analysis, Pragathi Prakashan, 2012.
3. Chemistry for Engineers, Teh Fu Yen, Imperial college press, London

COURSE OUTCOMES:

CO1	The student will have the ability to describe softening methods and desalination processes. He/ She will be able to explain various types of polymers; preparation, properties and engineering applications of thermoplastic, thermosetting plastics, rubbers and FRP's.
CO2	The student will have the ability to describe electrochemical reactions, principles of batteries, fuel cell and corrosion.
CO3	The student will have the ability to outline electromagnetic spectrum and explain the working principles of IR, UV, NMR and chromatographic techniques. The student describes the synthesis, properties and applications of nanomaterials, cement. HE/ She Outlines the cracking methods, knocking of fuels.
CO4	The student will have the ability to differentiate between hard and soft water, demineralization and deionization processes and thermosetting – thermoplastic materials.
CO5	The students will have the ability to give examples on primary and secondary batteries, various types of corrosion, methods of corrosion prevention.
CO6	The student will have the ability to draw inferences on the principles and applications of various instrumental methods and also can compare and contrast between cracking methods.
CO7	The student will have the ability to analyze water samples and validate the results obtained and apply their knowledge on polymers, batteries, materials and instrumentation.

CO/PO Mapping

Course Title:				Engineering Chemistry										
Course Code:				A2CYI101										
Course Designed by				Dept. of Chemistry										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3								2			1		
CO2	3								2			1		
CO3	3								2			1		
CO4	3								2			1		
CO5	3								2			1		
CO6	3								2			1		
CO7	3								2			1		

Course designed by	DEPARTMENT OF CHEMISTRY
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

Engineering Chemistry - Laboratory

List of Experiments:

1. Determination of HCl using sodium carbonate
2. Determination of Hardness of a groundwater sample.
3. pH metric titration of strong acid vs. strong base
4. Condcutometric titration of Strong acid VS Strong base
5. Condcutometric titration of Weak acid VS strong base
6. Potentiometric titration of Fe(II) with potassium dichromate
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of a polymer
9. Determination of viscosity of polymer solution using survismeter
10. Determination of percentage of Iron in Cement sample by colorimetry
11. Estimation of Calcium oxide in port land Cement
12. Preparation of Nanomaterials (ex: Fe/ Zn/ Ferrite)
13. Adsorption of acetic acid by charcoal
14. Determination of acid value and saponification value of a given lubricant
15. Project based learning (Mandatory for all students)

Course Outcomes:

CO1	The student will be able to determine total hardness, strength of acid in a lead acid battery, calcium in Portland cement using volumetric analysis
CO2	The student will be able to explain condcutometric, potentiometric, pH metric titrations and colorimetric determination
CO3	The student will be able to explain the synthesis of a polymer, nanomaterials

CO/PO Mapping

Course Title:				Engineering Chemistry										
Course Code:				A2CYI101										
Course Designed by				Dept. of Chemistry										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1			1				1	1	2		
CO2	3		1			1				1	1	1		
CO3	3		1							1	1	1		

Course designed by	DEPARTMENT OF CHEMISTRY
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2EEI201	SEMESTER – I	L	T	P	C
	Basic Electrical Engineering (Common to all branches)	3	-	3	5
	Total Contact Hours – 50				

SYLLABUS

UNIT 1: D.C. CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, Analysis of simple circuits with DC excitation, Superposition, Thevenin's and Norton's Theorems, Time-domain analysis of first-order RL and RC circuits.

UNIT 2: A.C. CIRCUITS

Representation of sinusoidal waveforms, Average and RMS values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase AC circuits (Series & Parallel), Resonance, Three-phase balanced circuits, voltage and current relations in star and delta configurations.

UNIT 3: DC & AC MACHINES [ELEMENTARY TREATMENT ONLY]

Principle and operation of DC Generator - EMF equation – open circuit characteristic of DC shunt generator – principle and operation of DC Motor – Types of DC Motors – Performance Characteristics of DC Motor - Speed control of DC Motor – Principle and operation of single-phase Transformer - OC and SC tests on transformer - principle and operation of single phase & Three phase Induction Motors, construction and working of synchronous motors

UNIT 4: BASICS OF POWER SYSTEMS:

Layout & operation of Hydro, Thermal, Nuclear Stations - Solar & wind generating stations – Typical AC Power Supply scheme – Elements of Transmission line – Types of Distribution systems: Primary & Secondary distribution systems.

UNIT 5: ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing, Types of Batteries, Characteristics of Batteries. Elementary calculations for energy consumption, power factor improvement, battery backup.

TEXT BOOK/ REFERENCES:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. Vincent Del Toro, "Electrical Engineering Fundamentals", Pearson, 2015.

COURSE OUTCOMES:

At the end of the course, Student will be able to

CO1	To recall fundamental concepts of electrical circuits such as charge, voltage, current and power.
CO2	Describe the principle of operation of D.C. & A.C. machines.
CO3	Outline the working operation of various generating stations.
CO4	Explain the procedure for solving circuits with A.C and D.C. Excitation
CO5	Summarize the performance characteristics of different machines
CO6	Explain about different equipment used in power industry
CO7	Apply the fundamental laws, associated with Basic Electrical Engineering to solve real world problems in the field of Engineering

CO/PO Mapping

CO / PO mapping	Program Outcomes													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
CO1	3	3	1	1			3			1			1	1
CO2	3	2	2	2	2					1			1	1
CO3	3	3	3	1	1		1			1			1	1
CO4	3	3	2	1	1		2			1			1	1
CO5	3	3	2	1	1	3	1			1			1	1
CO6	3	3	2	1		2	2			1		1	3	2
CO7	3	3	3	3	3	2	2			2		3	3	3

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

Basic Electrical Engineering Laboratory

LIST OF EXPERIMENTS

Basic safety precautions, Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope, resistors, capacitors and inductors.

1. Verification of Kirchhoff laws.
2. Verification of Network Theorems.
3. Magnetization characteristics of a DC Shunt Generator.
4. Speed control of DC Shunt Motor.
5. Predetermination of performance parameters of 1 – Phase Transformer.
6. I – V Characteristics of Solar PV cell
7. Brake test on DC Shunt Motor.
8. Measurement of earth resistance.
9. Measurement of reactive power in three phase balanced circuit.
10. Measurement of Choke coil parameters
11. Brake test on 3 - Phase Induction Motor.
12. Determination of AC quantities using CRO/DSO.
13. I – V characteristics of battery.

COURSE OUTCOMES:

At the end of the course, Student will be able to

CO1	Identify common electrical equipment used in laboratory.(L1)
CO2	Estimate the ratings of different equipment used to perform an experiment. (L2)
CO3	Demonstrate the usage of various electrical measuring instruments.(L3)
CO4	Analyze the characteristics of rotating & stationery electrical machines (L4).
CO5	Interpret the characteristics of PV cell and Battery.(L5)

CO/PO Mapping

CO / PO Mapping	Program Outcomes													
	1	2	3	4	5	6	7	8	9	10	11	12	PSO 1	PSO 2
CO1	3		1	1	3	1			3	2	2	2	2	1
CO2	3	2	3	3	3	2	1		3	3	2	2	2	3
CO3	2	2	2	2	3	1			3	3	1	2	2	1
CO4	3	3	3	3	2				3	3		2	3	2
CO5	3	3	3	3	3		1		3	3	2	2	3	3

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2EEW201	SEMESTER - I	L	T	P	C
	ENGINEERING WORKSHOP (Electrical)	0	-	3	2
	Total Contact Hours – 45				

SYLLABUS

1. Introduction to Electrical quantities, tools, symbols and elements.
2. Study of different sizes of wires and their current ratings.
3. Identification of colour code, resistors, ICs, Transistors, capacitors, diodes, SCRs, IGBTs etc.
4. To perform Stair case wiring
5. Load calculation for an Installation & Design of residential house wiring using fuse, switch, lamp and MCB.
6. Practice of Soldering and De-soldering.
7. Fluorescent Lamp Wiring
8. Ceiling Fan Wiring and Capacitor testing.
9. Simple relay connection using push buttons, NO, NC contacts
10. Measurement of Amplitude, Time Period and Frequency using CRO.
11. Measurement of Effective Voltage and Currents in Series and Parallel connected Batteries.
12. Measurement of Voltage, Current and Power

Course Outcomes Student will be able to

CO1	List different tools used in electrical workshop and learn the usage of tools (L1)
CO2	Demonstrate soldering and desoldering (L2)
CO3	Check ratings of commonly used house hold electrical appliances. (L3)
CO4	Analyze the load pattern for a building consisting of lamp, fan etc., (L4)
CO5	Design wiring schemes for various schemes such as staircase, residential building (L6)

CO / PO mapping	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		1	3		1				1	1	2	2
CO2					3		2		3			3	1	1
CO3	3	3	3	3	2		1		2	2	3	2	3	2
CO4	3	3	3	3	2	1	1		2	1	2	2	2	2
CO5	3	3	3	2	2	1	1		2	1	2	2	3	2

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2EHA701	SEMESTER - I	L	T	P	C
	CONSTITUTION OF INDIA	2	-	-	0
	Total Contact Hours – 30				

SYLLABUS

UNIT – I: HISTORY OF MAKING OF THE INDIAN CONSTITUTION
History - Drafting Committee, (Composition & Working)

UNIT – II: PHILOSOPHY OF THE INDIAN CONSTITUTION: Preamble - Salient Features

UNIT-III: CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES: Fundamental Rights -Right to Equality -Right to Freedom -Right against Exploitation -Right to Freedom of Religion -Cultural and Educational Rights -Right to Constitutional Remedies ; Directive Principles of State Policy ; Fundamental Duties.

UNIT-IV: ORGANS OF GOVERNANCE: Parliament -Composition - Qualifications and Disqualifications - Powers and Functions - Executive - President - Governor - Council of Ministers; Judiciary, Appointment and Transfer of Judges, Qualifications.

UNIT – V: LOCAL ADMINISTRATION: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

TEXT BOOK:
Reference Source compilation

REFERENCES:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.

COURSE OUTCOMES:

CO1	Students will be able to discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO2	Students will be able discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO3	Students will be able to discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP]under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
CO4	Students will be able to discuss the passage of the Hindu Code Bill of 1956.
CO5	Students will be able to discuss the powers of Executive, Judiciary and Legislature.

CO/PO Mapping

Course Title:	Constitution of India (Common to ALL Branches)													
Course Code:	A2EHA701													
Course Designed by	Dept. of English & Humanities													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2								
CO2						2								
CO3						2								
CO4						2								
CO5						2								

Course designed by	DEPARTMENT OF ENGLISH & HUMANITIES
Approval	Approved by: Meeting of Board of Studies held on 23.06.15
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

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A2MAT102	SEMESTER - II	L	T	P	C
	MATHEMATICS-II (MEC,ECE,EEE,CHE & CIV)	3	0	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: NUMERICAL METHODS-1

Solving Algebraic and Transcendental Equations: Intermediate value theorem (statement), solution concepts, error in solution, measure of accuracy, approximate and exact solutions, Solution methods: Bisection method, Regula-Falsi method and Newton-Raphson Iterative method; Finite differences: Forward, backward and shift operators, relations among operators, Interpolation: Interpolation and extrapolation, data of equal and unequal intervals, Newton's forward and backward Interpolation formulae, Lagrange's interpolation formula, Fitting polynomials to the data by using Newton's and Lagrange's formulae, Inverse Interpolation by Lagrange's formula.

UNIT- II: NUMERICAL METHODS-2

Numerical Integration: Simpson's and Trapezoidal rules, Weddle's and Boole's rules of integrations; Numerical solutions of ordinary differential equations: Concepts of Initial Value Problem, Taylor's series method, Euler's method, Runge - Kutta method of fourth order; Predictor-corrector method: Milne's method to solve initial value problems.

UNIT-III: MULTIVARIABLE CALCULUS

Overview: Functions of two variables, limit and continuity, partial derivative and its geometrical meaning; Functions of several variables: Partial differential coefficients of higher order, total derivatives, Chain rules for partial differentiation, partial differentiation of Implicit functions; Jacobians: Jacobian and properties, chain rule, functional dependence, Jacobian of implicit functions

Maxima and Minima: Maxima and minima of a function of two variables, constrained maxima and minima, Lagrange's method of undetermined multipliers.

UNIT-IV: PARTIAL DIFFERENTIAL EQUATIONS -FIRST ORDER

Formation of PDEs: Elimination of arbitrary constants, Elimination of arbitrary functions; Solution concepts of PDEs: Complete solution / integral, particular integral, general integral and singular integral, PDEs solvable by direct integration; Linear PDEs of first order (Lagrange's linear equation): Method of grouping and method of multipliers; Nonlinear PDEs of first order: Solution methods of solving PDEs in standard forms I, II, III & IV (as is specified in Text Book 1).

UNIT-V: PARTIAL DIFFERENTIAL EQUATIONS -HIGHER ORDER

Homogeneous Linear Partial Differential Equations of second and higher order with constant coefficients: Symbolic form, Rules for finding complementary function, Rules for finding particular integral, working procedure to get complete solution; Solving nonhomogeneous linear PDEs of second and higher order with constant coefficients; Method of separation of variables: concept of boundary value problem, solving boundary value problems by separating variables.

TEXT BOOKS:

1. B.S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publishers, Revised edition

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

COURSE OUTCOMES: At the end of course, students shall be able to

CO1	Recall the concepts of numerical methods
CO2	Recall the concepts of multivariable calculus.
CO3	Recall solution methods of PDEs
CO4	Use the concepts of numerical methods to solve equations, do interpolation & numerical integration and also to solve ODEs numerically.
CO5	Use the concepts of multivariable calculus to find maxima & minima of a multivariable function.
CO6	Use solution methods of PDEs to solve BVPs.
CO7	Apply the concepts of numerical methods, multivariable calculus and PDEs to solve real world problems including BVPs.

CO/PO Mapping

Course Title:				MATHEMATICS-II (MEC,ECE,EEE,CHE & CIV)										
Course Code:				A2MAT102										
Course Designed by				Dept. of Mathematics										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2							2			
CO2	3	3		2							2			
CO3	3	3		2							2			
CO4	3	3		2							2			
CO5	3	3		2							2			
CO6	3	3		2							2			
CO7	3	3		2							2			

Course designed by	DEPARTMENT OF MATHEMATICS
Approval	Approved by: Meeting of Board of Studies held on 06.07.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2PYI102	SEMESTER – II	L	T	P	C
	APPLIED PHYSICS (Common to EEE,ECE,CSE & IT)	3	-	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: WAVE OPTICS

Interference: Introduction- Coherence– Young's double slit experiment- Theory of interference fringes- Interference in thin parallel film by reflection (under reflected light)- Newton's Rings- Applications.

Diffraction: Introduction - Fraunhofer diffraction at- Single slit– Double slit (qualitative)- Diffraction Grating.

Polarization: Introduction– Polarization by refection- Brewsters law- Double refraction– Nicol Prism– Theory of Plane, circular and elliptically polarized light – Quarter wave & Half wave plate

UNIT-II: MAGNETIC PROPERTIES OF MATERIALS

Introduction– Origin of Magnetic moment in atom– Classification of magnetic materials– Ferromagnetism- Weiss theory (qualitative)- Domain theory- Hysteresis- Soft & Hard magnetic materials- Ferrites- Garnets- Applications.

UNIT-III: DIELECTRIC PROPERTIES OF MATERIALS

Introduction– Types of Polarization- Electronic- Ionic- Orientation polarization– Internal field- Clausius Mossoiti relation- Frequency dependency of polarization- Dielectric loss- Loss Tangent- Ferro electricity- Piezoelectricity- P-E loop- Applications.

UNIT-IV: HEAT TRANSFER

Transfer of heat energy- conduction, convection and radiation and their fundamental laws. Thermal expansion of solids and liquids - expansion joints -bimetallic strips. Heat conductions in solids- thermal conductivity - Forbe's and Lee's disc method: theory and experiment - applications (qualitative). Working principles of heat exchangers- refrigerators- ovens- solar water heaters.

UNIT–V: QUANTUM PHYSICS & SEMICONDUCTORS

Quantum Physics: Introduction- Matter wave– Davisson Germer Experiment- Schrodinger's wave equations– Wave function– Particle in potential box– Origin of energy bands.

Introduction- Intrinsic semiconductors– Carrier concentration (qualitative)– Electrical conductivity- Extrinsic semiconductors– Carrier concentration (qualitative)- Drift and Diffusion currents- Direct and Indirect band gap semiconductors- Light emitting diode– Solar cell- Hall effect- Applications.

TEXTBOOKS:

1. R.K.GAUR and S.L.GUPTA, Engineering Physics, Dhanpat Rai Publications

REFERENCES:

1. RESNICK, HALLIDAY and WALKER, Principles of Physics, Wiley Publishers
2. P.K. NAG, Heat and Mass Transfer, Mc Graw Hill Publishers.
3. B.K. PANDEY and S. CHATURVEDI, Engineering Physics, Cengage Learning Publishers.

COURSE OUTCOMES:

CO1	Student will be able to gain knowledge on basics of interference, diffraction and polarization of light.
CO2	Student will be able to gain knowledge on fundamentals of magnetic properties of materials and the polarization mechanisms of dielectrics.
CO3	Student will be able to gain knowledge on modes of heat transfer and the essentials of quantum physics & semiconductors for engineers.
CO4	The students will be able to understand and recognize the principle behind working of optical devices.
CO5	The students will be able to understand and recognize the underlying property behind working of electric and magnetic components in devices.
CO6	The students will be able to understand and recognize the importance of heat transfer and quantum mechanics based semiconductor devices.
CO7	The students will have the ability to apply the conceptual knowledge of principles of quantum physics in designing and developing engineering applications.

CO/PO MAPPING:

Course Title:	Applied Physics (EEE)													
Course Code:	A2PYI102													
Course Designed by	Dept. of Physics													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3						1				1		
CO2	3	3						1				1		
CO3	3	3						1				1		
CO4	3	3						1				1		
CO5	3	3						1				1		
CO6	3	3						1				1		
CO7	3	3						1				1		

Course designed by	DEPARTMENT OF PHYSICS
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2PYI102	SEMESTER – II	L	T	P	C
	APPLIED PHYSICS LAB	-	-	3	2
	Total Contact Hours – 42				

LIST OF EXPERIMENTS

1. Determination of the radius of curvature of the plano-convex lens by Newton's Rings method.
2. Determination of the thickness of the thin object (hair/paper) by Wedge method.
3. Determination of the prominent spectral line wavelengths in mercury spectrum by normal incidence method.
4. Obtain the signature variation of the axial magnetic field for a circular coil carrying current.
5. Estimation of the hysteresis loss for a ferromagnetic material.
6. Determination of thermal conductivity coefficient of the disc shaped material.
7. Determination of energy band gap of the semiconductor by using junction diode.
8. To plot I/V Characteristics of Zener diode.
9. Determination of temperature coefficient of the thermistor.
10. To plot frequency response characteristics of the L.C.R series circuit.

TEXTBOOKS:

BALASUBRAMANIAN.S, SRINIVASAN.M..N, A Text book of Practical Physics, S Chand Publishers, 2017

REFERENCES:

https://vlab.amrita.edu.

COURSE OUTCOMES:

CO1	Design experiments to demonstrate and investigate the interference and diffraction patterns of light.
CO2	Design experiments for signature variation of magnetic field due to current and the hysteresis loss in magnetic materials.
CO3	Design experiment to determine the thermal conductivity coefficient (*K*) of a material.
CO4	Design L.C.R series circuits for desired applications based on their frequency response characteristics.
CO5	Design experiments for determining the physiognomies of the semiconductor devices like the energy band gap, breakdown voltage and coefficient of resistance.

CO/PO MAPPING:

Course Title:				Applied Physics Lab										
Course Code:				A2PYI102										
Course Designed by				Dept. of Physics										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3						1	2	1		1		
CO2	3	3						1	2	1		1		
CO3	3	3						1	2	1		1		
CO4	3	3						1	2	1		1		
CO5	3	3						1	2	1		1		

Course designed by	DEPARTMENT OF PHYSICS
Approval	Approved by: Meeting of Board of Studies held on 29.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CII201	SEMESTER – II	L	T	P	C
	PROGRAMMING FOR PROBLEM SOLVING	3	0	3	5
	Total Contact Hours : 54				
	Prerequisites: Mathematics				

SYLLABUS

UNIT – I:

INTRODUCTION: Introduction to Programming, Computer System, Hardware and Software concepts.

PROBLEM SOLVING: Algorithm, Pseudo-code, flow-chart, program development steps, high-level, Assembly and machine languages.

BASICS OF C PROGRAMMING: Structure of C program, identifier, basic data types and sizes, constants, variables, arithmetic operators, relational operators, logical operators, increment and decrement operators, assignment operator, conditional operator, scanf and printf built-in functions, Creating and running programs.

UNIT – II:

BIT-WISE OPERATORS: logical, shift, rotation, masks.

EXPRESSIONS: expressions, type conversions, conditional expressions, precedence and order of evaluation.

SELECTION: Two-way selection: if-else, nested if, examples, multi-way selection: switch, else-if, examples.

ITERATIVE: loops - while, do-while and for statements, break continue, event and counter controlled loops.

UNIT – III:

Part – I:

ARRAYS: Arrays (1-D, 2-D), Character arrays and Strings, Searching (Linear Search and Binary Search).

Part – II: [9 HOURS]

BASIC ALGORITHMS: Basic Sorting Algorithms (Bubble, Insertion and Selection), comparing algorithms for complexity.

FUNCTIONS: Functions, Scope and Extent of Variables, Function Parameters, parameter passing using call-by-value, sub-routines, Storage Classes,#define,#ifdef, #ifndef pre-processor directives.

UNIT – IV:

RECURSION: Definition of Recursion, example programs using recursion like finding Factorial, Fibonacci series, Quick sort, puzzle solving using recursive functions (towers of hanoi, ackerman function).

POINTERS: Definition of Pointers, Pointer Type, Pointer Arithmetic, Function parameter passing using call-by-reference.

MEMORY ALLOCATION: Difference between static and dynamic memory allocation, dynamic memory allocation using built-in functions, dangling pointer, unreferenced memory problem.

UNIT – V:

ENUMERATED, STRUCTURE AND UNION TYPES: Derived types- structures-declaration, definition and initialization of structures, accessing structures, nested structures,

arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit-fields, concept of linked list, program applications.
FILE-HANDLING: Input and output- concept of a file, text files and binary files, Formatted I/O, File I/O operations, command line arguments.

Text Books

1. Programming For Problem Solving, Behrouz A.Forouzan & Richard F.Gilberg, Cengage Publishers, 3rd Edition
2. Programming In C:A Practical Approach, Ajay Mittal, Pearson Education

Reference Books

1. Brian W. Kernighan And Dennis M. Ritchie, The C Programming Language, Prentice Hall Of India
2. Introduction To C Programming, Reema Thareja, Oxford University Press
3. E. Balaguruswamy, Programming In Ansi C, Tata Mcgraw-Hill

COURSE OUTCOMES

The student will

CO1	Have the ability to **describe** a formal algorithmic solution for the given problem, **list** the features of C including scalar & vector data types, operators, **Outline** expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs.
CO2	Have the ability to **describe** one and two-dimensional arrays, **outline** loops and arrays for searching and **describe** various sorting techniques.
CO3	Have the ability to **outline** the purpose of functions, pointers, command line arguments, dynamic memory allocation. **Define** storage classes. **Describe** command like arguments, structures, unions, and enumeration. Have knowledge of handling files.
CO4	Have the ability to **solve** complex expressions, **design** algorithms and **develop** programs in C language using the basic constructs, data types, operators, control & iterative statements, and arrays.
CO5	Have the ability to **apply** arrays to solve complex matrix related problems and strings. **Compare and contrast** various searching and sorting techniques for complexity.
CO6	Have the ability to **distinguish between** function call types. **Draw inferences on** command line arguments, storage classes, and pre-processor directives. **Use** pointers with functions, arrays, strings, to **solve** complex problems. **Give example** and **solve** classical recursion problems**. Compare and contrast** static and dynamic memory allocation, and **apply** them. **Use** structures and unions to implement and **solve** real-time problems. **Apply** file related functions to process files.
CO7	Have the ability to **Fullyappreciate** the art of procedural programming in C and develop programs **optimally** using the full feature set of C language.

CO/ PO MAPPING

Course Title:	Programming for problem solving (Common to ALL Branches)														
Course Code:	A2CII201														
Course Designed by	Dept. of Computer Science and Engineering														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSOM	PSON	PSOO
CO1	3	3						3	2	1		2	1	1	1
CO2	3	3						3	2	1		2	1	1	1
CO3	3	3						3	2	1		2	1	1	1
CO4	3	3	3	3	3	3	3	3	2	1	1	2	3	3	3
CO5	3	3	3	3	3	3	3	3	2	1	1	2	3	3	3
CO6	3	3	3	3	3	3	3	3	3	1	1	2	3	3	3
CO7	3	3	3	3	3	3	3	3	3	1	1	3	3	3	3

Levels of Correlation: High-3, Medium-2, Low-1

PROGRAMMING FOR PROBLEM SOLVING PRACTICE

SYLLABUS

UNIT – I

WEEK 1:

Objective: Getting familiar with the programming environment on the computer and writing the first program.

Suggested Experiments/Activities:

Tutorial 1: Problem-solving using computers

Lab1: Familiarization with programming environment

i) Exposure to Turbo C, gcc, Code Blocks IDE
ii) Writing simple programs using printf(), scanf()

WEEK 2:

Objective: Getting familiar with how to formally describe a solution to a problem in a series of finite steps both using textual notation and graphic notation.

Suggested Experiments/Activities:

Tutorial 2: Problem-solving using Algorithms and Flow charts

Lab1: Converting algorithms/flowcharts into C Source code

Developing the algorithms/flowcharts for the following sample programs

i. Sum and average of 3 numbers
ii. Conversion of Fahrenheit to Celsius and vice versa
iii. Simple interest calculation

WEEK 3:

Objective: Learn how to define variables with the desired data-type, initialize them with appropriate values and how arithmetic operators can be used with variables and constants.

Suggested Experiments/Activities:

Tutorial 3: Variable types and type conversions:

Lab 3: Simple computational problems using arithmetic expressions

i) Finding the square root of a given number
ii) Finding compound interest
iii) Area of a triangle using heron's formulae
iv) Distance travelled by an object

UNIT – II

WEEK 4:

Objective: Explore the full scope of expressions, type-compatibility of variables & constants and operators used in the expression and how operator precedence works.

Suggested Experiments/Activities:

Tutorial 4: Operators and their precedence and associativity:

Lab 4: Simple computational problems using the operator's precedence and associativity

i) Evaluate the following expressions
   a. A+B*C+(D*E)+F*G
   b. A/B*C-B+A*D/3
ii) a. A+++B---A
   b. J=(i++)+(++i)

iii) Find the maximum of three numbers using conditional operator
iv) Take marks of 5 subjects in integers, and find the total, average in float

WEEK 5:
Objective: Explore the full scope of different variants of "if construct" namely if-else, null-else, if-else if*-else, switch and nested-if including in what scenario each one of them can be used and how to use them. Explore all relational and logical operators while writing conditionals for "if construct".
Suggested Experiments/Activities:
Tutorial 5: Branching and logical expressions:

Lab 5: Problems involving if-then-else structures

i) Write a C program to find the max and min of four numbers using if-else
ii) Write a C program to generate electricity bill
iii) Find the roots of the quadratic equation
iv) Write a C program to simulate a calculator using switch case
v) Write a C program to find the given year is a leap year or not

WEEK 6:
Objective: Explore the full scope of iterative constructs namely while loop, do-while loop and for loop in addition to structured jump constructs like break and continue including when each of these statements is more appropriate to use.
Suggested Experiments/Activities:
Tutorial 6: Loops, while and for loops:
Lab 6: Iterative problems e.g., the sum of series

i) Find the factorial of given number using any loop
ii) Find the given number is a prime or not
iii) Compute sine and cos series
iv) Checking a number palindrome
v) Construct a pyramid of numbers

UNIT – III
WEEK 7:
Objective: Explore the full scope of Arrays construct namely defining and initializing 1-D and 2-D and more generically n-D arrays and referencing individual array elements from the defined array. Using integer 1-D arrays, explore search solution linear search.

Suggested Experiments/Activities:
Tutorial 7: 1D Arrays: searching
Lab 7: 1D Array manipulation, linear search

i) Find the min and max of a 1-D integer array
ii) Perform linear search on1D array
iii) The reverse of a 1D integer array
iv) Find 2's complement of the given binary number
v) Eliminate duplicate elements in an array

WEEK 8:
Objective: Explore the difference between other arrays and character arrays that can be used as Strings by using null character and get comfortable with string by doing experiments that will reverse a string and concatenate two strings. Explore sorting solution bubble sort using integer arrays.
Suggested Experiments/Activities:
Tutorial 8: 2D arrays, Sorting and Strings
Lab 8: Matrix problems, String operations, Bubble sort

i) Addition of two matrices
ii) Multiplication two matrices
iii) Sort array elements using bubble sort
iv) Concatenate two strings without built-in functions
v) Reverse a string using built-in and without built-in string functions

UNIT-IV
WEEK 9:
Objective: Explore the Functions, sub-routines, scope and extent of variables, doing some experiments by parameter passing using call by value. Basic methods of numerical integration
Suggested Experiments/Activities:
Tutorial 9: Functions, call by value, scope and extent,
Lab 9: Simple functions using call by value, Solving differential equations using Eulers theorem

i) Write a C function to calculate NCR value
ii) Write a C function to find the length of a string
iii) Write a C function to transpose of a matrix
iv) Write a C function to demonstrate numerical integration of differential equations using Euler's method

WEEK 10:
Objective: Explore how recursive solutions can be programmed by writing recursive functions that can be invoked from the main by programming at-least five distinct problems that have naturally recursive solutions.

Suggested Experiments/Activities:

Tutorial 10: Recursion, the structure of recursive calls
Lab 10: Recursive functions

i) Write a recursive function to generate Fibonacci series
ii) Write a recursive function to find the lcm of two numbers
iii) Write a recursive function to find the factorial of a number
iv) Write a C Program to implement Ackermann function using recursion
v) Write a recursive function to find the sum of series.

WEEK 11:

Objective: Explore the basic difference between normal and pointer variables, Arithmetic operations using pointers and passing variables to functions using pointers

Suggested Experiments/Activities:

Tutorial 11: Call by reference, dangling pointers

Lab 11: Simple functions using Call by reference, Dangling pointers

i) Write a C program to swap two numbers using call by reference
ii) Demonstrate Dangling pointer problem using a C program
iii) Write a C program to copy one string into another using pointer
iv) Write a C program to find no of lowercase, uppercase, digits and other characters using pointers.

UNIT – V

WEEK 12:

Objective: Explore pointers to manage a dynamic array of integers, including memory allocation & value initialization, resizing changing and reordering the contents of an array and memory de-allocation using malloc(), calloc(), realloc() and free() functions. Gain experience processing command-line arguments received by C

Suggested Experiments/Activities:

Tutorial 12: Pointers, structures and dynamic memory allocation

Lab 12: Pointers and structures, memory dereference

i) Write a C program to find the sum of a 1D array using malloc()
ii) Write a C program to find the total, average of n students using structures
iii) Enter n students data using calloc() and display failed students list
iv) Read student name and marks from the command line and display the student details along with the total.
v) Write a C program to implement realloc()

WEEK 13:

Objective: Experiment with C Structures, Unions, bit fields and self-referential structures (Singly-linked lists) and nested structures

Suggested Experiments/Activities:

Tutorial 12: Bitfields**,** Self-Referential Structures, Linked lists

Lab 12: Bitfields, linked lists

i) Read and print a date using dd/mm/yyyy format using bit-fields and differentiate the same without using bit-fields
ii) Create and display a singly linked list using self-referential structure
iii) Demonstrate the differences between structures and unions using a C program
iv) Write a C program to shift/rotate using bitfields
v) Write a C program to copy one structure variable to another structure of the same type.

WEEK 14:

Objective: To understand data files and file handling with various file I/O functions. Explore the differences between text and binary files.

Suggested Experiments/Activities:
Tutorial 14: File handling:
Lab 14: File operations

i) Write a C program to write and read text into a file
ii) Write a C program to write and read text into a binary file using fread() and fwrite()
iii) Copy the contents of one file to another file
iv) Write a C program to merge two files into the third file using command-line arguments
v) Find no. of lines, words and characters in a file
vi) Write a C program to print last n characters of a given file.

TEXTBOOKS:

1. Ajay Mittal, Programming in C: A practical approach, Pearson.
2. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice-Hall of India
2. C Programming, A Problem Solving Approach, Forouzan, Gilberg, Prasad, CENGAGE

COURSE OUTCOMES

CO1.	**Demonstrate** the ability to write a formal algorithmic solution for the given problem, **name & explain** the features of C like types including scalar & vector types, operators, expressions, expression evaluation, operator precedence, sequential, conditional & iterative constructs.
CO2.	**Implement** one and two-dimensional arrays to solve simple mathematical and matrix related problems. **Make use of** loops and arrays for searching and **Compare** various sorting techniques.
CO3.	**Identify** the purpose of functions, pointers, command line arguments, dynamic memory allocation. **Define** storage classes. **Understand** command like arguments, structures and unions. Have **knowledge** of handling files.
CO4.	**Design** algorithms and **develop** programs in C language using the basic constructs, data types, operators, control statements, and arrays.
CO5	**Apply** pointers, functions, derived data types, and dynamic memory allocation, **design** solutions to challenging problems.
CO6	**Illustrate** the art of procedural programming in C and **develop** programs optimally using the full feature set of C language.

Course Title:	Programming for problem solving lab
Course Code:	A2CII201
Course Designed by	Dept. of CSE & IT

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1	3	3	1	2	3	1	1	1	2	2			2	2	2
CO2	3	3	1	2	3	1	1	1	2	2			2	2	2
CO3	3	3	2	3	3	2	1	1	2	2			3	3	3
CO4	3	3	2	3	3	3	1	1	2	2			3	3	3
CO5	3	3	3	3	3	3	1	1	2	2			3	3	3
CO6	3	3	3	3	3	3	1	1	3	3	3		3	3	3

Levels of Correlation: High-3, Medium-2, Low-1

Course designed by	DEPARTMENTS OF CSE & IT
Approval	Approved by: Meeting of Board of Studies held on 29-06-2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019

A2EHL001	SEMESTER - II	L	T	P	C
	Essential Communication in English	1	-	3	3
	Total Contact Hours – 60				

SYLLABUS

UNIT – I: BASIC LANGUAGE SKILLS – A REFRESHER

Organs of Speech: Consonant Sounds &Vowel Sounds; Phonemic Transcription; Using a Dictionary to know the Pronunciation of a word

Presenting Oneself: Introducing oneself -Using different expressions in Formal&Informal Contexts.

Reading a News Article: Identifying the key words and their usage; summarizing the information

Word Study & Mind Mapping: Root words–Derivatives; Homonyms, Homographs, Homophones; Synonyms & Antonyms

UNIT – II: RUDIMENTS OF FUNDAMENTAL COMMUNICATION

The World: Listening & watching Documentaries on World famous Places.

Describing People, Places and Life experiences: Physical Description- Describing someone's qualities – Usage of Jargon to present topography.

Short Story Corner: Reading a short story – Understanding the mood and essence – Sharing different perspectives.

Sentence Patterns: Concord – Rules – Common errors in day-day usage

UNIT-III: COMMUNICATION AT PRACTICE

Oratory Skills: Listening to World's Famous Speeches

JAM (Just a Minute) Talk: Format & Delivery Techniques

Nuances of Language: Company Description –Position Description (Formal) – processes like Chocolate Making(Informal)**.**

Types of Sentences – Declarative, Interrogative, Assertive etc.

UNIT-IV: COMMUNICATION THROUGH CONCEPTUAL LEARNING

BBC English: Watching interviews of Famous people.

Dialogue Practice: Situational Dialogues; Structuring a Role Play

New Inventions: Reading about latest technology pertaining to different fields (Source : Science Journals)

Transformation of sentences: Active Voice-Passive Voice**,** Direct & Indirect Speech**,** Degrees of Comparison**,** Simple Compound & Complex Sentences.

UNIT – V: COMMUNICATION THROUGH LIFE SKILLS

Watching Movies for Language Enrichment & Writing Reviews.

Skits: Enacting a Skit on a Social Issue

Reflections: Reading News Paper Editorial columns, Literacy Reviews, Poetry

Presenting an autobiography: Exploring different styles of writing autobiographies and evolving an own style**.**

TEXT BOOK:
Reference Source Compilation by the Department

REFERENCES:

1. **Fundamentals of Technical Communication** by Meenakshi Raman,OUP.
2. **Living English Structure** by W.Stannard Allen, Pearson Publications.
3. **English Made Easy** by Mary Margaret Hosler, Mc Graw Hill.
4.. **English and Communication Skills for Students of Science and Engineering**, by Dhanavel, S.P. Orient Blackswan Ltd.
5. **The Oxford Guide to Writing and Speaking** by John Seely , OUP

COURSE OUTCOMES:

CO1	Student will be able to come to terms with the basic language Skills required to cater to the requirement of the programme undertaken.
CO2	Student will be able to comprehend and analyze the core concepts well.
CO3	Student will be able to gain proficiency in all four skills of Language – Listening, Reading, Speaking and Writing.
CO4	Student will be able to understand the Syntactical and Grammatical Components of English Language and their correct use.
CO5	Student will be able to present his/her ideas confidently in a Professional manner.

CO/PO Mapping

Course Title:				**Essential Communication in English**										
Course Code:				A2EHL001										
Course Designed by				Dept. of English & Humanities										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2		2	3	3		3		
CO2						2		2	3	3		3		
CO3						2		2	3	3		3		
CO4						2		2	3	3		3		
CO5						2		2	3	3		3		

Course designed by	DEPARTMENT OF ENGLISH & HUMANITIES
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2MED201	SEMESTER - II	L	T	P	C
	COMPUTER AIDED ENGINEERING GRAPHICS	1	-	3	3
	Total Contact Hours – 60				

SYLLABUS

UNIT-I

Overview of Computer Graphics:

Computer technologies that impact on graphical communication, Demonstrating knowledge of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.
Set up of the drawing page and the printer, Scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing.
Applying dimensions to objects, applying annotations to drawings;

UNIT-II

Layers: Setting up and use of Layers, layers to create drawings, create, edit and use customized layers, concept of view ports.
Introduction to Orthographic Projections: Projections of Points; Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane.

UNIT-III

Projections of Straight Lines and Planes: Lines inclined to both planes, determination of true lengths, angle of inclinations and traces, Projections of Planes

UNIT-IV

Projections and sections of solids: Projections of simple solids- Sections of solids

UNIT -V

Development of surfaces, Isometric Projection and Conversion of Isometric Views to Orthographic Views: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa

TEXT BOOKS

1. DM Kulkarni, AP Rastogi, AK Sarkar “Engineering graphics with Auto CAD” PHI Publishers
2. Bhatt N.D., Panchal V.M. & Ingle P.R “Engineering Drawing” Charotar Publishing House.

REFERENCE BOOKS

1. Shah, M.B. & Rana B.C "Engineering Drawing and Computer Graphics", Pearson Education.
2. Agrawal B. & Agrawal C. M "Engineering Graphics", TMH Publication.
3. Narayana, K.L. & P Kannaiah "Engineering Drawing", SciTech Publishers.
4. CAD Software Theory and User Manuals.

COURSE OUTCOMES

At the end of the course the students will be able to:

CO1	Prepare two dimensional drawings using draw and modify commands in Auto CAD software and represent dimensions to the drawings
CO2	Clearly differentiate different types of projections and get solutions to projections of points in Auto CAD by applying the layers concept
CO3	Solve problems related to projections of straight lines and planes
CO4	Prepare simple solids in CAD software and obtain solutions to projections and sections of solids
CO5	Develop the surfaces of simple solids, prepare Isometric drawings and convert isometric drawings into orthographic views

CO/PO Mapping

Course Title:				Computer Aided Engineering Graphics										
Course Code:				A2MED201										
Course Designed by				Dept. of Mechanical Engineering										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2		3	1		1	2	3	2	2	3	2
CO2	3	2	2		3	1		1	2	3			2	1
CO3	3	2	2		3	1		1	2	3			2	1
CO4	3	2	3		3	1		1	2	3	2	2	3	1
CO5	3	2	3		3	1		1	2	3	2	2	3	1

Course designed by	DEPARTMENT OF MECHANICAL ENGINEERING
Approval	Approved by: Meeting of Board of Studies held on 29-06-2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

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	SEMESTER - III	L	T	P	C
A2EHT001	**EFFECTIVE TECHNICAL COMMUNICATION (Skill Oriented Course)**	**2**	**-**	**2**	**3**
	Total Contact Hours – 48				

SYLLABUS

UNIT – I: PROFICIENCY SKILLS IN COMMUNICATION

Listening Comprehension (Basic Level):

- *Working memory – attention –Vocabulary – Inference- comprehension monitoring.*

Elocution:

- *Composition of words in phrases and clauses – Collocation of words – patterns of sentences – proper use of conjunctions.*

Reading Comprehension Practice – I:

- *Reading Passages for Enrichment of Vocabulary and Sentence Improvement.*

Sentence Completion:

- *Concepts &Rules*

UNIT – II: COMMUNICATION FOR COMPETITIVE WORLD

Listening Comprehension- (Advanced):

- *TOEFL – GRE - IELTS Orientation, Mock Tests.*

Group Discussion:

- *Purpose – Planning –Participation. Etiquette – reaching consensus in group work*

Reading Comprehension Practice – II:

- *Skimming & Scanning Techniques*

Idiomatic expressions & Foreign Expressions and their usage

UNIT-III: COMMUNICATION FOR PROFESSIONAL OUTREACH

Interview Skills:

- *Watching Mock Interviews, Interview Training Sessions,*

Mock Interviews :

- *Facing Interviews, Prerequisites and practice*

Cloze Passages :

- *Reading &Understanding the sequence of sentences in passages*

Syllogisms:

- *Major Premise – Minor premise – Conclusion*

Analogies:

- *Types of Analogies*

UNIT-IV: CAREER PLANNING & GUIDANCE

Video Profile:

- *Preparation – Planning - Execution*

Presentation Skills:

- *Making an oral Presentation -Structuring ideas – Power Point Presentation etiquette –Practice*

Reading Comprehension – III (Practice)

- *(Passages culled from model papers of competitive and qualifying examinations)*

Resume Writing & Cover Letter writing

UNIT – V: ENGLISH & PROFESSIONAL ETIQUETTE

Learning through Visuals:

- *Body Language Gestures & Postures.*

Debating Skills:

- *Making an opening statement – rebuttals – Closing statement, Debate etiquette*

Logic based English Language Tests – Practice

Report Writing:

- *Types of Reports – Writing a Technical Report*

TEXT BOOK:

Open Source Compilation

REFERENCES:

1. Basic Communication Skills for Technology by Andrea J.Rutherfoord, Pearson Publications.
2. Business Communication Today Courtland L. Bovee,John V.Thill Abha Chatterjee, Pearson Publications.
3. How to Do Well in GDs and Interviews by Pearson Publications.

COURSE OUTCOMES:

CO1	Student will be able to develop proficiency in Communication in English.
CO2	Student understands the structure and pattern of various competitive and qualifying examinations for higher studies and employment.
CO3	Student will be able to express professionally his/her views to the context.
CO4	Student will be able to understand the need and concept of professional etiquette as a prerequisite for written and spoken communication.
CO5	Student shall be able to hone his/her analytical thinking skills.
CO6	Student will be able to acquire the employability skills needed.

CO/PO Mapping

Course Title:	**Effective Technical Communication**													
Course Code:	A2EHT001													
Course Designed by	Dept. of English & Humanities													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2		2	3	3		3		
CO2						2		2	3	3		3		
CO3						2		2	3	3		3		
CO4						2		2	3	3		3		
CO5						2		2	3	3		3		
C06						2		2	3	3		3		

Course designed by	DEPARTMENT OF EHGLISH & HUMANITIES
Approval	Approved by: Meeting of Board of Studies held on 29.06.19
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

	SEMESTER - III	L	T	P	C
A2MAT107	MATHEMATICS-III (common to EEE & ECE)	3	0	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: FOURIER SERIES

Outlines: Periodic function, even and odd functions, generalized rule of integration by parts, special wave forms like square wave, half wave rectifier, full wave rectifier, saw-toothed wave, triangular wave; Fourier Series expansions: Euler's formulae for Fourier series, Dirichlet's conditions, Fourier series expansions for functions of period 2π, functions having points of discontinuity, Change of interval, Fourier series expansions for functions of period 2L, Fourier series of odd and even functions; Half range Fourier Series: Half range sine and cosine series.

UNIT-II: FOURIER TRANSFORMATIONS

Fourier Integral: Fourier integral theorem and its complex, sine and cosine forms (statements only); Fourier Transformations (FTs): Concepts of integral transforms and its Kernels, Complex Fourier transformation, Fourier sine transformation & Fourier cosine transformations and their inverse transforms, Properties of Fourier transforms, Computation of Fourier, Fourier sine and Fourier cosine transformations using properties, evaluation of integrals, deductions of identities, Applications of FTs to solve integral equations.

UNIT-III: MULTIPLE INTEGRALS

Double Integral: Concept of double integration, properties, evaluation procedures, change of order of integration, double integrals in polar coordinates; Change of variables: Jacobian of transformations, Change of Cartesian coordinates to polar coordinates in double integrals, Applications of double integrals: Calculation of areas enclosed by plane curves (Cartesian and polar coordinates);

Triple Integrals: Evaluation procedures of triple integrals; Change of variables: Jacobian of transformations, Change of rectangular coordinates to Cylindrical and Spherical polar coordinates in triple integrals; Applications of triple integrals: Volumes of solids.

UNIT-IV: DIFFERENTIAL CALCULUS OF VECTORS

Gradient: Scalar and vector point functions, scalar and vector fields, vector operator 'del', Gradient of a scalar point function (GradΦ), geometrical interpretation of GradΦ, directional derivative, maximum directional derivative, evaluation of scalar potential of an irrotational field; Divergence: Divergence of a vector point function, physical interpretation of divergence, solenoidal vector function; Curl: Curl of a vector point function, physical interpretation of curl, Rotational and Irrotational fields.

UNIT-V: INTEGRAL CALCULUS OF VECTORS

Line integral of a vector function: Line integral and its types, applying line integral to calculate 'circulation' of a fluid particle and total work done by a force; Surface integral of a vector function: Surfaces, types of surfaces, surface integral and its types, evaluation of surface integrals; Volume integral of a vector function: Evaluation of volume integrals; Integral theorems relating line, surface and volume integrals: Green's theorem in a plane, Stoke's theorem and Gauss divergence theorem (all statements), Verification of theorems.

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publications, Revised edition.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11th Reprint, 2010.
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

Course Outcomes

At the end of the course, students shall be able to:

CO 1	Recall the concepts of Fourier Series and Fourier Transforms
CO 2	Recall the concepts of Multiple Integrals
CO 3	Recall the concepts of Vector Calculus
CO 4	Use and Interpret the concepts of Fourier Series and Fourier Transforms
CO 5	Use and interpret the concepts of Multiple Integrals
CO 6	Use and interpret the concepts of Vector Calculus
CO 7	Apply the concepts of Fourier Series and Fourier Transforms, Multiple Integrals and Vector Calculus to model and solve real world problems.

CO/PO Mapping

Course Title:				Mathematics-III (EEE & ECE)									
Course Code:				A2MAT107									
Course Designed by				Dept. of Mathematics									
CO	Program Outcome (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
1	3	3		2							2			
2	3	3		2							2			
3	3	3		2							2			
4	3	3		2							2			
5	3	3		2							2			
6	3	3		2							2			
7	3	3		2							2			

Course Designed by	Dept. of Mathematics
Approval	Approved by Board of Studies (BoS) of Department of Mathematics in its 4th meeting held on 06.07.2019.
	Ratified by Academic Council in its 5th meeting held on 13.07.2019.

A2EET301	SEMESTER - III	L	T	P	C
	ELECTROMAGNETIC FIELD THEORY	3	-	0	3
	Total Contact Hours – 45				

SYLLABUS

UNIT-I: VECTOR ANALYSIS AND ELECTROSTATIC FIELDS

Review of vector algebra – Coordinate systems – Line, Surface & Volume integrals – Gradient – Divergence – Curl – Stoke's theorem

Coulomb's law – Electric field intensity – EFI for different charge distributions – Electric flux density – Gauss's law – Applications – Divergence theorem

UNIT-II: ENERGY & POTENTIAL IN ELECTROSTATIC FIELD

Work done – Potential – Potential difference – Potential gradient – Energy density in electrostatic field – Electric dipole – Dipole moment – EFI due to dipole – Torque on a dipole in electric field

UNIT-III: ELECTRIC FIELDS IN MATERIAL SPACE - BOUNDARY-VALUE PROBLEMS

Properties of materials – Current and current density – Conductors – Ohm's law – Polarization in dielectrics- Dielectric constant and strength - Linear, Isotropic, and Homogeneous Dielectrics - Continuity equation - Relaxation time – Kirchhoff's laws

Boundary conditions - Poisson's and Laplace's equations - Uniqueness theorem – Capacitance calculation – Energy stored in a capacitor

UNIT-IV: MAGNETOSTATIC FIELDS & MAGNETIC FORCE

Biot – Savart's law – Magnetic field intensity – Magnetic flux density – Ampere's circuital law – Applications – Stoke's theorem – Force due to magnetic fields – Magnetic torque and dipole moment – Force and torque on closed circuits – Magnetic boundary conditions

UNIT-V: INDUCTANCE & TIME VARYING FIELDS

Self and mutual inductance – Calculation of self and mutual inductances for various arrangements – Energy density in magnetic field – Faraday's law – transformer and motional EMFs – Maxwell's equations – Power and Poynting theorem

Text Books:

1. Matthew N O Sadiku, " Elements of Electromagnetics", Oxford university Press, Third Edition, 2005
2. William H Hayt Jr., John A Buck, 'Engineering Electromagnetics' , Tata Mc Graw Hill edition, New Delhi, Third Edition, 2007.

References:

1. Joseph A Edminister, ' Thoery and Problems of Electromagnetics', Second edition, Schaum's outline series , Tata McGraw Hill, New Delhi, 2005.
2. Gangadhar K A, Field Thoery, Khanna publishers, Fifteenth Edition, Third Reprint 2004.

Course Outcomes (COs): At the end of course, students shall be able to:

CO 1	Define and recognize different coordinate systems to describe the spatial variations of the physical quantities dealt in electromagnetic field theory such as Electric Field Intensity, Potential etc.,
CO 2	To describe static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials.
CO 3	Define the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications in problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
CO 4	Explain fundamental laws governing electromagnetic fields and evaluate the physical quantities of electromagnetic fields (Field intensity, Flux density etc.) in different media using the fundamental laws.
CO 5	Identify the electrostatic boundary-value problems by application of Poisson's and Laplace's equations.
CO 6	Illustrate the concepts of Faraday's law, induced emf and Maxwell's equations to analyze the electrodynamics fields
CO 7	Design electromagnetic energy storage devices like capacitor, inductor which are frequently used in electrical systems and choose suitable materials required to assemble such electromagnetic energy storage devices.

CO/PO Mapping

Course Title:				Electro Magnetic Field Theory										
Course Code:				A2EET301										
Course Designed by				Department of Electrical & Electronics Engineering										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										2	3	1
CO2	3	1											3	1
CO3	3	1										1	3	1
CO4	3	2	1	1								1	3	1
CO5	3	2	2	1								1	3	2
CO6	2	2	1	1	2							1	3	1
CO7	3	2	2	2	2	1	1					1	3	2

Course designed by	DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

A2EET302	SEMESTER - III	L	T	P	C
	Digital Electronics	3	-	0	3
	Total Contact Hours – 45				

SYLLABUS

UNIT-I: NUMBER SYSTEM AND BOOLEAN ALGEBRA

Number systems, Base conversion methods, Complements of numbers, Codes- Binary codes, Binary coded decimal code and its properties, Unit distance codes, Excess 3 code, Gray code, Alphanumeric codes, Error detecting and correcting codes, Weighted and unweighted Codes, Boolean algebra, postulates, Boolean theorems, De Morgan's laws, Basic logic gates, Universal gates.

UNIT-II: MINIMIZATION OF SWITCHING FUNCTIONS

Switching functions, Minimization of switching functions using theorems, Canonical and standard form, Two level and Multi-level implementation, Karnaugh map up to 5-variables, Prime and Essential implications, Don't Care map entries, Minimization of switching functions using K-map, Tabular minimization, Minimal SOP and POS Realization.

UNIT-III: COMBINATIONAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICE

Design of Adder, Subtractor, Applications of adder, Decoder, Encoder, Priority encoder, Multiplexer, De-multiplex, Realization of switching functions using decoders and multiplexers. Code converters, Look ahead adder, Binary multiplier, Magnitude comparator, TTL and CMOS logic.

Programmable logic devices

ROM, PLA, PAL, Realization of switching functions using PROM, PLA and PAL, Comparison of PROM, PLA and PAL, Programming tables of PROM, PLA and PAL.

UNIT-IV: SEQUENTIAL CIRCUIT - I

Classification of sequential circuits, basic flip-flops, truth tables and excitation tables (NAND RS latch, NOR RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals), Conversion of flip-flops, Design of ripple counter, synchronous counter, Johnson and ring counter, Registers, Shift register, Bidirectional shift register, Universal shift register.

UNIT-V: SEQUENTIAL CIRCUIT – II

Analysis and design of clocked sequential circuits, State assignment and sate reduction, state reduction using partition method, Mealy and Moore models, capabilities and limitations of finite state machines, conversion from Moore to Mealy and vice-versa.

TEXT BOOKS:

1. A. Anand Kumar, "Switching Theory & Logic Design", PHI Learning Pvt.Ltd.,2010.
2. Morris-Mano, "Digital Design", Pearson Education Pte. Ltd, 5th Edition.

REFERENCE BOOKS:

1. R. P. Jain, "Modern Digital Electronics", Tata McGraw Hill Education Pvt. Ltd, 4th Edition.

2. ZVI Kohavi and Niraj K. Jha , "Switching and Finite Automata Theory ", Cambridge University Press, 4th Edition.

Course Outcomes (COs):

At the end of course, students shall be able to:

CO 1	Describe the minimization techniques to simplify the given digital circuits
CO 2	Identify the appropriate logic gates for designing combinational switching circuits
CO 3	Know the design procedure of various flip – flops
CO 4	Interpret, convert and represent different number systems
CO 5	Analyse digital system using PLD
CO 6	Design and analyse finite state machines
CO 7	Apply the fundamental Boolean laws and minimization techniques to design digital circuits used for processing and transmission of data.

CO/PO Mapping

Course Title:				Digital Electronics										
Course Code:				A2EET302										
Course Designed by				Electrical & Electronics Engineering Department										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3											3	
CO2	3	2											3	
CO3	3	3											3	
CO4	3	1											3	
CO5	3	3											3	
CO6	3	3											3	
CO7	3	3											3	

Course designed by	DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

	SEMESTER - III	L	T	P	C
A2EEI202	**AI Tools, Techniques and Applications (Integrated Course)**	**3**	**1**	**2**	**5**
	Total Contact Hours – 50				

SYLLABUS

UNIT – I: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Concept of AI, history, Turing test, current status, scope, agents, environments, Heuristic search, Depth First search, breadth first search, Difference between convention and Artificial Intelligence Technique with example, Hill climbing, Branches of Artificial intelligence, Knowledge Representation, Major components of AI systems, Expert systems, Classification of different search methods, Production system characteristics.

UNIT – II: BASICS OF FUZZY LOGIC AND GENETIC ALGORITHM

Crisp & fuzzy sets- properties and operations, Fuzzification, Membership functions and Defuzzification methods, Fuzzy rule-based system, Fuzzy toolbox using MATLAB, Fuzzy based PID controller and Speed control of DC motor, Basics of genetics and fitness function, Terminology in Genetic Algorithm, GA toolbox using MATLAB, Minimization/maximization function, Design of Power System Stabilizers using Genetic Algorithm.

UNIT-III: BASICS OF NEURAL NETWORK AND ARTIFICIAL NEURAL NETWORK LEARNING & TRAINING

Biological neural networks, Artificial Neural network Model of an artificial neuron Activation functions Architectures of Neural network Characteristics-learning methods McCulloch & Pitts model Perceptron, ADALINE, MADALINE Hopfield Network Radial Basis function Widrow Hoff /LMS Learning rule Application of Neural Network.

Back-propagation networks: architecture, Back propagation learning, Multilayer perceptron, BP algorithm and effect of tuning parameters of BP algorithm, Backpropagation learning-input layer, Momentum and learning rate, Calculation of error, Selection of various parameters in BP networks, Training of ANN, Application of BP algorithm and its limitations.

UNIT-IV: MACHINE LEARNING

Introduction to Machine Learning, Regression (Simple Linear) and Evaluation metrics in regression models, Model Evaluation in Regression, Multiple Linear regression and Non-Linear Regression, Introduction to classification, KNN and Evaluation metrics. Decision Trees and Support Vector, Machine Logistic Regression, Introduction to clustering-K-Means Clustering, Hierarchical Clustering, Density-Based Clustering, Recommendation systems-Content-based recommender systems Collaborative Filtering.

Decision Trees and Support Vector Machine, Logistic Regression, Introduction to clustering-K-Means Clustering, Hierarchical Clustering, Density-Based Clustering, Recommendation systems- Content-based recommender systems, Collaborative Filtering

UNIT – V: BASICS OF PYTHON AND ML USING PYTHON:

Introduction to Python and Basic syntax, Variables and Basic Operators, Decision Making and Looping, Strings, Tuples, Lists and Dictionary, Modules, Functions and File I/O, Numpy & Pandas Libraries, Scikit-learn Library, Regression using Python, Classification using Python, Clustering using Python.

TEXT BOOK:

1. Stuart Russell, Peter Norvig, Artificial Intelligence: A Modern Approach, 3rd Ed., Prentice Hall, 2009.
2. Rajasekaran and G.A. Vijayalakshmi Pai Neural Networks, Fuzzy Logic and Genetic Algorithms Synthesis and Applications by S., PH India publication.
3. Tom M. Mitchell Machine Learning, McGraw-Hill

REFERENCES:

1. Timothy J. Ross, Fuzzy Logic with Engineering Applications by, Wiley India, 3rd edition.
2. S. N. Sivanandam, Sumati.S, S.N. DEEPA, Introduction to fuzzy logic using MATLAB by Springer
3. S. N. Sivanandam, Sumati.S, S.N. Deepa, Introduction to Genetic algorithm by, Springer
4. S. N. Sivanandam, Sumati.S, S.N. Deepa Introduction Neural Networks using MATLAB 6 by McGraw-hill companies
5. Simon Haykins Neural Networks 3rd ed by PHI
6. Manohar Swamynathan Mastering Machine Learning with Python in six Steps by APRESS
7. Sebastian Raschka Python Machine learning by PACKT Publishing- 2015

LIST OF EXPERIMENTS:

1. Implementation of Fuzzy Relations (Max-min Composition)
2. Design of aircraft controller using Fuzzy Logic toolbox
3. Speed control of Electrical machine using using fuzzy logic toolbox
4. Programming the different steps in Genetic algorithm
5. Implementation of Simple Genetic algorithm with toolbox for DC motor application
6. Write a program to implement XOR logic using matlab
7. Write a program for Heb net to classify two Dimensional input pattern
8. Write a MATLAB program for perceptron net for an AND function with bipolar inputs and targets.
9. Perform different Matrix operation for a 3 by 3 matrix using numpy
10. Read a csv file using Pandas and calculate the statistical parameters.
11. Download the Iris data set and predict the class using linear regression
12. Perform Text classification using backpropagation based neural network
13. Face recognition using machine learning dimensionality reduction and classification.
14. Perform Inverse kinematics using neural network

Course Outcomes (COs)

At the end of course, students shall be able to:

CO 1	Illustrate the basics AI tools and techniques
CO 2	To state the concept of fuzzy and genetic algorithms
CO 3	Know the importance of neural network and its various functions and models.
CO 4	Classify the training and learning algorithms for various networks.
CO 5	Illustrate the steps of genetic algorithms and evaluation of fitness function for a given problem.
CO 6	Explain the importance of Machine Learning and to learn about the Theoretical/ Practical understanding techniques of machine learning algorithms.
CO 7	Application of machine learning algorithms with python

CO/PO Mapping

Course Title:	AI Tools, Techniques and Applications (Integrated Course)
Course Code:	A2EEI202
Course Designed by	Electrical & Electronics Engineering Department

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	3				1		1	1	2	1
CO2	3	1	1	1	3				1		1	1	2	2
CO3	3	1	2	1	3				2		1	2	2	1
CO4	2	1	2	1	3				1		1	1	1	1
CO5	3	2	1	1	3				1		1	1	2	1
CO6	2	1	1	1	3				1		2	2	2	2
CO7	3	2	1	1	3				2		2	2	2	2

Course designed by	DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

A2EEI301	SEMESTER - III	L	T	P	C
	Electrical Circuit Analysis (Integrated Course)	3	1	2	5
	Total Contact Hours – 45				

SYLLABUS

UNIT-I: BASIC CONCEPTS OF DC & SINGLE PHASE AC CIRCUITS

Circuit concepts –Source transformation technique – V-I relationship among Passive bilateral elements (for different input signals – Square, Ramp, Saw tooth, Triangular) –Nodal analysis and Mesh analysis – Super node and Super mesh analysis, Millman's theorem, Maximum power transfer theorem, Thevenin's and Norton's theorems; Sinusoidal steady state analysis, resonance;

UNIT-II: TRANSIENT ANALYSIS OF DC & AC CIRCUITS

Transients in DC & AC circuits, transient response of RL, RC and RLC systems using differential equations and Laplace transforms.

UNIT-III: THREE PHASE SYSTEMS: BALANCED AND UNBALANCED

Phase sequence – Star and Delta connections – Relation between Line and Phase voltages and currents in balanced systems – Analysis of Balanced three-phase circuits – Measurement of Active and Reactive powers in balanced three-phase systems.

Analysis of Three-phase unbalanced circuits: Loop method – Millman's method - Two-wattmeter method for measurement of Three-phase power.

UNIT-IV: TWO PORT NETWORKS

Two-port Network parameters – Z, Y, ABCD and Hybrid parameters and their relations. Cascaded Networks – Poles and Zeros of Network functions.

UNIT-V: NETWORK TOPOLOGY & MAGNETIC COUPLED CIRCUITS

Definitions of Graph and Tree – Basic Cut set and Tie set matrices for planar networks – Incidence matrix, Analogy between Electrical and Magnetic circuits – Faraday's laws of Electromagnetic induction – Lenz's law, Concept of Self and Mutual inductances – Dot convention – Analysis of Composite Magnetic circuits.

TEXT BOOKS:

1. William Hayt and Jack E.Kemmerley, '*Engineering Circuit Analysis'*, McGraw Hill company, 6th edition.
2. Van Valkenburg, '*Network Analysis'*, Prentice-Hall of India Private Ltd.

REFERENCE BOOKS:

1. Joseph Edminister, 'Electrical Circuits', McGraw Hill International Book Company, Singapore.
2. A.Chakrabarthi, '*Circuit Theory (Analysis and Synthesis)'*, Dhanpat Rai & co.
3. Smarajit Ghosh, '*Network Theory Analysis and Synthesis*', PHI Publications.
4. D. Roy Choudhury, '*Networks and Systems*', New Age International Publishers.

LIST OF EXPERIMENTS

1. Verify the Maximum power transfer theorem
2. Verify the Thevenin's and Norton's theorem.
3. Verify the Millman's theorem.
4. VI characteristics of R, L and C. Elements.
5. Measurement of three phase active power for unbalanced Star load.
6. Measurement of three phase active power for unbalanced delta load.
7. Measurement of three phase active power for balanced load using two watt meter method.
8. Find the Z & Y parameters for given two-port network.
9. Find the H & T parameters for given two-port network.
10. Understanding of DOT convention in coupled coils.
11. Calculate the coefficient of coupling for given coupled coil.
12. Analysis of Transient behavior of RLC network

Course Outcomes (COs):

At the end of course, students shall be able to:

CO 1	Describe the methods of network reduction techniques and the concept of resonance.
CO 2	Outline the concept of line and phase quantities, different types of powers in a three phase system
CO 3	Recall the concepts of coupled circuits, two port network parameters and network topology
CO 4	Explain the procedure for solving circuits by applying network theorems and techniques during transient and steady state conditions.
CO 5	Summarize different methods for the measurement of three phase power during balanced and unbalanced loading conditions.
CO 6	Explain the simplification of magnetic circuits, measurement of network parameters and the application of network topology to electrical circuits.
CO 7	Develop problem solving skills through the application of techniques and principles of electrical circuit analysis to common circuit problems

CO/PO Mapping

Course Title:				Electrical Circuit Analysis										
Course Code:				A2EEI301										
Course Designed by				Electrical & Electronics Engineering Department										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2										2	3	1
CO2	3	3	1	1	1								3	1
CO3	2	2		1	1							1	3	1
CO4	3	3	1									1	3	2
CO5	3	2	2										3	2
CO6	2	2	1	1	2							1	3	1
CO7	3	2	2	2	2	1	1					1	3	2

Course designed by	DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

A2EEI302	SEMESTER - III	L	T	P	C
	Analog Electronic Circuits (Integrated Course)	3	0	2	4
	Total Contact Hours – 45				

SYLLABUS

UNIT 1: DIODE CIRCUITS

PN junction diode – structure, operation and Diode equation. V-I characteristics, Half wave rectifier, full wave rectifier – Center tapped and Bridge type. Zener diode – structure, operation, Characteristics, Zener diode as a regulator. Clipping and clamping circuits.

UNIT 2: BIPOLAR JUNCTION TRANSISTOR

BJT construction, operation, transistor current components, transistor as an amplifier. Transistor configurations - CB, CC, CE and characteristics. Small signal equivalent circuits. Transistor biasing – fixed bias, collector feedback bias, emitter feedback bias, collector-emitter feedback bias, voltage divider bias.

UNIT 3: JFET, FEEDBACK AMPLIFIERS AND BASICS OF OP-AMP

Comparison between BJT and JFET, JFET construction, Operation. JFET- Characteristics and Parameters. JFET biasing. Feedback amplifiers classification, transfer gain, negative feedback amplifier characteristics, effect of feedback on input and output resistance, methods of analysis of feedback amplifiers.

Basic information about op-amps – Ideal Operational Amplifier – General operational amplifier stages (Block Diagram), Parameters. Open and close loop configurations. Linear applications: DC sources, Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, adder, Subtractor, V-to-I and I-to-V converters, Instrumentation amplifier

UNIT 4: NON-LINEAR APPLICATIONS OF OP-AMP, 555 TIMER AND VCO

Logarithmic amplifier, Antilogarithmic amplifier, Precision rectifier, peak detector, Comparators, RC phase shift, Wein bridge, colpitts, Hartley oscillators. Introduction to 555 timer, functional diagram. PLL - introduction, Block Diagram, Principles and description of individual blocks, VCO.

UNIT 5: VOLTAGE REGULATORS AND WAVEFORM GENERATORS

IC Voltage regulators – Three terminal fixed and adjustable voltage regulators – IC 723 general purpose regulator. Multivibrators, Triangular wave generator, Saw-tooth wave generator, Schmitt trigger, ICL8038 function generator.

TEXT BOOK:

1. J.Millman, C.C.Halkias, "Electronic Devices And Circuits "Tata Mc Graw Hill,2nd Edition.

2. OP–AMPS and linear integrated circuits by Ramakanth A. Gayakwad (PHI).

REFERENCES:

1. Op–amp and linear integrated circuits by Sanjaysharma, S.K.Kataria & amp; son’s New Delhi.

2. Electronic Devices And Circuits by J.B. Gupta, Dhanpat Rai Publications

LIST OF EXPERIMENTS:

1. V-I characteristics of P-N junction Diode
2. V-I characteristics of Zener diode
3. Transistor biasing
4. Drain and Transfer of characteristics of JFET
5. Frequency response of CE amplifier
6. IC 741 op amp applications: adder, subtractor
7. Active filters: low pass filter, integrator circuit
8. Active filters: high pass filter, differentiator circuit
9. IC555 – mono-stable circuit, Astable circuit
10. Schmitt trigger using IC 741 Op-Amp
11. Study of logic gates
12. 4-bit DAC using 741 Op-Amp

Course Outcomes (COs)

At the end of course, students shall be able to:

CO 1	To recall fundamental concepts of electronic devices such as diodes and transistors
CO 2	Describe the principle of operation of JFET, Operational amplifier.
CO 3	Outline the working operation of 555 timer and voltage regulators.
CO 4	Explain the procedure for clipping and clamping circuits using diodes.
CO 5	Summarize the applications of operational amplifiers.
CO 6	Explain about different waveform generators.
CO 7	Apply the insight fundaments of electronic components to solve real world problems in the field of Engineering

CO/PO Mapping

Course Title:				Analog Electronic Circuits (Integrated Course)										
Course Code:				A2EEI302										
Course Designed by				Department of Electrical & Electronics Engineering										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1		1							2			
CO2	3	1		1							2		2	
CO3	3	2		3	3						2			
CO4	3	1									2			
CO5	3	3		3							2		3	
CO6	3				3								2	
CO7	3	3		2	3									

Course designed by	DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

A2EHA702	SEMESTER – IV	L	T	P	C
	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	2	-	-	0
	Total Contact Hours – 30				

COURSE CONTENT

- Basic Structure of Indian Knowledge System

  i) Ashtadasa vidya
  ii) Veda
  iii) Upavedha
  iv) Ayurvedha
  v) Dhanurvedha
  vi) Ghaandravedha
  vii) Vedang
    a. Shiksha,Kalp
    b. Nirutha
    c. Vyakaran
    d. Jyotishya)
  viii) Shastra
    a. Meemamsha
    b. Purana
    c. Tarka Shasthra

- Modern Science and Indian Knowledge System

- Yoga and Holistic Health care

- Case Studies.

Suggested Text/Reference Books

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course Material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014
2. Swami Jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics
4. Fritzof Capra, The wave of Life
5. V N Jha (Eng. Trans,), Tarkasangraha of Annam Bhatta, Inernational Chinmay Foundation, Velliarnad, Amaku,am
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta
7. GN Jha (Eng. Trans.) Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016
8. RN Jha, Science of Consciousness Psychotherapy and Yoga Practices, Vidyanidhi Prakasham, Delhi, 2016
9. P R Sharma (English translation), Shodashang Hridayam

COURSE OUTCOMES

CO1	The students will be able to comprehend the concepts of Indian Traditional Knowledge.
CO2	The Students will be able to connect themselves with Knowledge from the modern scientific perspective.
CO3	The students will be able to connect the past with the present advancements in Technology.
CO4	The students will be to come to terms with the holistic health care system.
CO5	The students will be able to develop critical thinking skills.
CO6	The students will be able to comprehend the principles enshrined in ancient Sanskrit Literature

CO/PO Mapping

Course Title:	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						2								
CO2						2								
CO3						2								
CO4						2								
CO5						2								
C06						2								

Course designed by	DEPARTMENT OF ENGLISH & HUMANITIES
Approval	Approved by: Meeting of Board of Studies held on 23.06.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CHT101	SEMESTER – IV	L	T	P	C
	Biology for Engineers	**3**	**0**	**0**	**3**
	Total Contact Hours – 48				

SYLLABUS

UNIT-I:

Introduction: Biology and its applications, Biological classification, Living Organisms: Cells and Cell theory, Cell structure and function.

UNIT-II:

Biochemistry and molecular analysis: Chemical composition of living forms, analysis of Chemical composition, Carbohydrates, Amino acid and proteins, protein synthesis, Nucleic acids, lipids, nature of bonding and qualitative tests.

Unit-IIIA:

Genetics: Transfer of genetic information, Mendelian Law, Mendel's law of inheritance, Gene interaction, multiple allens, chromosome theory of inheritance., linkage, Recombination, Chromosome mapping, Genetic disorders, Nucleic acids, replication of DNA, types of RNA, Transcription, Genetic code, translation and steps in translation.

Unit-IIIB:

Metabolism: Thermodynamics as applied to biological systems. Exothermic and endothermic reactions. Concept of Keq and its relation to standard free energy, Spontaneity. ATP as an energy currency. The breakdown of glucose toCO_2 + H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis). Energy yielding and energy consuming reactions, Concept of Energy charge.

UNIT-IV:

Enzymes and industrial applications: Mode of action of enzymes, properties of enzymes, chemical reactions, factors affecting enzyme activity, Co-factors, importance of enzymes, industrial application of enzymes.

UNIT-V:

Microbiology and Industrial applications: Microorganism, Growth kinetics, culture media, sterilization, Microscopy, application of microbiology, immunology and immunity, Cancer Biology, stem cells.

Text books:

1. Biology for Engineers by Wiley (ISBN: 9781121439931), 1st edition TMH, New Delhi (2019)
2. Suraish kumar G K, Biology for Engineers, Oxford University Press, New Delhi (2019)

References:

1. Campbell, NA and Reece JB, Biology, International edition, 7th edition or later, Benjamin Cummings, New York (2007 or later)
2. Karp, G, Cell and Molecular Biology: Concepts and Experiments, 7th edition, Wiley, New York (2013)

Course Outcomes:

Students will be able to:

CO1	Explain the importance of biology in engineering.
CO2	Identify the importance of chemicals like lipids, sugars, polysaccharides, amino acids and proteins
CO3	Know the importance of DNA and RNA
CO4	Describe the process metabolism
CO5	Know the various applications of industrial enzymes
CO6	Know the importance of industrial microbiology in the current scenario.
CO7	Explain importance of the microbes and its applications.

Mapping of POs & COs

CO / PO mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO-1	2			2				2	2		2	2	2	
CO-2	2												2	
CO-3	2												2	
CO-4	2												2	
CO-5	2												2	
CO-6	2			2				2	2		2	2	2	
CO-7	2												2	

A2CHT101 Biology for Engineers	
Course designed by	Department of Chemical Engineering
Approval	Approved by: Meeting of Board of Studies held on 29th Jun, 2019
	Ratified by: 2nd Meeting of Academic Council, 13th AUG, 2020

A2MAT109	SEMESTER - IV	L	T	P	C
	MATHEMATICS-IV (common to EEE & ECE)	3	0	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: RANDOM VARIABLES & PROBABILITY DISTRIBUTIONS

Random Variables: Discrete and continuous random variables, properties of mass and density functions. Mathematical Expectation: Properties (statements), Moment Generating Function; Outlines of Binomial and Poisson distributions; Normal Distribution: Probability density function, Normal approximation to Binomial Distribution, Parameters of Normal Distribution(statements), Characteristics of normal distribution, Area under normal curve, Standard normal distribution.

UNIT-II: STATISTICAL METHODS

Curve fitting by least squares method: Bi-variate data, scatter diagram, method of least squares, normal equations, fitting of straight line, second degree curve (parabola), exponential and power curves; Correlation: types of correlation, measures of correlation, Karl Pearson coefficient of correlation and its properties; Regression Analysis: Regression Coefficients and its Properties, Regression lines

UNIT-III: Z-TRANSFORMS

Z-Transformation: Z-transformation of elementary sequences, recurrence formula, linearity property, Damping rule, change of scale, Shifting u_n to left and right, multiplication by 'n', division by 'n', initial value theorem and Final value theorem;

Inverse Z- Transformations: Partial fractions method, convolution theorem(statement), Applications: Concept of difference equation, solving difference equations by Z-Transformations.

UNIT-IV: COMPLEX VARIABLES (DIFFERENTIATION)

Functions of complex variables: Neighborhood of a point in complex plane, Regions, limit and continuity of a complex function, derivative of a complex function, Cauchy-Riemann equations, analytic function, Entire function, Conjugate function, C-R equations in polar coordinates, Laplace equation, harmonic functions, harmonic conjugates; Construction of analytic functions: Milne-Thomson method; Applications to Electrical field and fluid flow problems: Complex potential, velocity potential, stream function in electrical field and fluid flow problems.

UNIT-V: COMPLEX VARIABLES (INTEGRATION)

Line integral of a complex function: Concept of complex integration, simple closed curve and multiple curves, simply and multiply connected domains, line integral and its properties, evaluation of line integral, Cauchy's integral formula, Cauchy's integral theorem, Cauchy's integral formula for derivatives; Outlines: of Taylor's & Laurent's series; Cauchy's residue theorem: Concepts of zeros, singularities and poles of an analytic function, residues, calculation of residues, Cauchy's residue theorem.

TEXT BOOKS:

1. B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017
2. T.K.V. Iyengar et al, Mathematical Methods, S.Chand Publishers

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011
2. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

Course Outcomes (COs): At the end of course, students shall be able to:

CO 1	Recall the concepts of Random Variables, Probability Distributions & statistical methods
CO 2	Recall the concepts of Z-Transforms
CO 3	Recall the concepts of Complex variables
CO 4	Use and Interpret the concepts of Random Variables, Probability Distributions & statistical methods
CO 5	Use and interpret the concepts of Z-Transforms
CO 6	Use and interpret the concepts of Complex variables
CO 7	Apply the concepts of Probability& statistics, Z-transforms and complex variables to model and solve real world problems.

CO/PO Mapping

Course Title:	Mathematics-IV (Common to EEE & ECE)
Course Code:	A2MAT109
Course Designed by	Dept. of Mathematics

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3		2							2			
CO2	3	3		2							2			
CO3	3	3		2							2			
CO4	3	3		2							2			
CO5	3	3		2							2			
CO6	3	3		2							2			
CO7	3	3		2							2			

Course designed by	DEPARTMENT OF MATHEMATICS
Approval	Approved by: Meeting of Board of Studies held on 06.07.2019
	Ratified by: 5th Meeting of Academic Council, 13-07-2019.

A2CET202	SEMESTER-III	L	T	P	C
	Design Thinking and Product Innovation	3	0	0	3
	Total Contact Hours : 48				
	Prerequisites: None				

SYLLABUS

UNIT 1: INTRODUCTION TO DESIGN THINKING

Design Thinking in General: The Concept of Design Thinking; Wicked Problems, The Principles and the mindset of Design Thinking, Generic Phases of Design Thinking process and activities involved in each of the phase, Design Thinking Frameworks.

Design Thinking for New Product Development : Role of Design Thinking in NPD, When to Apply Design Thinking and When Not to, StageGate Vs Lean Vs. Agile methodologies Vs Design Thinking, Design innovation.

UNIT 2: PROBLEM IDENTIFICATION PROCESS IN DESIGN THINKING

Empathize: Empathize - Goals and methods, Usage of Tools (Design Briefs - Nine Criteria with example), Usage of Tools (Creation of Personas, Illustrative application of Personas), Student Activity on Empathize phase.

Define: Importance of Define Phase, activities, Usage of Tools (Experience Mapping process with example), Usage of Tools (Developing Insights using HMW Questions, question ladder), Student Activity on Define phase.

UNIT 3: PROBLEM SOLVING PROCESS IN DESIGN THINKING, CASE STUDY DISCUSSION & IMPLEMENTATION

Ideate: Importance of Ideate Phase, 77 Design Heuristics, Diverge Ideas, Converge Ideas Student Activity on Ideate phase

Prototype & Test: "A Design Thinking Product Development Framework", What Is a Story? What Is a Prototype?, "Putting It Together—Combining Stories and Prototypes", Employing Stories and Prototypes in Your Process

Case Study Implementation: Case Study - 1 (Problem Identification Processes in Design Thinking), Case Study - 1 (Problem Solving Processes in Design Thinking), Case Study - 2 (Problem Identification Processes in Design Thinking), Case Study - 2 (Problem Solving Processes in Design Thinking)

Student implementing phases of DT towards Problem Solving: Problem Area Identification , Application of Empathize Phase , Application of Empathize Phase,
Case Study Evaluation Phase - 1

UNIT 4: PRODUCT INNOVATION

The Role of Design in Early-Stage Ventures: Introduction: An Emerging Start-up Culture, The Process: Winding from idea to product, Discussion on Case Study, Troubleshooting Common Mistakes

Optimal Design for Radically New Products: Introduction- six ideas and their implementation, Communicate the Challenge Goal toward Radically New Products; Shift Time Frames to Future and Past, Promote an Emerging Technology Focus across the Consumption Chain; Use of Analogical Thinking, Look for Novel Ways to Solve Simple Problems; Leverage More Ideators via Crowd sourcing

UNIT 5: CASE STUDY IMPLEMENTATION

Student implementing phases of DT towards Problem Identification & Solving

Application of Define Phase, Application of Define Phase, Case Study Evaluation Phase – 2, Application of Ideate Phase

Student implementing phases of DT towards Problem Identification & Solving

Application of Ideate Phase, Build Prototype, Test the solution, Case Study Evaluation Phase – 3

Textbooks:

1. Design think new product development essentials from the PDMA – Wiley edition
2. Product Design and Development Karl Ulrich (Author), Steven Eppinger –Fifth edition

References:

1. Design Thinking Getting Started Sidney eve Matrix, https://innovationbydesign.pressbooks.com/
2. https://en.wikipedia.org/wiki/Wicked_problem
3. https://web.mit.edu/jrankin/www/engin_as_lib_art/Design_thinking.pdf
4. https://www.interaction-design.org/literature/article/5-stages-in-the-design-thinking-process
5. https://www.interaction-design.org/literature/article/design-thinking-a-quick-overview
6. https://www.designorate.com/measuring-the-impact-of-design-thinking/
7. https://www.mindtheproduct.com/understanding-design-thinking-lean-agile-work-together/
8. https://www.sopheon.com/spiral-development-lean-vs-stage-gate/#:~:text=In%20practice%2C%20lean%20product%20development,is%20completed%20within%20each%20stage.
9. https://medium.com/codomo/what-is-design-innovation-why-you-need-to-know-it-b8d850503b3a
10. https://dschool-old.stanford.edu/groups/k12/wiki/3d994/empathy_map.html
11. https://www.designkit.org/methods/how-might-we
12. https://careerfoundry.com/en/blog/ux-design/what-is-ideation-in-design-thinking / https://www.interaction-design.org/literature/article/stage-3-in-the-design-thinking-process-ideate

Course Outcomes:

CO1	Have the ability to describe various phases of Design Thinking and various tools for Empathizing in Design Thinking.
CO2	Have the ability to describe various tools for Ideation, Prototyping in Design Thinking
CO3	Have the ability to outline the Design process for new Product development in startups and techniques to design Radically New Products.
CO4	Have the ability to give examples for empathize and define phases in Design Thinkin
CO5	Have the ability to give examples for Ideation, Prototyping in Design Thinking
CO6	Have the ability to draw inferences on designing Radically New Products in emerging startups.
CO7	Have the ability to apply Design Thinking principles, methodologies, phases and tools to design New/Radically new Process/Service/Product

Course Designed by	Department of CSE and IT
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: 6th meeting of academic council held on 21.11.2020

A2EET303	SEMESTER - IV	L	T	P	C
	Power Transmission and Distribution	3	-	-	3
	Total Contact Hours – 45				

SYLLABUS

UNIT-I: TRANSMISSION AND PARAMETERS

Basic definitions - Structure of power transmission systems – Resistance, Inductance and Capacitance calculation for various arrangements - transposition of lines – concepts of GMR and GMD

UNIT-II: TRANSMISSION LINE PERFORMANCE

Classification and important terms – Representation of Short, medium and long transmission lines – Voltage regulation and efficiency calculations – ABCD parameters of transmission lines – Ferranti effect - Surge impedance loading - Skin and Proximity effects – Corona and power loss calculation

UNIT-III: MECHANICAL ASPECTS OF TRANSMISSION LINES & CABLES

Transmission line design considerations – Tower design – Sag – Effect of wind and ice tension – stringing chart

Insulator types – Potential distribution – String efficiency – Methods of improving string efficiency – Insulator testing

Cables – Construction – Resistance & Capacitance – Dielectric stress – Grading of cables – Tan (δ) and power loss - Thermal characteristics

UNIT-IV: SUBSTATIONS

Substation – classification, operation – Bus-bar arrangements – Earthing – Feeders, distributors and service mains - Lightning mechanism

UNIT-V: DISTRIBUTION SYSTEMS

Classification – Comparison with other systems - Voltage drop in DC distributor for various conditions – Voltage drop in AC distribution

TEXT BOOKS

1. John J Grainger William D Stevenson, “Power system Analysis”, TMH Companies, 4th edition.
2. ‘Generation, Distribution and Utilization of Electric Energy’ by C.L.Wadhawa, New Age International (P) Limited, New Delhi, 2015.

REFERENCE BOOKS

1. C.L.Wadhwa, "Electrical Power Systems", New Age International (P) Ltd, New Delhi, 4thEdition.
2. J.B. Gupta, “Transmission & Distribution of Electric Power”, S.K.Kataria & Sons, January 2009.
3. ‘Electrical Power Distribution Systems’ by V.Kamaraju, Tata McGraw Hill, New Delhi, 2009.
4. ‘Elements of Electrical Power Station Design’ by M.V.Deshpande, PHI Learning, New Delhi, 2009.
5. M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, “A Text Book on Power System Engineering”, Dhanpat Rai & Co Pvt. Ltd.

6. Olle I.Elgerd, 'Electric Energy Systems theory: An introduction', Tata McGraw Hill Publishing Company Ltd. New Delhi.

Course Outcomes (COs)

At the end of course, students shall be able to:

CO 1	Interpret the normal operation of electrical transmission and distribution system
CO 2	Illustrate UG cables and their operational characteristics
CO 3	Outline the working operation of substations
CO 4	Describe various factors affecting the performance of the transmission lines and evaluate the electrical & mechanical parameters
CO 5	Demonstrate transmission line design, insulators and their testing
CO 6	Demonstrate the different layouts distribution systems
CO 7	Make use of the concepts associated with transmission & distribution to model and solve the problems in the field of power transmission and distribution

CO/PO & PSO mapping

Course Title:	Power Transmission and Distribution
Course Code:	A2EET303
Course Designed by	Electrical & Electronics Department

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1										2	3	1
CO2	3	1	2	2								2	3	1
CO3	3	1		1									3	1
CO4	3	3	3	2	1							2	3	2
CO5	3	2	3	2	2								3	2
CO6	2	1	1	1								1	3	
CO7	3	2	3	3	3	1	1					1	3	3

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

A2EEI303	SEMESTER - IV	L	T	P	C
	Electrical Machines-I (Integrated Course)	3	2	-	4
	Total Contact Hours – 56				

SYLLABUS

UNIT-1: GENERAL CONCEPTS OF ROTATING ELECTRICAL MACHINES

Construction Features of electrical machines- poly phase induction motors, synchronous machine, DC machine, Types of Windings and Factors- lap winding, wave winding, concentrated winding, and distributed winding, pitch factor, distributed factor, and winding factor, Generated EMF's- generated EMF in full-pitch coil, Generated EMF in short pitch coil and Generated EMF in DC machine- Torque- Electromagnetic torque, reluctance torque, and torque production in DC machine.

UNIT-2: TRANSFORMER-I:

Transformers-I: single phase transformer – Construction- EMF equation-Phasor diagram of no-load and on- load, equivalent circuit, Per unit representation, Voltage regulation of a transformer, Losses in a transformer, Efficiency of a transformer, Condition for maximum efficiency, All day efficiency.

UNIT 3: TRANSFORMERS-II

Testing of Single-Phase Transformers- Parallel operation and auto transformer, Polarity test, Sumpner's test and Separation of core losses. **Special Purpose Transformers**- Instrument transformers (CT and PT), Earthing transformer, Pulse transformer, High frequency transformer and Converter transformer.

Three-Phase Transformer- Advantages of three phase transformer and construction. Types of Three phase transformers-Single, two and three winding connections, Open delta, Scott connection and tap changing transformers.

UNIT IV: DC GENERATORS:

Classification of DC generators and voltage equations, Armature reaction, Compensating windings, Commutation, Methods of improving commutation, Characteristic of DC generators, Efficiency, Condition for maximum efficiency, Parallel operation and applications of DC generators.

UNIT V: DC MOTORS

Classification of DC motors and voltage equations, Back EMF equation and significance of back EMF, Methods of Starting and Speed control of DC motors, Characteristic of DC motors, Efficiency. Testing of DC machines-Brake test, Swinburne's test, Hopkinson's test, Retardation test, Field's test and applications of D C motors.

Text Books:

1. Bimbhra, P.S., Electrical Machinery, Khanna Publishers (2008).
2. Nagrath, I.J. and Kothari, D.P., Electric Machines, Tata McGraw Hill (2004).

Reference Books:

1. R K Rajput, Electrical Machines, Laxmi publications
2. Performance and Design of DC Machines by M.G. Say
3. Albert E Clayton and Hancock. N.N, "The performance and design of direct current Machines", Oxford and IBH publishing company Pvt. Ltd., New Delhi 1990.

4. Fitzgerald, A.E., Kingsley, C. Jr. and Umans, Stephen, Electric Machinery, McGraw Hill (2002).

List of Experiments:

1. Internal and External characteristics of DC Shunt Genertor
2. Internal and External characteristics of DC Compund Genertor
3. Internal and External characteristics of DC Series Genertor
4. Determination of efficiency of two DC shunt machines through Hopkinson's test (back to back test)
5. Determination of performance curves of DC shunt motor by direct test
6. Determination of performance curves of DC compound motor by direct test
7. Determination of efficiency and voltage regulation of single-phase transformer through Sumpner's test
8. Parallel Operation of Two Single Phase Transformers
9. Separation of core losses of a single-phase transformer
10. Convert 3-Phase to 2 Phase of two identical single-phase transformers using Scott connection.
11. Speed control of DC shunt motor by armature voltage control and field current control method using MATLAB
12. Obtain speed- torque characteristics of PMDC Motor

Course Outcomes (CO):

After the completion of the course the students will be able to

CO 1	Recall the construction and generated voltages of rotating machines.
CO 2	Select the special purpose transformer for measurement of electrical quantities.
CO 3	Recall the performance of DC motors and generators in various modes.
CO 4	Compare the performance of auto-transformer with that of two winding transformer.
CO 5	Explain the advantages of increasing load with parallel operation.
CO 6	Explain the speed control and starting methods of DC motors for specific purpose(s).
CO 7	Choose the proper electrical machine and transformer based on their applications.

CO/PO Mapping

Course Title:				ELECTRICAL MACHINES-I									
Course Code:				A2EEI303									
Course Designed by				Department of Electrical & Electronics Engineering									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1				2							3	1	2
CO2	1											3	1	2
CO3	1	1	1	1	2							3	1	3
CO4	1	1										3	1	3
CO5	1		1	1	2							3	1	1
CO6	1	1	1									3	1	1
CO7	1	1	1									3	1	3

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

A2EEI304	SEMESTER - IV	L	T	P	C
	Control Systems (Integrated Course)	3	-	2	4
	Total Contact Hours – 45				

SYLLABUS

UNIT- I: **TRANSFER FUNCTION**

Basic introduction to control system, classification of control systems , open loop , closed loop control systems, Mathamatical modeling of mechanical and electrical systems, transfer function, analogous systems , transfer function using block diagram reduction, signal flow graphs and using Mason's gain formula , effects of feed back, servomotors.

UNIT- II: **TIME DOMAINANALYSIS**

Concept of transient and steady state, type number and order of a system, standard test signals , step response of 2^{nd} order system, time domain specifications, steady state error, static error constants , effect of P ,PI and PID controllers, dynamic errror constants

UNIT- III: **STABILITY ANALYSIS**

Concept of stability, characterstic equation, location of roots in s-plane for stability, Routh stability criterion, root locus technique construction of root loci, relative stability.

FREQUENCY DOMAIN ANALYSIS

Introduction to frequency response, frequency domain specifications, Bode plot- gain margin and phase margin from Bode plot ;

UNIT- IV: **STABILITY ANALYSIS IN FREQUENCY DOMAIN**

Polar plot, Nyquist stability criterion; introduction to compensation.

UNIT- V: **STATE VARIABLE ANALYSIS**

Concept of state, state variable, state models for linear continous systems, solution of state equation, State transition matrix , controllability and observability.

TEXT BOOKS:

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 2^{nd} edition.
2. Modern Control Engineering, Fifth edition, Kotsuhiko Ogata, Prentice Hall of India pvt ltd

REFERENCE BOOKS:

1. Control Systems by A.Anand Kumar, PHI Publications,4^{th} edition
2. Control Systems Engineering by S.Palani, Tata Mc Graw Hill Publications.

List of Experiments:

1. Time response of 2nd order system
2. Effect of P, PI, PD and PID controllers on the performance of a 2nd order system.
3. Transfer function of a DC Motor
4. Transfer function of a DC Generator
5. Lag and Lead compensators – Magnitude and phase plot
6. Characteristics of DC servomotor
7. Characteristics of AC servomotor
8. Effect of feedback on DC servomotor
9. State space model for a given transfer function of a system using MATLAB
10. Characteristics of Magnetic Amplifier
11. Characteristics of Synchros
12. Assessment of stability of a given system using Bode plot in MATLAB.

Course Outcomes (COs)

At the end of course, students shall be able to:

CO 1	Recognize open loop and closed loop control systems.
CO 2	Describe the stability of a system
CO 3	Describe frequency domain specifications
CO 4	Summarize the time response of a 2nd order system
CO 5	Illustrate the methods of stability analysis.
CO 6	Estimate state variables of a control system
CO 7	Apply the time domain, frequency domain approaches and investigate stability of a system in control engineering.

CO/PO Mapping

Course Title:	Control Systems
Course Code:	A2EEI304
Course Designed by	Department of Electrical & Electronics Engineering

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												1	1
CO2	3	1											1	1
CO3	3	1	1		2				2	1	1		1	2
CO4	3	2	1	1	3				3	1	1		1	2
CO5	3	3	2	1	3				3	1	1		2	2
CO6	2	3	2	2	3				3	1	1		2	2
CO7	3	3	2	2	3				3	1	1	2	1	3

Course designed by	Department of Electrical & Electronics Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.20

A2CHA701	SEMESTER - IV	L	T	P	C
	ENVIRONMENTAL SCIENCE	2	0	0	0
	Total Contact Hours – 30				

SYLLABUS

UNIT – I:

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: Definition, Scope and Importance of Multidisciplinary nature of Environmental Studies, Climate change: Global warming, Acid rains, Ozone layer depletion

UNIT – II:

NATURAL RESOURCES: Forest resources, deforestation, case studies –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 mining, case studies. Food resources- World food problems, effects of modern agriculture, Land resources- land degradation, soil erosion and desertification, Energy resources: Growing energy needs, renewable and non-renewable energy sources.

UNIT – III:

Part A:

Ecosystem: Concept of an ecosystem**,** Classification, Structure of an Ecosystem: Producers, consumers and decomposers, different functions of an ecosystem.

Part B:

Biodiversity: Definition and types: genetic, species and ecosystem diversity, Values of biodiversity, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT – IV:

ENVIRONNEMENTAL POLLUTION Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution.

UNIT – V: SOCIAL ISSUES AND THE ENVIRONMENT

Sustainability, urban and energy related problems

Solid waste Management: Causes, effects and control measures of urban and industrial wastes,

Text Books:

1. Environmental Studies by Anubha Kaushik, 4th Edition
2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

References:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi

COURSE OUTCOMES:

Students will be able to:

CO1	Understand the scope and importance of multidisciplinary nature of environmental science.
CO2	Understand the natural resources and their importance for the sustenance of life and the need to conserve natural resources.
CO3	Understand ecosystem and its function in the environment,
CO4	Understand the importance of biodiversity, the threats to biodiversity and conservation practices to protect the biodiversity.
CO5	Understand the various types of pollution, its impact and measures to control pollution.
CO6	Understand solid waste management technologies.
CO7	Understand the sustainability nature of environment.

CO-PO-PSO MAPPING

CO / PO mapping	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	2					1								
CO2	1					2	2							
CO3	2					2	1						1	
CO4	1					1								
CO5	1	1					1						1	
CO6	1					2	1						1	
CO7	1	1											1	

A2CHA701	**ENVIRONMENTAL SCIENCE**
Course designed by	Department of Chemical Engineering
Approval	Approved by: Meeting of Board of Studies held on 29th Jun, 2019
	Ratified by: 2nd Meeting of Academic Council, 13th AUG, 2020

A2EET201	**V – SEMESTER**	**L**	**T**	**P**	**C**
	Internet of Things	**3**	**-**	**-**	**3**
	Total Contact Hours – 48				

SYLLABUS

UNIT-I INTRODUCTION TO IOT

Definition and characterization of IoT, Physical and Logic Design of IoT, IoT Enabling Technologies, IoT Levels, 3 layer and 5 layer models of IoT, Domain Specific applications of IoT: Home Automation, Smart cities, Environment, Energy, Retail, Logistics, Agriculture, Industries, Health & Life Style.

UNIT-II DESIGN PRINCIPLES OF IOT

Definition and principles of Internet – Internet communication, TCP/IP, IP Addresses, MAC Address, Link and Network layer protocols, Transport layer protocols, Application Layer Protocols.

IoT and M2M - Introduction to M2M, Differences between IoT and M2M, SDN and NFV for IoT, Need for IoT Systems Management, Simple Network Management Protocol, Limitations of SNMP.

UNIT-III PROTOTYPING EMBEDDED DEVICES

IoT Design Methodology, Basics of Electronics, Embedded Computing Basics, Arduino, ESP8266 NodeMCU, ESP 32 and Raspberry Pi.

Communication techniques and modules – Wi-Fi, Bluetooth/BLE, Zigbee, LPWAN, LoRa, SIGFOX, GSM; Bluetooth HC-05, ESP-01 Wi-Fi module, LoRa-WAN module, Xbee module.

Sensors in IoT- Introduction to Sensors, commonly used sensors, Serial communication using USART, SPI, TWI, Interfacing of sensors with Arduino and Programming.

UNIT-IV PROGRAMMING USING ARDUINO IDE

Structure- Sketch, Control structure, additional syntax and various operators; Variables- Constants, data types and conversions; Basic Functions- Digital and analog I/O, advanced I/O, mathematical and trigonometric, random numbers, characters, bits and bytes, serial and stream, keyboard and USB; Libraries and Functions – Liquid crystal, Servo, Stepper, Software serial, Wi-Fi, Wire, SPI and other libraries used in IoT; AT commands- Basic, Wi-Fi layer, TCP/IP layer; Programs- Basic, serial communication, ESP8266 and ESP32.

UNIT-V IOT PHYSICAL SERVERS AND CLOUD OFFERINGS

Introduction to Cloud storage models and communication API, WAMP; IoT software development challenges; Features of IoT cloud platforms; Fog & Edge computing; Benefits of Cloud based IoT computing; Cloud based IoT platforms - ThingSpeak, Amazon Web Services – IoT Platform, Microsoft Azure IoT suite, Thingworx, Google Cloud, Ubidots, AutoBahn.

TEXTBOOKS

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.
2. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things" 1st Editionm John Wiley, 2014

3. James A. Langbridge, “Arduino Sketches – Tools and Techniques for Programming Wizardly” published by John Wiley & Sons, Inc., 2015.

REFERENCES

1. Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
2. Olivier Hersent, “The Internet of Things: Key Applications and Protocols”, 2nd Edition, Wiley publisher 2012.
3. Cuno Pfister, Getting Started with the Internet of Things, O‟Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
4. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

WEB REFERENCES

a) https://www.udemy.com/internet-of-things-iot-for-beginners-getting-started/
b) http://www.arduino.cc
c) http://runtimeprojects.com
d) http://www.megunolink.com/articles/arduino-garage-door-opener
e) http://www.willward1.com/arduino-wifi-tutorial
f) http://www.makeuseof.com/tag/pi-overdose-heres-5-raspberry-pi-alternatives
g) http://www.electronicshub.org/arduino-project-ideas
h) http://homeautomationserver.com
i) http://www.toptechboy.com/arduino-lessons
j) https://www.eprolabs.com
k) www.particle.io
l) www.hackster.io
m) www.nodejs.org
n) www.sparkfun.com

Internet of Things (Hands-on Examples)

1. Introduction to various sensors and various actuators & its Application (Students have to prepare Report for the same).
   a) PIR Motion Sensor.
   b) Ultrasonic Sensor
   c) Rain Drop Sensor.
   d) Moisture Sensor.
   e) Temperature Sensor.
   f) Touch Sensor.
   g) Infrared Sensor.
   h) Light Dependent Resistor.
   i) Servo Motor
   j) Motor drivers
   k) DC relays
   l) 16×2 LCD display
   m) Demonstration of Arduino Uno R3 and its pins.
   n) Demonstration of ESP8266 NodeMCU development board and its working.
2. Getting Started with ESP32 Wi-Fi SoC and its working.

3. Creating channels and exploring various options in Thingspeak cloud platform.
4. Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor and read these values using Thingspeak cloud platform.
5. Create a circuit using Arduino to measure temperature and monitor the measured values remotely using Thingspeak.
6. Develop a circuit to measure the light intensity near a solar PV system and send those values over Thingspeak cloud for continuous monitoring.
7. Develop a circuit to continuously monitor the soil moisture in agriculture field using Arduino Uno R3 and Thingspeak.
8. Create a IoT based model to monitor the voltage, current and ambient temperature of an electrical motor drive.
9. OPEN Ended problem: Students are required to submit an IOT based project using the Arduino UNO R3 or NodeMCU, connecting various sensors and actuators. The data for the same should be displayed via a webpage or a web app.

COURSE OUTCOMES

Course Outcomes (COs): At the end of course, students shall be able to:

CO 1	Define IoT, List applications of IoT and the design principles of IoT
CO 2	Select relevant sensor and embedded device for the given application
CO 3	Recall the fundamental of Arduino programming and Cloud storage models
CO 4	Outline different layer protocols and enabling technologies of IoT
CO 5	Compare and contrast the discussed embedded devices and sensors
CO 6	Illustrate the use of ESP866 and ESP32 to implement IoT models
CO 7	Apply the concepts learned to develop real-time model/applications

CO/PO Mapping: ***(3 – Strong, 2 – Medium, 1 – Weak)***

Course Title:	Internet of Things													
Course Code:	A2EET201													
Course Designed by	Electrical & Electronics Department													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	2	1	1			1	1	1		1	1	1
CO2		1	3	2	2			2		1	1	1	2	
CO3		1	2	1	2			1	1	1	1		1	
CO4			2		2			1	2	1	1		1	
CO5		3	3		3	1		1		1	2		2	
CO6		1	2	1	2			1	1	1	1		2	
CO7	2	3	3	2	3	1	1	2	2	2	2	1	3	2

Course designed by	Department of E1ectrica1 & E1ectronics Engineering
Approva1	Approved by: Meeting of Board of Studies he1d on 29.08.20
	Ratified by: 5th Meeting of Academic Counci1

A2EEI305	V – SEMESTER	1	T	P	C
	Electrical Machines - 2	3	0	3	4.5
	Tota1 Contact Hours – 52				

UNIT-I

Construction of Three phase induction motors, Comparison: Squirrel cage type Vs Slip ring type, Working of three phase induction motor, Equivalent circuit, Power flow analysis, losses in the machine, Expression for torque, Torque-slip characteristics, Determination of Equivalent circuit parameters – No load and blocked rotor tests, Circle diagram, Cogging phenomenon and remedies and Crawling phenomenon and remedies

UNIT-II

Problems in starting of induction motor, Starting of squirrel cage induction motors-I, Starting of squirrel cage induction motors-II, Starting of wound rotor/slip ring induction motors, Speed control of induction motor from stator end – through stator voltage, Pole changer, Frequency control, Speed control of induction motor from rotor end – through rotor resistance control, Cascade connection and Slip power recovery scheme

UNIT-III

Construction of three phase alternators, Comparison: Salient pole type Vs non-Salient pole type, Working of three phase alternator, expression for generated emf, Armature windings, Pitch factor and Distribution factor, Equivalent circuit, Armature reaction, Phasor diagrams, Voltage regulation: through emf method, Mmf method, ZPF method and Suppression of harmonics in generated emf

Power flow equations, Power angle characteristics, Synchronization of alternator with infinite bus bars – I, Synchronization of alternator with infinite bus bars – II, Two reaction model of salient pole alternator, Slip test to determine Xd and Xq., Parallel operation of alternators, Effect of change of excitation, Effect of change of mechanical power input and hunting phenomenon and damper windings

UNIT-IV

Working of synchronous motors, Starting of synchronous motor – Pony motor starting. Induction motor starting of synchronous motor, Synchronous Induction motor and Super Synchronous motor, 'v' and 'ʌ' curves of synchronous motor, Power flow analysis – I, Power flow analysis – II, Excitation circles, Power circles and Synchronous condenser

UNIT-V

Construction of single phase induction motor, Working – Double revolving field theory, Torque-slip characteristics, Equivalent circuit, Power flow analysis, No load and blocked rotor tests, determination of equivalent circuit parameters, Split phase motors – Resistance start motors, Capacitor start motors, Capacitor start and capacitor run motors, Permanent split capacitor / single value capacitor motors and Shaded pole motors

TEXT BOOKS:

1. Nagarath. I. J. and Kothari. D. P., "Electric Machines", T.M.H. Publishing Co Ltd., New Delhi, 3th edition 2006.
2. Bimbra .P.S, Electrical Machinery, Khanna Publishers

3. I L Kosow, “Electrical Machines & Transformers”, Prentice Hall of India. 2nd edition 2003.

REFERENCES:

1. Fitzgerald Kingsley and Umans, “Electric Machinery” 6th Edition, McGraw Hill Books co., New Delhi, 2002.
2. Performance and Design of AC Machines by M.G. Say
3. Gupta. “Theory and Performance of Electrical Machines”, Kataria and Sons, 14th edition 2009
4. Stephen J. Chapman, “Electric Machinery Fundamentals”, McGraw Hill Book Co., New Delhi 4th edition 2004.
5. Murugesh Kumar, “Induction and Synchronous Machines”, Vikas Publication Pvt. Ltd., 2003.

Laboratory Practice:

Students can conduct either 10 of the following experiments

1. Determination of performance characteristics of three phase slip ring induction motor by direct test.
2. Determination of performance characteristics of three phase squirrel cage induction motor by direct test.
3. No load and blocked rotor tests on three phase squirrel cage induction motor to develop the circle diagram and thereby study the behavior of the machine.
4. Speed control of three phase squirrel cage induction motor through stator voltage control technique.
5. Speed control of three phase slip ring induction motor through rotor resistance control technique.
6. Determination of voltage regulation of three phase alternator through emf method and mmf method and comparison of results.
7. Determination of voltage regulation of three phase alternator through Potier-Triangle.
8. Determination of direct axis reactance (X_d) and quadrature axis reactance (X_q) for a three phase salient pole alternator and determination of voltage regulation.
9. Determination of sequence impedances of three phase synchronous machine by direct technique and fault analysis technique.
10. Synchronization of three phase alternator to three phase mains.
11. Determination of ‘V’ and ‘Λ’ curves of three phase synchronous motor.
12. Determination of equivalent circuit parameters and thereby determination of behavior of the single phase induction motor by conducting no load and blocked rotor tests.

COURSE OUTCOMES: Student will be able to

CO1.	Describe the construction and operation of three phase induction motors.
CO2.	Describe the construction and operation of three phase alternators.
CO3.	Describe the construction and operation of three phase synchronous motors and single-phase induction motors.
CO4.	Understand the torque speed characteristics of three phase induction motors and to compare various speed control techniques.

CO5.	Compare various practices to determine voltage regulation of three phase alternators and to understand the steady state behavior of the machine under parallel operation.
CO6.	Understand the starting techniques of three phase synchronous motors and single-phase induction motors.
CO7.	Develop the circuit model and three by determine the steady state behavior of single-phase induction motors, three phase induction motors, three phase alternators and three phase synchronous motors at various operating conditions.

CO – PO Mapping:

Course Tit1e:				Electrical Machines - 2									
Course Code:				A2EEI305									
Course Designed by				Electrical & Electronics Department									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		1		3				1			1	1	3
CO2	3		1		3				1		1	1	1	3
CO3	3	1	1		3				1					3
CO4	3				3				1					3
CO5	3				3				2		2	2	2	3
CO6	3				3				2		3	3	2	3
CO7	3	2	1		3				2		3		3	3

Course designed by	Department of E1ectrica1 & E1ectronics Engineering
Approva1	Approved by: Meeting of Board of Studies he1d on 29.08.20
	Ratified by: 5th Meeting of Academic Counci1

A2EEI306	SEMESTER - V	1	T	P	C
	Power Electronics	3	-	3	4.5
	Tota1 Contact Hours – 45				

SYLLABUS

UNIT I POWER SEMI-CONDUCTOR DEVICES

Study of switching devices: SCR, TRIAC, MOSFET, IGBT - Static characteristics: SCR, TRIAC, MOSFET and IGBT - Triggering and commutation circuits for SCR- Thyristor ratings and protection, introduction to gate drive circuits.

UNIT II AC -AC CONVERTERS

Introduction, principle of operation of Single phase and Three phase AC voltage controllers–- single phase and three phase cyclo converters.

UNIT III AC – DC CONVERTERS

Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three- phase fully-controlled converter operation with RLE load, Effect of load and source inductances, Single phase and Three phase dual converters

UNIT IV DC - DC CONVERTERS

Introduction, Basic principles of step-down and step-up operation, chopper classification Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

UNIT V DC - AC CONVERTERS

Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL Loads and three phase voltage source inverters (both120^0 mode and 180^0 mode)– Voltage& harmonic control--PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM

TEXT BOOKS:

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, Third Edition, New Delhi, 2004.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition, 2003.

REFERENCES

1. Joseph Vithayathil,' Power Electronics, Principles and Applications', McGraw Hill Series, 6th Reprint, 2013.
2. Philip T. Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.
3. L. Umanand, "Power Electronics Essentials and Applications", Wiley, 2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, third edition, 2003.
5. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2007.

POWER ELECTRONICS LAB

List of Experiments

Bridge course on

a. Identification of electronic components and their terminals as per various types of codes.
b. Reading of the data sheets and noting down the details.
c. Operation and calibration of CRO.

Any 10 of the following Experiments are to be conducted

1. Study of characteristics of SCR, MOSFET & IGBT
2. Triggering circuits for SCR

Verification of different parameters and controlling of PMDC motor for following experiments

3. 1-Ø half wave controlled rectifier with R and RL loads
4. 1-Ø Fully controlled bridge Converter with R, RL and RLE loads
5. 1-Ø Dual converter with R, RL and RLE loads

Verification of different parameters for following converters should be done.

6. 3-Ø Fully controlled convertor with R and RL Load
7. 1-Ø AC Voltage controller with R & R-L Loads using TRIAC and SCR
8. 1–Ø Cyclo convertor with R and RL Load
9. DC–DC buck converter.
10. DC–DC boost converter.
11. Four quadrant chopper.
12. 1–Ø Parallel bridge inverter with R and RL loads
13. 1–Ø PWM inverter with R load
14. 3–Ø PWM inverter with R load
15. 3–Ø AC Voltage regulator
16. Design of triggering circuits using
    a. Discrete elements
    b. ICs
    c. Micro controllers

COURSE OUTCOMES:

At the end of course, students shall be able to:

CO 1	Select the suitable switching device for given application, also describe the operation of AC-AC converter
CO 2	Describe the operation of AC-DC converters
CO 3	Describe the operation of DC-DC and DC-AC converters
CO 4	Interpret the triggering and protection circuits of SCR and the operation of AC-AC converters
CO 5	Outline the operation of AC-DC converters
CO 6	Explain the operation of DC-DC and DC-AC converters
CO 7	Analyze and design the different converters

CO/PO & PSO mapping

Course Tit1e:	Power Electronics
Course Code:	A2EEI306
Course Designed by	E1ectrica1 & E1ectronics Department

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2						2		1	1
CO2	3	2			2						2		1	1
CO3	3	2			2						2		1	1
CO4	3	2	1	1	3		1				2		2	2
CO5	3	2	1	1	3		1				2		2	2
CO6	3	2	1	1	3		1				2		2	2
CO7	3	3	3	3	3		3		3	1	2	2	3	3

Course designed by	Department of E1ectrica1 & E1ectronics Engineering
Approva1	Approved by: Meeting of Board of Studies he1d on 29.08.20
	Ratified by: 5th Meeting of Academic Counci1

A2EET401	SEMESTER - V	L	T	P	C
	Signals & Systems	3	-	-	3
	Tota1 Contact Hours – 56				

SYLLABUS

UNIT-I: CLASSIFICATION OF SIGNALS AND SYSTEMS

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids_ Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals – Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT-II: FOURIER SERIES & FOURIER TRANSFORM

Review of Fourier series and its exponential representation; Review of Fourier transform and its properties, relationship between Fourier transform and Fourier series; Generalized Fourier transform; Amplitude and phase spectra, energy and power spectral density, signal bandwidth.

UNIT-III: LAPLACE TRANSFORMS

Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T. of a signal.

Z–Transforms: Fundamental difference between continuous and discrete time signals, discrete time signal representation using complex exponential and sinusoidal components, Periodicity of discrete time using complex exponential signal, Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Z transforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

UNIT-IV: SAMPLING

Sampling theorem – Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling.

UNIT-V: CONVOLUTION AND CORRELATION OF SIGNALS

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution properties, Cross correlation and Auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Parseval's theorem, Relation between auto correlation function and energy/ power spectral density function, comparison between ESD and PSD.

TEXT BOOKS:

1. A. Anand Kumar, "Signals & Systems" –2nd Edition, PHI, 2012.
2. B.P. Lathi, "Signals, Systems & Communications" BSPublications, 5th Reprint, 2008.

REFERENCE BOOKS:

1. K.Raja Rajeswari, B.Visvesvara Rao, "Signals & Systems" –1st Edition, PHI, 2009.
2. Simon Haykin and Van Veen, "Signals & Systems", Wiley, 2nd Edition, 2002.

3. Charles L.Phillips, John M. Parr, Eve A. Riskin, "Signals, Systems, and Transforms", Pearson Publications, 4th Edition.

Course Outcomes (CO):

After the comp1etion of the course the students wi11 be ab1e to

CO 1	Describe the concepts and techniques associated with the understanding of signals and systems.
CO 2	Determine the response of linear time invariant systems using convolution classical methods.
CO 3	Identify and understand the properties of the Z transform.
CO 4	Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms.
CO 5	Apply the knowledge of Reconstructing continuous time signals from their sampled signals using interpolation
CO 6	Find the Laplace transform and solve engineering problems using Laplace transform
CO 7	Analyze a problem and formulate appropriate solution for signal analysis and processing application.

CO/PO Mapping

Course Tit1e:			Signals & Systems											
Course Code:			A2EET401											
Course Designed by			Department of E1ectrica1 & E1ectronics Engineering											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3											2	1
CO2	3	3												
CO3	3	3												
CO4	3	3											2	1
CO5	3	3											2	1
CO6	3	3												
CO7	3	3			2								3	

Course designed by	Department of E1ectrica1 & E1ectronics Engineering
Approva1	Approved by: Meeting of Board of Studies he1d on 29.08.20
	Ratified by: 5th Meeting of Academic Counci1

A2EEI401	SEMESTER - V	L	T	P	C
	MATLAB Programming	2	-	2	3
	Tota1 Contact Hours – 56				

SYLLABUS

UNIT-I: INTRODUCTION TO MATLAB

Command Window-Workspace-Current Directory-Editor Window-Types of MATLAB Files, General Commands-Directory Commands-Workspace Commands-Termination Commands-Help Commands.

UNIT-II: CONSTANTS, VARIABLES, VECTORS AND MATRICES

Data Types-Constants & Variables-MATLAB Operators (Arithmetic, Relational, Logical) -Built-in Functions- Assignment Statements. Vectors and commands-Working with Matrices & Special Matrices-Matrix Manipulations (Shape & Size)-Matrix and Array Operations (Arithmetic, Relational, Logical)-Structure Arrays

UNIT-III: PROGRAMMING WITH CONTROL STRUCTURES AND FUNCTIONS

Interactive inputs (input Function, Keyboard command, menu, pause commands)-Reading / Storing File Data-Output format commands- disp Function-Low level file Input/output functions. For & Nested For loop-while loop-if control structure-Switch case structure-Special MATLAB statements (break, continue, error, try- catch).

Script files- Function Files-Function Workspace-Types of Functions-Function handles.

Types of errors-Error handling-display error/warning messages-Debugging using break points - Debugging from Command line.

UNIT-IV: POLYNOMIALS, ODE & GRAPHS

Operations on Polynomials-Derivation and integration of polynomials-Polynomials with Matrix Arguments-Polynomial curve fitting-ODE solvers.

Plotting a Graph-Multiple Plots-Sub Plots-Specialized Plots-3D Plots.

UNIT-V: NUMERICAL METHODS & SIMULINK

Simple Fixed-Point Iteration-Newton Raphson Method-Secant Methods-Brent's method-MATLAB function fzero.

Introduction to Simulink-Simulation of Step response of a Transfer Function- State Space Modeling and Simulation-Simulation of Nonlinear Systems-Simulation of Power Electronic Converters

TEXT BOOKS:

1. RAJ KUMAR BANSAL, '*MATLAB and its Applications in Engineering'*,2nd Edition, Pearson Education.
2. STEVEN C CHAPRA, '*Applied Numerical Methods with MATLAB for Engineers and Scientists*', 3rd Edition, Mc Graw Hill.
3. MISZA KALECHMAN, '*Practical MATLAB Applications for Engineers'*, CRC Press.

REFERENCE BOOKS:

1. ANDREW KNIGHT, '*Basics of MATLAB and Beyond'*, Chapman & Hall/CRC .
2. RUDRA PRATAP, '*Getting Started with MATLAB: A Quick Introduction for Engineers and Scientists*', 7th Edition, Oxford University Press.
3. STEPHEN J CHAPMAN, '*MATLAB Programming for Engineers*', 6th Edition, Cengage India Learning Pvt. Ltd.
4. AGAM KUMAR TYAGI, '*MATLAB and Simulink for Engineers'*, Oxford University Press.

LIST OF EXPERIMENTS

1. Determine the binomial coefficients of a given expression using Pascal's triangle.
2. Solve for branch currents in an electrical resistive network using mesh analysis
3. Plot the Fermi- Dirac distribution function f(E) at 0K, 300K,2500K.
4. Plot and analyze the DC Transient Voltages and Currents in a RL network.
5. Verify the maximum power transfer theorem for an AC Network.
6. Using Fourier series, plot the first 5 harmonics for a given function. Also verify Parseval's theorem and determine the error.
7. Solve a given set of non-linear equations using Newton Raphson Method.
8. Obtain the simulation results when State-Space equations for a Control system are given.
9. Simulation of a Buck Boost Converter
10. Simulation of Single-Phase Inverter
11. For a given Transfer function of a second order system, obtain rise time, delay time, maximum overshoot, peak time and settling time
12. Obtain the power flow solution for a simple 3 bus power system.

Course Outcomes (CO):

After the comp1etion of the course the students wi11 be ab1e to

CO 1	List basic MATLAB commands, operations on Variables and Matrices.
CO 2	Outline the Input/output statements, control structures & user defined functions
CO 3	Describe operations on polynomials, solutions to Nonlinear equations and plot functions
CO 4	Distinguish between Matrices & Structure Arrays
CO 5	Distinguish between Loops & Branch statements, In-built & User defined functions
CO 6	Draw inferences on polynomials, roots using numerical methods and Simulation circuits
CO 7	Apply MATLAB programming skills to solve engineering problems.

CO/PO Mapping

Course Tit1e:				MATLAB Programming									
Course Code:				A2EEI401									
Course Designed by				Department of E1ectrica1 & E1ectronics Engineering									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			3							2		
CO2	3	3	2		3							2		
CO3	3	3	2		3							2		
CO4	3	3	2		3							2		
CO5	3	3	3	2	3							2		
CO6	3	3	3	3	3							2	3	3
CO7	3	3	3	3	3							3	3	3

Course designed by	Department of E1ectrica1 & E1ectronics Engineering
Approva1	Approved by: Meeting of Board of Studies he1d on 29.08.20
	Ratified by: 5th Meeting of Academic Counci1

A2EET402	SEMESTER - V	L	T	P	C
	Electrical Wiring Estimation & Costing	3	-	-	3
	Tota1 Contact Hours – 50				

SYLLABUS

UNIT-I: ELECTRICAL WIRING AND DESIGN OF SIMPLE CIRCUITS

List of Symbols, Types of wires, Different types of wiring systems, Merits, demerits and comparison of different types of wiring, Different types and specifications of wiring materials, Accessories and wiring tools.Lamp circuits-Series and parallel connections (Dim and Bright) of lamps, Fan circuits, Alarm circuits, Tube light circuit, Stair case wiring, Corridor lighting. Examples. I.E. rules for wiring, IE Act-2003

UNIT-II: PRINCIPLES OF ESTIMATING THE MATERIALS

Purpose of estimating and costing, essentials of estimating and costing, calculation of material and labour cost, I.S. specifications, calculation of No. of points (light, fan, socket outlet), calculation of total load including domestic power, determination of no. of circuits, size of wires and cables, switches and main switch, distribution board and switch board, batten conduit and other wiring accessories.

UNIT-III: ESTIMATING AND COSTING OF DOMESTIC AND INDUSTRIAL WIRING

Prepare Layout and wiring diagram for domestic wiring. Calculate the Load, quantity and cost of material required for domestic wiring. Prepare Layout and wiring diagram for industrial wiring. Calculate the Load, quantity and cost of material required for industrial wiring, Examples.

ESTIMATION OF INDUSTRIAL INSTALLATIONS

purpose of earthing, various types of earthing, IE rules regarding earthing systems, To prepare the estimate and cost of materials used for a standard pipe earthing estimate and cost of materials used for a standard and plate earthing, estimate of wiring materials and cost of wiring for single phase and 3 phase supplies. i. Domestic pump set. ii. Irrigation pump set etc.

UNIT-IV: EXTERNAL WIRING SYSTEM:

Introduction, Different types of Under Ground (UG) Cables, Cable Laying, Electrical Control Panels, Feeder Pillar, External Electrical Distribution System, Single Line Diagram, Load Calculations, General Specifications of Generating Set, Transformer, Circuit, Street Lighting.

UNIT-V: PROTECTIVE DEVICES:

Introduction, Protective devices used in Residential, Commercial and Industrial buildings for protection of wiring system, Fuse, MCM, MCCB, ELCB/RCCB and other Circuit Breakers.

TEXT BOOKS:

1) Electrical Design, estimating & Costing by Raina, K. B. and Bhattacharya,S.K., New Age International (p) Limited.
2) Electrical Estimating & costing by Uppal, S L, Khanna Publisher
3) Electrical Installation Estimating& Costing by Gupta, J.B. S. K. Kataria& Sons
4) M G say, Electrical Engineers Reference Book, George Newnes Limited, Tower House, Southampton street strand, w.c.2

REFERENCE BOOKS:

1) Electrical estimating and costing. By M.N. Bajpai- Saroj publication
2) Electrical Design & Drawing *by* Surjeet Singh, S.K.Kataria& Sons
3) Electrical Engg. Design & Drawing by O. P. Soni , SatyaPrakashan

Course Outcomes (CO):

After the comp1etion of the course the students wi11 be ab1e to

CO 1	Understand various types of materials required for wiring and able to design simple circuits.
CO 2	Identify tools, appliances, special outlets, motors and motor circuits.
CO 3	Know the importance of earthing and selection of earthing
CO 4	Prepare detail estimate and costing of Domestic and Industrial Electrical Installations following IE Act-2003
CO 5	To comprehend the estimation of substations
CO 6	To comprehend the estimation of industrial installations
CO 7	To prepare a report on valuation of a property, price escalation, recommendations and auditing.

CO/PO Mapping

Course Tit1e:				Electrical Wiring Design & Estimation									
Course Code:				A2EET402									
Course Designed by				Department of E1ectrica1 & E1ectronics Engineering									
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	3	1	2			3				3	2	1
CO2	3	2	3	1	2					3		3	3	2
CO3	3	3	3	2	3							3	3	2
CO4	3	3	3	3	3	1					3	2	3	3
CO5	3	3	3	3	3	3	2	2	3			2	3	3
CO6	3	3	3	3	3	3		2	2			2	2	2
CO7	3	3	3	3	3		2		2			3	2	3

Course designed by	Department of E1ectrica1 & E1ectronics Engineering
Approva1	Approved by: Meeting of Board of Studies he1d on 29.08.20
	Ratified by: 5th Meeting of Academic Counci1