ACADEMIC REGULATIONS & CURRICULUM

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

ELECTRONICS AND COMMUNICATION ENGINEERING

(B.Tech. Programme)

MAHARAJ VIJAYARAM GAJAPATHI RAJ COLLEGE OF ENGINEERING

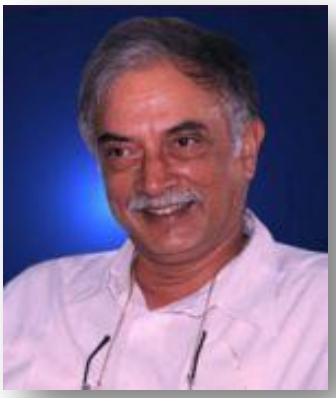
(Autonomous)

(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 – ELECTRONICS AND COMMUNICATION ENGINEERING

(A2 Regulation)

SEMESTER-I						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MAT101	Mathematics-I	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	A2EHA701	Constitution of India	2	--	--	0
Total number of Credits:						**16**

SEMESTER-II						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2MAT102	Mathematics-II	3	--	--	3
2	A2CYI101	Engineering Chemistry (Integrated Course)	3	--	3	5
3	A2EEI201	Basic Electrical Engineering (Integrated Course)	3	--	3	5
4	A2EHL001	Essential Communication in English	1	--	3	3
5	A2ECW201	Electronics Workshop	--	--	3	2
Total number of Credits:						**18**

SEMESTER-III						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2CHT101	Biology for Engineers	3	--	--	3
2	A2MAT107	Mathematics-III	3	--	--	3
3	A2ECT201	Internet of Things	2	--	2	3
4	A2ECT301	Network Theory	3	--	--	3
5	A2ECT302	Switching Theory and Logic Design	3	--	--	3
6	A2ECI201	AI Tools, Techniques and Applications (Integrated Course)	3	--	3	5
7	A2ECI301	Electronic Devices and Circuits (Integrated Course)	3	--	2	4
8	A2CHA701	Environmental Science	2	--	--	0
Total number of Credits:						**24**

SEMESTER-IV						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2EHT001	Effective Technical Communication	2	--	2	3
2	A2MAT109	Mathematics-IV	3	--	--	3
3	A2ECT202	Design Thinking and Product Innovation	3	--	--	3
4	A2ECT303	Signal and Systems	3	--	--	3
5	A2ECT304	Random Variables and Stochastic Process	3	--	--	3
6	A2ECT305	Analog Circuits	3	--	--	3
7	A2ECI302	Analog Communications (Integrated Course)	3	--	2	4
8	A2EHA702	Essence of Indian Traditional Knowledge	2	--	--	0
Total number of Credits:						**22**

SEMESTER-V						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1	A2ECT306	Control Systems	3	--	--	3
2 (PE-1)	A2ECT401	Information Theory and Coding	3	-	-	3
	A2ECT402	VLSI Design				
	A2ECT403	Soft Computing Techniques				
3 (OE-1)	A2MST002	OE-I: Human Resources Development and Organizational Behavior	3	-	-	3
4 (OE-2)	A2XXT5XX		3	-	-	3
5	A2ECI303	Electromagnetic Waves and Transmission Lines (Integrated Course)	3	--	3	4.5
6	A2ECI304	Digital Communications (Integrated Course)	3	--	3	4.5
7	A2ECP601	Socially Relevant Project	--	--	2	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	A2ECT307	Antennas and Wave Propagation	3	--	--	3
3 (PE-2)	A2ECT404	Optical Communication	3	-	-	3
	A2ECT405	Digital IC Design				
	A2ECT406	Machine Learning				
4 (PE-3)	A2ECT407	EMI/EMC	3	-	-	3
	A2ECT408	Computer Architecture and Computer Networks				
	A2ECT409	Transform Techniques				
5	A2ECI305	Digital Signal Processing (Integrated Course)	3	--	3	4.5
6	A2ECI306	Microprocessors and Microcontrollers (Integrated Course)	3	--	3	4.5
7	A2ECP602	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 (PE-4)	A2ECT410	Cellular and Mobile Communication	3	-	-	3
	A2ECT411	Analog IC Design				
	A2ECT412	Digital Image and Video Processing				
3 (PE-5)	A2ECT413	Radar and Satellite Systems	3	-	-	3
	A2ECT414	Embedded and Real time Operating Systems				
	A2ECT415	Biomedical Signal Processing				
4 (PE-6)	A2ECT416	Display Systems	3	-	-	3
	A2ECT417	System On Chip				
	A2ECT418	Speech and Audio Processing				
5	A2ECI307	Microwave Engineering (Integrated Course)	3	--	2	4
6	A2ECL301	Virtual Instrumentation	1	--	3	3
7	A2ECP603	Project (Phase – I)	-	-	4	2
Total number of Credits:						**21**

SEMESTER-VIII						
Sl. No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
1 (OE-3)	A2ECT507	Telecommunication Systems	3	--	--	3
	A2ECT508	Wireless Communication Systems	3	--	--	
	A2ECT509	IOT Systems Design	3	--	--	
	A2ECT510	MOOCS	3	--	--	
2 (OE-4)	A2ECT511	GPS & Navigational Systems	3	--	--	3
	A2ECT512	Cognitive Radio	3	--	--	
	A2ECT513	Industrial IOT	3	--	--	
	A2ECT514	MOOCS	3	--	--	
3	A2ECP604	Project (Phase – II)	3	--	--	
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.

//Topics prefixed with 'outlines / overview' are not for assessment//

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	KO#1	Recall the concepts of Linear algebra
CO 2	KO#2	Recall the solution methods and applicability of first order differential equations
CO 3	KO#3	Recall the solution methods of higher order differential equations and the concepts of Laplace transforms
CO 4	UO#1	Use and interpret the concepts of linear algebra
CO 5	UO#2	Use and interpret solution methods and applicability of first order differential equations
CO 6	UO#3	Use and interpret solution methods of higher order differential equations and the concepts of Laplace transforms
CO 7	AO#1	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.

A2PYI102	SEMESTER – I	L	T	P	C
	APPLIED PHYSICS (COMMON TO EEE,ECE, CSE & IT)	3	-	-	3
	Total Contact Hours – 48				

SYLLABUS

UNIT-I: WAVE OPTICS **[10hrs]**

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 **[8hrs]**

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 **[8hrs]**

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 **[10hrs]**

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 **[12hrs]**

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 (Common to ECE, CSE & IT Branches)													
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 – I	L	T	P	C
	APPLIED PHYSICS LAB (COMMON TO EEE,ECE, CSE & IT)	-	-	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:

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

REFERENCES:

1. 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 (Common to ECE, CSE & IT Branches)													
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 – I	L	T	P	C
	PROGRAMMING FOR PROBLEM SOLVING	3	0	0	3
	Total Contact Hours : 54				
	Prerequisites: Mathematics				

COURSE OBJECTIVES

COBJ1.	Students will study systematic approach to problem solution specification using finite number of unambiguous steps.
COBJ2.	Students will gain understanding of procedural language features using C as the template.
COBJ3.	Students will read and analyse alternative construct choices in procedural language C.
COBJ4.	Students will get exposure to systematic approach of automated solution design, implementation and testing using a procedural language.

SYLLABUS

UNIT – I: [9 HOURS]

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: [9 HOURS]

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: [18 HOURS]

Part – I: [9 HOURS]

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: [9 HOURS]

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: [9 HOURS]

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.

Suggested 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

Suggested 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

1. 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.

2. Have the ability to **describe** one and two-dimensional arrays, **outline** loops and arrays for searching and **describe** various sorting techniques.

3. 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.

4. 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.

5. Have the ability to **apply** arrays to solve complex matrix related problems and strings. **Compare and contrast** various searching and sorting techniques for complexity.
6. 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.

7. Have the ability to **Fully appreciate** 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 (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

COURSE OBJECTIVES	
1.	To use basic data types, operators, expressions and expression evaluation mechanisms using C Programming Language.
2.	To implement control flows construct in C Programming Language and understand the syntax, semantics and usability contexts of these different construct.
3.	To develop composite data types in C and constructs available to develop their data-types, utilize them to model things and dealing with data from and to external files.
4.	To design programs with different variations of the constructs available for practicing modular programming and understand the pros and cons of using different variants and apply optimization.

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	PSO1	PSO2	PSO3
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

A2MED201	SEMESTER - I	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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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 (CIV, EEE, MEC, ECE, & CHE)	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.

//Topics prefixed with ‘outlines / overview’ are not for assessment//

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 (CIV, EEE, MEC, ECE, & CHE)													
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.

A2CYI101	SEMESTER - II	L	T	P	C
	ENGINEERING CHEMISTRY (Common to all branches)	3	--	2	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

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.

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

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 – II	L	T	P	C
	Basic Electrical Engineering (Common to all branches)	3	1	2	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	PSO1	PSO2
To recall fundamental concepts of electrical circuits such as charge, voltage, current and power.	3	3	1	1			3			1			1	1
Describe the principle of operation of D.C. & A.C. machines.	3	2	2	2	2					1			1	1
Outline the working operation of various generating stations.	3	3	3	1	1		1			1			1	1
Explain the procedure for solving circuits with A.C and D.C. Excitation	3	3	2	1	1		2			1			1	1
Summarize the performance characteristics of different machines.	3	3	2	1	1	3	1			1			1	1
Explain about different equipment used in power industry	3	3	2	1		2	2			1		1	3	2
Apply the fundamental laws, associated with Basic Electrical Engineering to solve real world problems in the field of Engineering	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

CO 1. Identify common electrical equipment used in laboratory.(L1)

CO 2. Estimate the ratings of different equipment used to perform an experiment. (L2)

CO 3. Demonstrate the usage of various electrical measuring instruments.(L3)

CO 4. Analyze the characteristics of rotating & stationery electrical machines (L4).

CO 5. 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	PSO1	PSO2
Identify common electrical equipment used in laboratory.	3		1	1	3	1			3	2	2	2	2	1
Estimate the ratings of different equipment used to perform an experiment.	3	2	3	3	3	2	1		3	3	2	2	2	3
Demonstrate the usage of various electrical measuring instruments.	2	2	2	2	3	1			3	3	1	2	2	1
Analyze the characteristics of rotating & stationery electrical machines.	3	3	3	3	2				3	3		2	3	2
Interpret the characteristics of PV cell and Battery.	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.

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.

A2ECW201	Semester : II	L	T	P	C
	Subject : Electronics workshop	0	0	3	2
	Total Contact Hours : 48				
	Prerequisite : Semiconductor Physics				

SYLLABUS

List of Experiments

1. Familiarization and testing of basic electronics and electrical components.
2. a) Familiarization of commonly used Equipment and Tools in Electronics laboratory

   b) Simple circuit connection practice on bread board.
3. a) Familiarization of basic electronic instruments in Electronics laboratory.

   b) Measurement of current through and voltages across the components in a given circuit.
4. a) Study of CRO.

   b) Measurement of time period, amplitude, frequency of a signal using CRO.
5. Soldering and De soldering Practice.
6. Study of Logic gates using digital ICs.
7. Assembling and testing of simple electronic circuits using MULTISIM software.
8. Verification of Thevenin's and Norton's theorems using MULTISIM software.
9. a) Familiarization of Computer Hardware.

   b) Dissembling and assembling a Personal Computer.
10. Installation of Operating system on a PC

Course Outcomes

At the end of the course the student will

1. Have the ability to identify various electronic components like resistor, diode, transistor etc.,
2. Have the ability to test various electronic circuits using electronic equipment like multimeter, CRO and function generator.
3. Have the ability to solder and desolder various electronic components.
4. Appreciate Multisim software to test simple electronic circuits.
5. Have the ability to identify different internal parts of a computer and to dissemble and assemble a Personal Computer.
6. Have the ability to install Windows 8 operating system on a Personal Computer.
7. Have the ability to implement simple electronics project.

Mapping COs with Program Outcomes and Program Specific Outcomes

Subject : Electronics Workshop														
Course designed by				Department of Electronics and Communication Engineering										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				1					1			3	1
CO2	3	2			1								3	1
CO3	3								1				3	1
CO4	3	3		3	1				1	2			3	3
CO5	3	1	1	2					2	2			1	3
CO6	3	1	1	2					2	2			1	3
CO7	3	3	3		3				3	1			3	1

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

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

COURSE OBJECTIVES	
1	To understand the biological concepts from an engineering perspective
2	To study the importance of chemicals like lipids, sugars, polysaccharides, amino acids and proteins
3	To understand about DNA and RNA
4	To understand the process of metabolism
5.	To understand the various applications of industrial enzymes
6.	To understand the importance of industrial microbiology in the current scenario
7.	To understand the importance of microbes and its applications

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.

Course Outcomes:

Students will be able to:

1. Explain the importance of biology in engineering.
2. Identify the importance of chemicals like lipids, sugars, polysaccharides, amino acids and proteins
3. Know the importance of DNA and RNA
4. Describe the process metabolism
5. Know the various applications of industrial enzymes
6. Know the importance of industrial microbiology in the current scenario.
7. Explain importance of the microbes and its applications.

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)

Mapping of POs & COs (Program Outcomes & Course Outcomes)

A2CHT101 Biology for Engineers														
CO / PO mapping	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
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

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

Syllabus

Unit-I: Fourier Series **08 Hours**

utlines: 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 **09 Hours**

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 **07 + 07 Hours**

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 **08 Hours**

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 **09 Hours**

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.

//Topics prefixed with 'Outlines' are not for assessment//

Text Books:

TB1 B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017

TB2 T.K.V. Iyengar et al, Engineering Mathematics, S. Chand Publications, Revised edition.

Reference Books:

RB1 Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.

RB2 B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi,11th Reprint, 2010.

RB3 T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

Course Outcomes

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

CO 1	KO#1	Recall the concepts of Fourier Series and Fourier Transforms
CO 2	KO#2	Recall the concepts of Multiple Integrals
CO 3	KO#3	Recall the concepts of Vector Calculus
CO 4	UO#1	Use and Interpret the concepts of Fourier Series and Fourier Transforms
CO 5	UO#2	Use and interpret the concepts of Multiple Integrals
CO 6	UO#3	Use and interpret the concepts of Vector Calculus
CO 7	AO#1	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.

A2ECT201	SEMESTER - III	L	T	P	C
	Subject : INTERNET OF THINGS	3	0	0	3
	Total Contact Hours – 48				
	Prerequisite: Basics of Programming, Basics of Electronics				

SYLLABUS

UNIT I : Introduction to IoT

Definition and characterization of IoT, Physical and Logic Design of IoT, IoT Enabling Technologies, IoT Levels, Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

UNIT II : Design Principles of IoT

Internet Principles – Internet communication, IP Addresses, MAC Address, TCP and UDP ports, Application Layer Protocols.

IoT and M2M - 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, Electronics, Arduino, Raspberry Pi, Beagle Bone Black, Other Notable Platforms.

Importance of Sensors in IoT- Example Sensors, Interfacing with Arduino, Programming.

UNIT IV : Internet of Things Systems - Logical Design using Python

Introduction, Motivation for using Python, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages of Interest for IoT.

UNIT V : IoT Physical Servers and cloud offerings

Introduction to Cloud storage models and communication API, ThingSpeak, Thingworks, Microsoft Azure, Amazon AWS.

Text Books:

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

References:

1. Francis daCosta, "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.

COURSE OUTCOMES : Learners at the end of course will be able to	
1.	fine what is IOT, List the applications of IOT and what are design principles of IOT
2.	Choose the platform for design and sensors required to interface to get the desired results
3.	To program using python
4.	Outline different protocols and enabling technologies for IOT
5.	Compare and Contrast different Prototyping Embedded Devices and sensors
6.	plain the cloud storage models for IOT
7.	Apply the concepts learned to design the Realtime applications

Course Title				**INTERNET OF THINGS**										
Course Code				**A2ECT201**										
Course Designed by				**Department of Electronics and Communication Engineering**										
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
CO1	3													
CO2	3													
CO3	3	2	2		2									
CO4	3													
CO5	3													
CO6	3				2									
CO7	3	3	3		3						2	2	3	3

Subject Code & Subject Name : A2ECT201 & Internet of Things

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: Meeting of Academic Council held on 21.11.2020

A2ECT301	Semester - III	L	T	P	C
	Subject : Network Theory	3	0	0	3
	Total Contact Hours : 48				
	Prerequisite : Basic Electrical Engineering				

UNIT I : Introduction to Electrical Circuits

Introduction to circuit elements –Kirchhoff Laws, Mesh Analysis, Nodal Analysis, Super mesh analysis, Super Nodal Analysis, Star-Delta Conversion

AC Power Circuit Analysis

Introduction, Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power and Power Factor, Power Triangle, Duals and duality

UNIT II : Coupled Circuits

Introduction to Coupled circuits, Mutual inductance, Dot convention, Coefficient of Coupling, Series connection of Coupled Coils, Parallel connection of Coupled Coils.

Resonant Circuits:

Series Resonance, Voltages and Currents in a Series Resonant Circuit, Quality factor and its effect on Bandwidth, Parallel resonance, Magnification.

UNIT III : Network Theorems

Superposition, Thevenin's theorem, Norton's theorem, Maximum Power Transfer, Tellegens theorem, Milliman's theorem, Reciprocity theorem, Compensation and Substitution theorems.

Two-Port Networks

Introduction to two port network, Open circuit Impedance (Z) parameters, Short circuit Admittance (Y) parameters, Transmission (ABCD) parameters, Inverse Transmission (A'B'C'D') parameters, Hybrid (h) parameters, Inverse hybrid (g) parameters, Inter-relationships of different parameters, Inter-connection of two-port networks, T and π Representation.

UNIT IV : Transients

Overview of Laplace Transforms, Steady state and Transient response, DC Response of R-L, R-C circuits, DC response of R-L-C circuits, Sinusoidal Response of R-L, R-C circuits, AC response R-L-C circuit, Circuit elements in S-Domain

UNIT V : Filters

Classification of filters, filter networks, Equations of Filter Networks, Classification of pass band and stop band, Characteristic Impedance of pass band and stop band, Constant K - low pass filter, Constant K high pass filter, M-derived T section, m-derived π Section, M-derived BPF, M- derived BSF

Text Books:

1. Engineering Circuit Analysis by William H. Hayt& Jack E. Kemmerly McGraw-Hill 8^{th} Edition, 2013.
2. Network Analysis by A. Sudhakar and Shyammohan S palli. McGraw-Hill 5^{th}Edition, 2010.

References:

1. Van, Valkenburg.; "Network analysis" ; Prentice hall of India, 2000
2. Circuit Theory Analysis & Synthesis –Abhijit Chakrabarti, Dhanpat Rai Publishing Company (P) Limited, 6th edition, 2008.
3. Network Analysis and Synthesis – Ravish R Singh, McGraw Hill (I) Pvt. Ltd, 2013
4. https://nptel.ac.in/courses/108/105/108105159/
5. https://gradeup.co/electronics-communication-exams/networks
6. https://questions.examside.com/past-years/gate/gate-ece/network-theory/
7. https://www.youtube.com/watch?v=NEhH6C7Fzw4&list=PLBlnK6fEyqRgLR-hMp7wem-bdVN1iEhsh
8. https://www.youtube.com/watch?v=07OMyxWhaDU&list=PLFW6lRTa1g81LohrWnYo_hsVB-RIzJDRm

COURSE OUTCOMES : After completion of this course, the student will	
1.	Have the ability to outline the basic concepts of electrical networks and to describe the coupled circuits and resonant circuits.
2.	Have the ability to state network theorems and different parameters of two-port networks
3.	Have the ability to describe steady state- transient response of circuits and to list different filter circuits.
4.	Have the ability to compare & contrast Mesh analysis and Nodal analysis and distinguish resonant circuits and coupled circuits.
5.	Have the ability to appreciate network theorems to solve complex circuits and distinguish various two port network parameters.
6.	Have the ability to distinguish steady-state response and transient response and distinguish various filter circuits.
7.	Have the ability to apply and bring to bear the full complement of concepts of 'Network Theory' to solve any electrical circuit.

Course Title			**Network Theory**											
Course Code			**A2ECT301**											
Course designed by			**Department of Electronics and Communication Engineering**											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	1				1				2	1
CO2	3	3	3	2					1			1	2	1
CO3	3	3	3	1					1			1	2	1
CO4	3	3	3	1	1				1				2	1
CO5	3	3	3	2					1			1	2	1
CO6	3	3	3	1					1			1	2	1
CO7	3	3	3	1					1			1	2	1

1. Low 2. Medium 3. High

Subject Code & Subject Name : A2ECT301 & Network Theory

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: Meeting of Academic Council held on 21.11.2020

A2ECT302	**Semester - III**	**L**	**T**	**P**	**C**
	Subject : Switching Theory and Logic Design	3	0	0	3
	Total Contact Hours : 48				
	Prerequisite : Electronic Devices and Circuits & Network Analysis				

UNIT I : Review of Number systems & Codes

Binary numbers, Number base conversions, Complements, r's complement and r-1's complement, Signed number representations, Unsigned addition with overflow check, Unsigned subtraction, Signed addition/subtraction with overflow, Binary codes: Weighted codes and Non-weighted codes, Basic logic operations: NOT, OR,AND, Universal building blocks, EX-OR, EX-NOR Gates, Error detection & Correction Codes, Introduction to digital logic families.

UNIT II : Boolean algebra and Minimization techniques

Huntington's postulates, Duality and Complement, Boolean Theorems, POS and SOP Canonical and Standard forms, NAND and NOR gates (AND and OR using NAND and NOR) – universal gates, Minimization using K-maps (up to 5 variables) Q-M Method of Minimization.

UNIT III : Combinational logic circuits and PLDs

Part1: Design procedures, Adders, Subtractors, Code Converters, Analysis procedure, Binary parallel adder (Ripple Adders), Binary Adder-Subtractor, Carry Look-Ahead Adder, Magnitude Comparator, BCD Adder, 9's Complement circuit, Decoders, Encoders & Priority Encoders.

Part2: Multiplexers, De-Multiplexers, PROM, PLA, PAL-basic structures, Realization of switching functions using PROM , PLA and PAL.

UNIT IV : Sequential circuits I

Classification of sequential circuits (synchronous and asynchronous): Basic flip-flops, SR-flip-flops, D-flip-flops, JK-flip-flops, T-flip-flops, Master-Slave flip-flops, flip-flop characteristic tables, Analysis of clocked sequential circuits, flip-flop excitation tables, design procedure, Conversion of flip-flops, Design of synchronous counters.

UNIT V : Sequential circuits II

Registers, Shift registers, Universal Shift register, Ripple counters, Synchronous Counters, Design Counters with unused states, Ring Counter & Johnson Counter, Finite State Machines, Machine Minimization, Design of State machines, Meelay to Moore conversion and vice-versa.

TEXTBOOKS

1. Digital Design - Morris Mano, 2nd Edition
2. Switching & Finite automata theory - Zvi Kohavi, TMH publications.

REFERENCES

1. Switching Theory & Logic Design - Hill and Peterson Mc-Graw Hill TMH edition.
2. Digital fundamentals – Thomas L Floyd, 11th edition, Pearson 2017.
3. https://nptel.ac.in/courses/106/105/106105185
4. https://www.springer.com/gp/book/9780387285931
5. https://nptel.ac.in/courses/108/105/108105132

COURSE OUTCOMES : At the end of the course, students	
1.	ve the ability to describe about the Number Systems and Boolean Algebra.
2.	ve the ability to describe about the Combinational Circuits and Programmable Logic Devices.
3.	Have the ability to describe about the Sequential Circuits
4.	ve the ability to explain about the Number Systems and Boolean Algebra.
5.	ve the ability to explain about the implementation of the Combinational Circuits and Programmable Logic Devices.
6	ve the ability to explain about the implementation of Sequential Circuits.
7	Have the ability to apply and bring to bear the full complement of Combinational Circuits, Sequential Circuits and Programmable Logic Devices.

Course Title			**Switching Theory & Logic Design**											
Course Code			**A2ECT302**											
Course designed by			**Department of Electronics and Communication Engineering**											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1									2	2	2	2
CO2	3	1									2	2	2	2
CO3	3	1									2	2	2	2
CO4	3	1									2	2	2	2
CO5	3	1									2	2	2	2
CO6	3	1									2	2	2	2
CO7	3	1									2	2	2	2

1. Low 2. Medium 3. High

A2ECT302 & Switching Theory & Logic Design

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: Meeting of Academic Council held on 21.11.2020

A2ECI201	III - SEMESTER	L	T	P	C
	Subject : AI Tools, Techniques & Applications	3	0	3	5
	Total Contact Hours : 96				
	Prerequisites: Programming for Problem Solving				

Syllabus

UNIT I : Introduction to Python

The basic elements of python, Control Structures, Loops, Functions and scoping, Recursion, Global variables, Modules, Strings, Files.

UNIT II : OOP in Python

Structured Types, Mutability and Higher-Order Functions, Tuples, Lists and Dictionaries, OOP in Python: Classes, Objects, Constructors, Inheritance, Encapsulation.

UNIT III : Introduction to AI

Basics of AI. Applications of AI. Advanced search, Constraint satisfaction problems, Knowledge representation & reasoning, Non-standard logics, Uncertain and probabilistic reasoning

Conceptual introduction to **Machine Learning:** Introduction to Neural Networks, Supervised, Unsupervised, and Semi-Supervised Learning, introduction to Reinforcement learning, Deep Learning: layers, activation functions, optimizers.

UNIT IV : Image Processing

Conceptual introduction to **Image Processing & Computer Vision:** Introduction to Image processing, Setting up Open CV, Filtering Images, Tracking Faces with Haar Cascades, Detecting Edges and Applying Image Filters, Detecting and Tracking Different Body Parts, Extracting Features from an Image.

Applications: ***GEN*****:** Automation, Agriculture [Crop and Soil Monitoring, Grading farm produce, Predictive Analytics], ***Mech:*** Autonomous vehicles, ***Civil:*** Building Crack Detection using Thermal Images, ***EEE:*** Heat detection near HT Connectors, Crack detection in insulators.

UNIT V : Computer Vision:

Image - Definition and Tagging. Classification of images. Image formation, Deep Learning algorithms for Object detection & Recognition. Object Tracking, Stereo Vision and 3D Reconstruction, Augmented Reality

Applications: ***GEN*****:** Robotics; ***ECE***: Diagnostic systems.

Text Books:

1. Programming and Problem solving with PYTHON, McGraw Hill Education, Ashok Namdev Kamthane, Amit Ashok Kamthane, 2018 (UNIT-I & II)
2. Joseph Howse, Prateek Joshi, Michael Beyeler - OpenCV Computer Vision Projects with Python-Packt Publishing (2016) – (UNIT-IV & V)
3. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach (UNIT-III)

References:

1. Tom Mickiewicz & Josh Zheng, Getting started with Artificial Intelligence, Published by O'Reilly Media, 2017.
2. Aurelian Geron, Hands on Machine Learning with Scikit-Learn and TensorFlow [Concepts, Tools, and Techniques to Build Intelligent Systems], Published by O'Reilly Media, 2017.
3. Navin Kumar Manaswi, Deep Learning with Applications Using Python, Apress.
4. Keras: https://keras.io/ https://github.com/keras-team
5. Deeplearning4j: https://deeplearning4j.org/
6. Scikit-learn: https://scikit-learn.org/stable/ https://github.com/scikit-learn/scikit-learn
7. Deep Learning.Ai:https://www.deeplearning.ai/
8. OpenCv: https://opencv.org/ https://github.com/qqwweee/keras-yolo3
9. NVIDIA:CUDA https://developer.nvidia.com/cuda-math-library
10. Programming and Problem solving with PYTHON, McGraw Hill Education, Ashok Namdev Kamthane, Amit Ashok Kamthane, 2018.
11. AI Tool and Techniques Laboratory manual.
12. Computer Vision with Python 3, Packt Publishing Ltd, Saurabh Kapur, 2017.

Laboratory Experiments

Week 1) Working of operators, expression evaluation, ways of accepting input and displaying output. Recall the basics of elements of Python and their usage in different advanced packages.

Week 2 & 3) Explore on control and iterative statements.

Week 4 & 5) Working on Functions, Strings, Files, and Global variables along with modules.

Week 6 &7) Explore on python data Structures like lists, tuples and dictionaries.

Week 8) Integrating Machine Learning with Computer Vision.

Week 9) Image preprocessing operations using openCV

Week 10) Feature extraction of an image

Week 11) Perform object detection.

Week 12) Image classification

Week 13) Lab based Project

Week 14) Lab based Project

Course Outcomes: After completing this course, the students	
1	Have the ability to describe basic programming constructs and object oriented programming concepts in Python
2	Have the ability to describe the fundamentals of AI & ML concepts and DL concepts.
3	Have the ability to describe about Image Processing & Computer Vision concepts
4	Have the ability to explain the fundamental concepts and OOP of Python.
5	Have the ability to explain and outline the features of AI & ML and DL
6	Have the ability to demonstrate the Image Processing techniques & Computer Vision concepts and apply in various domains.
7	Have the ability to apply and bring to bear the full complement of concepts of Python to solve AI problems through programming with Python.

Course Title			**AI Tools, Techniques & Applications**											
Course Code			**A2ECI201**											
Course designed by			**Department of Electronics and Communication Engineering**											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			3						2	3		
CO2	3	2	2	1									3	
CO3	3	2	2	1									1	
CO4	2	1			3							1		
CO5	3	2	2	1									2	
CO6	3	2	2	1									2	
CO7	3	2	2	1							1	2	3	

1. Low 2. Medium 3. High

A2ECI201 & AI Tools, Techniques & Applications

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.20
	Ratified by: Meeting of Academic Council held on 21.11.2020

A2ECI301	SEMESTER - III	L	T	P	C
	Subject : Electronic Devices and Circuits	3	0	2	4
	Total Contact Hours : 80 Hours				
	Prerequisite : Applied Physics				

UNIT I : PN Junction Diode

Formation of PN junction diode, Open circuited PN Junction, Energy Band Diagram of PN Diode, Forward and Reverse Bias, Current components in PN Diode, Diode Equation, V-I Characteristics, Temperature Dependence on V–I characteristics, Diode Resistance (Static and Dynamic), Diode Capacitance, Zener Diode, Avalanche and Zener break Down, Zener diode as voltage regulator, Half wave rectifier, Full wave rectifier (Center tapped and Bridge), Inductor filter, Capacitor filter, LC filter and π-section filter.

UNIT II : Transistor Characteristics and Biasing

Bipolar Junction transistor, Transistor current components, operation of NPN and PNP Transistor, Transistor CB,CE,CC configurations, CE Amplifier, Operating point, bias stability, Fixed bias, collector to base bias, self-bias circuits, stabilization factors (S, S', S''), bias compensation, thermistor and sensitor compensation, thermal runaway.

UNIT III : Small Signal Analysis of Transistor Amplifiers

Two port devices and transistor hybrid model, determination of h-parameters from characteristics, measurement of h-parameters, conversion formulas for the parameters of three transistor configurations, analysis of a transistor amplifier circuit using h- parameters, comparison of transistor amplifier configurations, generalized approximate hybrid model and analysis of CE, CC amplifiers, hybrid- π model of a BJT.

Construction and operation of Junction Field Effect Transistor, JFET volt -ampere characteristics, FET parameters, Expression of saturation drain current, small signal model of JFET, common source amplifier and common drain amplifier, hybrid- π model of a FET, MOSFET characteristics (Enhancement and depletion mode), symbols of MOSFET

UNIT IV : Multistage Amplifiers & Special Semiconductor Devices

Introduction, different coupling schemes used in amplifiers, General analysis of cascade amplifiers, Two stage RC coupled BJT and FET amplifiers, effect of coupling capacitor, Construction, operation and characteristics of SCR,TRIAC, DIAC, LASCR, Tunnel diode, Varactor diode, UJT and LED.

UNIT V : Feedback Amplifiers and Oscillators

Feedback concept, transfer gain with feedback, general characteristics of negative feedback amplifiers, Types of negative feedback- voltage series, voltage shunt, current series, and current shunt feedback amplifiers. Condition for oscillations, RC-phase shift oscillators with transistor and FET with necessary derivation for frequency of oscillation, Wien bridge oscillator, Hartley and Colpitts oscillators, crystal oscillators.

Text Books:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Satyabrata Jit, Tata Mc-Graw Hill , Second Edition-2007.
2. Electronic Devices and Circuits- G.K.Mithal, Khanna publishers.-2010.

References:

1. Electronic Devices and Circuits – S Salivahanan, N. Suresh Kumar, McGraw Hill, Education-2015.
2. Electronic Devices and Circuits- G.S.N Raju, I. K. International publishers.-2006.
3. https://nptel.ac.in/courses/117/103/117103063/
4. https://nptel.ac.in/courses/122/106/122106025/
5. https://nptel.ac.in/courses/108/101/108101091/#

List of Lab Experiments

Minimum ten experiments to be conducted

1. P-N Junction Diode Characteristics
2. Zener Diode Characteristics and load regulation
3. Half Wave Rectifiers (without and with filter)
4. Full Wave Rectifiers (without and with filter)
5. Transistor CB Characteristics
6. Transistor CE Characteristics
7. FET Characteristics
8. SCR Characteristics
9. UJT Characteristics
10. CE Amplifier
11. FET-CS Amplifier
12. CC Amplifier

COURSE OUTCOMES : At the end of the course, students shall	
1.	Have the ability to describe the operation and characteristics of PN junction diode and BJT and state their applications in rectifiers and amplifiers
2.	Have the ability to state h-parameter model for BJT and describe the FET and MOSFET characteristics.
3.	Have the ability to list different kinds of feedback amplifiers and oscillators and describe the operation of special semiconductor devices
4.	Have the ability to compare & contrast different types of rectifiers, BJT configurations and Transistor biasing techniques.
5.	Have the ability to distinguish between different BJT configuration amplifiers.
6	Have the ability to distinguish different coupling schemes in amplifiers and different types of feedback amplifiers.
7	Have the ability to apply the concepts of electronic devices and circuits in the design of Analog and digital electronic circuits.

Course Title			**Electronic Devices & Circuits (Theory + Lab)**											
Course Code			**A2ECI301**											
Course designed by			**Department of Electronics and Communication Engineering**											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2										3	2	2
CO2	2	2	2									3	2	2
CO3	2	2	2		1							2	2	2
CO4	1	1										1	1	2
CO5	1	1										1	2	2
CO6	1											1	1	2
CO7	2	2	3		1							2	3	2

1. Low 2. Medium 3. High

Subject code & Subject Name : A2ECI301 & Electronic Devices & Circuits

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29.08.2020
	Ratified by: Meeting of Academic Council held on 21.11.2020

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

COURSE OBJECTIVES	
1.	To study about the scope and importance of multidisciplinary nature of environmental science.
2.	To study about the natural resources and their importance for the sustenance of life and the need to conserve natural resources.
3.	To study about the ecosystem and its function in the environment.
4.	To study about the importance of biodiversity, the threats to biodiversity and conservation practices to protect the biodiversity.
5.	To study about the various types of pollution, its impact and measures to control pollution.
6.	To study about solid waste management techniques
7.	To study about the sustainability nature of environment

ENVIRONMENTAL SCIENCE

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:

1. Understand the scope and importance of multidisciplinary nature of environmental science.
2. Understand the natural resources and their importance for the sustenance of life and the need to conserve natural resources.
3. Understand ecosystem and its function in the environment,
4. Understand the importance of biodiversity, the threats to biodiversity and conservation practices to protect the biodiversity.
5. Understand the various types of pollution, its impact and measures to control pollution.
6. Understand solid waste management technologies.
7. Understand the sustainability nature of environment.

ENVIRONMENTAL SCIENCE														
CO / PO mapping	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO-1	2					1								
CO-2	1					2	2							
CO-3	2					2	1						1	
CO-4	1					1								
CO-5	1	1					1						1	
CO-6	1					2	1						1	
CO-7	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

	SEMESTER - IV	L	T	P	C
A2EHT001	**EFFECTIVE TECHNICAL COMMUNICATION (Skill Oriented Course)**	**1**	**-**	**3**	**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.

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

Syllabus

Unit-I: Random Variables & Probability Distributions **09 Hours**

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 **08 Hours**

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 **07 +07 Hours**

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) **09 Hours**

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) **08 Hours**

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.

//Topics prefixed with 'Outlines' are not for assessment//

Text Books:

TB1 B. S. Grewal, Higher Engineering Mathematics, 44/e, Khanna Publishers, 2017

TB2 T.K.V. Iyengar et al, Mathematical Methods, S.Chand Publishers

Reference Books:

RB1 Erwin Kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011

RB2 B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

RB3 T. Veerarajan, Higher Engineering Mathematics, Tata McGraw-Hill, 2008

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

CO 1	KO#1	Recall the concepts of Random Variables, Probability Distributions & statistical methods
CO 2	KO#2	Recall the concepts of Z-Transforms
CO 3	KO#3	Recall the concepts of Complex variables
CO 4	UO#1	Use and Interpret the concepts of Random Variables, Probability Distributions & statistical methods
CO 5	UO#2	Use and interpret the concepts of Z-Transforms
CO 6	UO#3	Use and interpret the concepts of Complex variables
CO 7	AO#1	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 ECE & EEE)													
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.

A2ECT202	**SEMESTER – IV**	**L**	**T**	**P**	**C**
	Design Thinking and Product Innovation	3	0	0	3
	Total Contact Hours : 48				
	Prerequisites:				

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, Stage Gate 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 & REFERENCES:

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

COURSE OUTCOMES

I. **KO#1 :** Describe various phases of Design Thinking and various tools for Empathizing in Design Thinking

II. **KO#2 :** Describe various tools for Ideation, Prototyping in Design Thinking

III. **KO#3 :** Outline the Design process for new Product development in startups and techniques to design Radically New Products

IV. **UO#1 :** Give examples for empathize and define phases in Design Thinking

V. **UO#2 :** Give examples for Ideation, Prototyping in Design Thinking

VI. **UO#3 :** Draw inferences on designing Radically New Products in emerging startups.

VII. **AO#1 :** Apply Design Thinking principles, methodologies, phases and tools to design New/Radically new Process/Service/Product

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	3	1											1	1
2.	2	2	2	2								2	2	2
3.	2	2	2	1								2	3	2
4.	2	2	2	1								2	2	2
5.	2	2	1	1								2	3	2
6.	2	2	1	1								2	2	2
7.	2	2	1`	1								2	3	3

1. Low 2. Medium 3. High

A2ECT202- Design Thinking and Product Innovation

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29-08-2020
	Ratified by: Meeting of Academic Council held on 21-11-2020

A2ECT303	**SEMESTER - IV**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**
	Subject : SIGNALS AND SYSTEMS				
	Total Contact Hours : 48				
	Prerequisites: Differentiation, Integration, Vector Analysis, Partial Fractions.				

UNIT I

REPRESENTATION OF SIGNALS: Classification of signals, Elementary signals, Basic operations on signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions,

Fourier series representation of periodic signals, Trigonometric and Exponential Fourier series, Fourier spectrum, Properties of continuous time Fourier series.

UNIT II

THE CONTINUOUS-TIME FOURIER TRANSFORM: Deriving Fourier transform from Fourier series, Existence of Fourier transform, Fourier transform of standard signals- Gate pulse, Impulse function, Single sided real exponential, Constant amplitude, Signum function, Unit step signal, Triangular pulse, sinusoidal signal, Fourier transform of periodic signals, properties of Fourier transforms.

UNIT III

SAMPLING: Sampling theorem, Graphical and analytical proof for Band Limited Signals, Aliasing effect, types of sampling: impulse, natural and flat top sampling, Introduction to band pass sampling theorem.

LTI SYSTEMS: Linear system, Linear time invariant (LTI) system, impulse response, Response of LTI system, Transfer function of a LTI system, properties of LTI systems: causality and stability, Causal LTI systems described by differential equations, Distortionless transmission through a system, ideal and non-ideal filters, Paley-wiener criterion, Signal bandwidth, System bandwidth.

UNIT IV

CORRELATION OF SIGNALS : Convolution of signals, Properties of convolution, Cross correlation and Auto correlation of signals and their properties, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Detection of periodic signals in the presence of noise by correlation

UNIT V

LAPLACE & Z TRANSFORM TECHNIQUES: Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Laplace transform of commonly used signals, Properties of L.T's, Relation between L.T and F.T. of a signal, Concept of Z- Transform of a discrete sequence, Region of convergence in Z-Transform, constraints on ROC for various classes of signals, properties of Z-transforms, Inverse Z-transform.

TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 3rd edition, 2009.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd edition, 2011.

REFERENCES

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd edition, 2008.
2. Signals & Systems – A. Anand Kumar, PHI, 2nd edition, 2013.
3. https://nptel.ac.in/courses/108/106/108106163/
4. https://nptel.ac.in/courses/108/104/108104100/
5. https://nptel.ac.in/courses/117/101/117101055/

COURSE OUTCOMES	
1.	Have the ability to list different kinds of signals and describe signal representation with Fourier series and Fourier transform
2.	Have the ability to state sampling theorem for band limited and band pass signals and describe the properties of LTI system
3.	Have the ability to describe convolution , correlation operations between signals and state the properties of Laplace transform and Z-transform
4.	Have the ability to distinguish between Fourier series and Fourier transform techniques.
5.	Have the ability to distinguish different kinds of sampling techniques and contrast between signal bandwidth and system bandwidth concepts
6	Have the ability to contrast between energy spectral density and power spectral density concepts and draw inferences from ROC of Laplace transform and Z-transform of signals
7	Have the ability to apply the Fourier, Laplace and Z-transform techniques in the domain of digital signal processing

Subject Code & Subject Name														
Course designed by			Department of Electronics and Communication Engineering											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1									1		2
CO2	2	2	1			2						1		1
CO3	1	2	1									1	1	2
CO4	1	2	1									1		1
CO5	1	2	1									1		1
CO6	2	2	2									2	1	3
CO7	2	3	3		2							2	2	3

1. Low 2. Medium 3. High

A2ECT303- SIGNALS AND SYSTEMS

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29-08-2020
	Ratified by: Meeting of Academic Council held on 21-11-2020

	SEMESTER - IV	L	T	P	C
A1ECT304	**Subject : Random Variables and Stochastic Process**	3	0	0	3
	Total Contact Hours : 48				
	Prerequisite : Mathematics – I, Mathematical Methods				

UNIT I

RANDOM VARIABLE

Definition of a Random Variable, Types of Random variables, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions and Properties.

Conditional distribution and density function, standard distribution & density functions: Gaussian, Rayleigh, Uniform, Exponential, Binomial, Poisson density functions.

UNIT II

OPERATIONS ON ONE RANDOM VARIABLE

Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality.

Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Nonmonotonic Transformations of Continuous Random Variable.

UNIT III

MULTIPLE RANDOM VARIABLES

Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution and density functions, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Central Limit Theorem: Unequal Distribution, Equal Distributions.

OPERATIONS ON MULTIPLE RANDOM VARIABLES

Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables, Two Random Variables case, N Random Variables case, Transformations of Multiple Random Variables.

UNIT IV

RANDOM PROCESS-TEMPORAL CHARACTERISTICS

Concept of random process, Classification of random processes, deterministic and non-deterministic processes, distribution and density Functions, Concept of Stationary and Statistical Independence. First- Order Stationary Processes. Second- Order and Wide-Sense Stationary, N^{th}-order and Strict- Sense Stationary, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions.

RANDOM PROCESS-SPECTRAL CHARACTERISTICS

The Power Spectrum Properties, Relationship between Power Spectrum-and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

UNIT V

LINEAR SYSTEM RESPONSE

Random Signal Response of Linear Systems: System Response-Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross- Power Density Spectra of Input and Output, Modeling of Noise Sources:

Resistive (Thermal) Noise Source, Effective Noise Temperature, Average Noise Figure, Average Noise Figure of cascaded networks.

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition, 2002.
2. Probability theory and stochastic process, Y. Mallikarjuna Reddy, Universities Press, 4th edition.2003

REFERECES:

1. Probability Theory and Stochastic Processes - B. Prabhakara Rao, Oxford University Press 1st edition.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishnan, PHI, 4th Edition, 2002.
3. https://nptel.ac.in/courses/111/102/111102111/
4. http://people.math.harvard.edu/~knill/books/KnillProbability.pdf
5. https://www.netlab.tkk.fi/opetus/s38145/k05/lectures/lect04_1.pdf

COURSE OUTCOMES	
1	Understand concepts of random variable, distribution, density functions and different types of density functions
2	Understand operations on single random variable
3	Understand operations on multiple random variables
4	Explain the statistical properties of random processes
5	Explain the spectral characteristics of random processes
6	Analyze Autocorrelation and Cross-Correlation Functions
7	Analyze linear systems with random inputs and modeling of noise sources.

A1ECT304 - **RANDOM VARIABLES AND STOCHASTIC PROCESS**														
Course designed by			Department of Electronics and Communication Engineering											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2									2	2	
CO2	3	1												2
CO3	3		2									2		
CO4	3												2	
CO5	3		2											2
CO6	3	2										3		
CO7	2		2									3	2	2

1. Low 2. Medium 3. High

A1ECT304 - **RANDOM VARIABLES AND STOCHASTIC PROCESS**

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29-08-2020
	Ratified by: Meeting of Academic Council held on 21-11-2020

A2ECT305	SEMESTER - IV	L	T	P	C
	Subject : Analog Circuits	3	0	0	3
	Total Contact Hours : 48				
	Prerequisite : Electronic Devices and Circuits, Network Analysis				

UNIT I

POWER AMPLIFIERS: Concept, features of power amplifiers, comparison of voltage and power amplifiers, Classification of power amplifiers**,** Series fed directly coupled Class A amplifier, Transformer coupled Class A amplifier, Distortion in Amplifiers, Push pull class B amplifier, Complementary symmetry Class B amplifier, cross over distortion.

TUNED AMPLIFIERS: Introduction, classification of tuned amplifiers, Q-Factor, requirements of tuned amplifier, Single and double tuned amplifier analysis.

UNIT II

NON-LINEARWAVESHAPING: Diode series clippers, Diode shunt clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Positive clamping operation, Negative clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem.

UNIT- III

INTRODUCTION TO OP-AMP: The operational Amplifier, Block diagram representation of a typical Op-Amp, schematic symbol, Classification of IC's, Types of IC's, Manufacturers designation for Linear IC's, Package Types and temperature ranges, power supplies for IC's, electrical parameters, The Ideal OP-Amp ,equivalent circuit of an Op-Amp, Ideal voltage transfer curve, open-loop Op-Amp configurations, Ideal and practical Op-Amp specifications, CMRR, PSRR, DC and AC characteristics, Compensation techniques.

APPLICATIONS OF OP- AMPS AND 555 TIMER: Peaking amplifier, Summing, scaling, averaging amplifiers, Instrumentation amplifier, Integrator and differentiator, Comparators, Schmitt Trigger, Introduction to 555 timer, connection diagram, Block diagram, Monostable and Astable Operations.

UNIT-IV

VOLTAGE TIME BASE GENERATORS: General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, and Transistor Bootstrap time base generator.

UNIT-V

ACTIVE FILTERS: Active filters, Butter worth filters– 1st order LPF, HPF filters, 2nd order LPF, HPF filters ,Wide Band pass Filter, Narrow Band pass Filter, Wide Band reject Filter, Narrow band reject Filter and All pass filters.

TEXT BOOKS:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, SatyabrataJit, Tata Mc-Graw Hill , Second Edition-2007.
2. "Pulse, Digital and Switching Waveforms" by J. Millman, H. Taub and MS Prakash Rao, McGraw-Hill, 2007.
3. Op-Amps & Linear ICs by Ramakanth A. Gayakwad, PHI, 1987.

REFERENCES:

1. Electronic Devices and Circuits- G.K.Mithal, Khanna Publishers, 2010.
2. Pulse and Digital Circuits" by A.Anand Kumar, PHI, Second Edition 2012.
3. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2nd Edition, 2003.
4. https://www.youtube.com/watch?v=huDZjQcEBMg
5. https://www.youtube.com/watch?v=aO6tA1z933k
6. https://www.youtube.com/watch?v=xki9taCqsWY

COURSE OUTCOMES	
1	Have the ability to describe the concepts of Power , Tuned amplifiers,clippers and clampers
2.	Have the ability to state the characteristics and applications of Operational amplifier and describe the concepts of 555 timer.
3	Have the ability to list active filters and, A/D & D/A converters.
4	Have the ability to compare and contrast Power, Tuned amplifiers, clippers and clampers.
5	Have the ability to draw the inferences on op-amp characteristics and 555 Timers.
6	Have the ability to compare and contrast active filters, A/D & D/A converters.
7	Have the ability to solve problems using operational amplifier for various applications

Subject code & Subject Name : A2ECT305, ANALOG CIRCUITS														
Course designed by			Department of Electronics and Communication Engineering											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4		1												
CO5		1												
CO6		1												
CO7						3							1	

1. Low 2. Medium 3. High

Subject code & Subject Name : A2ECT305, ANALOG CIRCUITS

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29-08-2020
	Ratified by: Meeting of Academic Council held on 21-11-2020

A2ECI302	SEMESTER - IV	L	T	P	C
	Subject : Analog Communications	3	0	2	4
	Total Contact Hours : 48				
	Prerequisite: Electronic Devices and Circuits, Network Theory				

UNIT I
AMPLITUDE MODULATION:

Introduction to communication system, Need for modulation, Amplitude Modulation, Definition, Time domain and frequency domain description, single-tone modulation, power relations in AM waves, Generation of AM waves; Square law modulator, Switching Modulator, Detection of AM Waves; Square-law detector, Envelope detector, Frequency Division Multiplexing.

UNIT II
DSB &SSB MODULATION:
Doubleside band suppressed carrier modulators, time domain and frequency domain representation, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method and Phase discrimination method for generating AM SSB Modulated waves , Demodulation of SSB Waves, Vestigial sideband modulation: Generation of VSB Modulated wave, Frequency domain and Time domain representation.

UNIT III
Part 1:
ANGLEMODULATION:
Basic concepts, Frequency Modulation: Single-tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave, Generation of FM Waves, Direct and Indirect FM, Detection of FM Waves: Balanced Frequency discriminator, Phase locked loop, Comparison of FM&AM.

Part 2:
PULSEMODULATION:
Time Division Multiplexing, Types of Pulse modulation, Generation & demodulation of PAM (Single polarity, double polarity), PWM, PPM, TDM vs FDM.

UNIT IV
TRANSMITTERS: Radio Transmitter - Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter–Variable reactance type and phase modulated FM Transmitter, Frequency stability in FM Transmitter. **RECEIVERS**: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics-Frequency changing and tracking, Intermediate frequency, AGC,F M Receiver, Comparison with AM Receiver, Amplitude limiting

UNITV

NOISE: Noise in Analog Communication System, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis &De-emphasis.

LIST OFEXPERIMENTS

Minimum10 experiments to be conducted (Hardware) and Minimum 2 experiments to be conducted software(using Mat lab or Simulink)

1. Amplitude Modulation & Demodulation.
2. AM -DSBSC-Modulation & Demodulation.
3. Diode Detector.
4. Pre-emphasis & De-emphasis.
5. Frequency Modulation & Demodulation.
6. Automatic Gain Control Circuits.
7. Verification of Sampling Theorem.
8. Pulse Amplitude Modulation & Demodulation.
9. Pulse Width Modulation & Demodulation.
10. Pulse Position Modulation & Demodulation.
11. Phased Locked Loop.
12. Spectral analysis of modulated signals using Spectrum Analyzer.
13. Lab based project

TEXT BOOKS:

1. Communication Systems-Simon Haykin, John Wiley, 2nd Ed.2005
2. Communication Systems– R.P. Singh, S P Sapre, Second Edition TMH, 2007.

REFERENCES:

1. Electronics & Communication Systems–George Kennedy and Bernard Davis,TMH 2004.
2. Communication Systems– B.P.Lathi, BS Publication,2006.
3. PrinciplesofCommunicationSystems–HTaub&D.Schilling,GautamSahe,TMH, 2007 3rd Edition.
4. https://www.academia.edu/8767678/Introduction_to_Analog_and_Digital_Communications_2nd_Edition_An_Simon_Haykin
5. https://ict.iitk.ac.in/wp-content/uploads/EE320A-Principles-Of-Communication-CommunicationSystems-4ed-Haykin.pdf
6. https://www.tutorialspoint.com/analog_communication/analog_communication_quick_guide.htm

Course Outcomes	
1	Have the ability to describe different amplitude modulation and demodulation schemes with their advantages, disadvantages and applications.
2	Have the ability to analyze generation and detection of FM signal and comparison between amplitude and angle modulation schemes.
3	Have the ability to differentiate between different pulse modulation and demodulation techniques and signal multiplexing for various applications
4	Have the ability to describe various modulation and demodulation techniques including AM, FM and PM
5	Have the ability to explain various transmitters and receivers
6	Have the ability to evaluate the performance of analog communications in the presence of noise.
7.	Have the ability to apply and bring to bear the full complement of analog communication to acquire life long experience in doing projects related to communication systems.

Subject Code & Subject Name: A2ECI302, Analog Communications														
Course designed by			Department of Electronics and Communication Engineering											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1							1			2	2	2
CO2	1	1							1			2	2	2
CO3	1	1							1			2	2	2
CO4	1	1							1			2	2	2
CO5	1	1							1			2	2	2
CO6	1	1							1			2	2	2
CO7	3	3	3		2	2			2	1	1	2	3	2

1. Low 2. Medium 3. High

Subject Code & Subject Name: A2ECI302, Analog Communications

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of Board of Studies held on 29-08-2020
	Ratified by: Meeting of Academic Council held on 21-11-2020

A2EHA702	SEMESTER - IV	L	T	P	C
	Essence of Indian Traditional Knowledge	**2**	**-**	**-**	**0**
	Total Contact Hours – 30				

Course Objectives:

- To impart basic principles of thought process, reasoning and inference. Sustainability is at the core of Indian Traditional Knowledge Systems connecting society and nature.
- To impart holistic lifestyle of Yogic-science and wisdom capsules in Sanskrit literature which is very important in modern society experiencing rapid technological advancements and societal disruptions.
- To focus on introduction to Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.

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

CO-1: The students will be able to comprehend the concepts of Indian Traditional Knowledge.

CO-2: The Students will be able to connect themselves with Knowledge from the modern scientific perspective.

CO-3: The students will be able to connect the past with the present advancements in Technology.

CO-4: The students will be to come to terms with the holistic health care system.

C0-5: The students will be able to develop critical thinking skills.

C0-6: 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.

A2ECI303	**Semester : V**	**L**	**T**	**P**	**C**
	Subject : ELECTROMAGNETIC WAVES AND TRANSMISSION LINES	**3**	**---**	**3**	**4.5**
	Total Contact Hours : 80 Hours				
	Prerequisite : Integration, Differentiation, Matrix Algebra, Vector Calculus				

UNIT I

ELECTROSTATICS:

Introduction to 3D coordinate systems and their transformations, coulomb's law, Electric field intensity and electric flux density, electric field potential and relation between E an V, Gauss law, its applications and its Maxwell's equation, Energy Density, Convection and Conduction Currents, Continuity equation and relaxation time, Poisson's and Laplace's Equations, Capacitance and energy density, related problems.

UNIT II

MAGNETOSTATICS:

Introduction, Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, inductance and magnetic energy density, Magnetic energy density, Magnetization in materials, Magnetic material, related problems.

UNIT III

MAXWELL'S EQUATIONS:

Faraday's law of electromagnetic induction, Transformer and motional emf, inconsistency of Ampere's Law and Displacement Current Density, Maxwell's equations in differential form, Maxwell's equations in integral form and word statement, Time varying harmonic Maxwell's equations, Boundary conditions: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Related problems

ELECTROMAGNETIC WAVE EQUATIONS:

Introduction, Applications of EM waves, Wave equations for conducting, dielectric and lossless media, Uniform Plane Wave (UPW) and general solution of UPW. Relations between E & H in UPW. Characterization of conductors and dielectrics, wave propagation in good conductors and good dielectrics, skin depth, polarization. Related problems.

UNIT IV

ELECTROMAGNETIC WAVE CHARACTERISTICS:

Introduction Normal and Oblique incidence of UPW on perfect conductor and perfect dielectrics for parallel and perpendicular polarization, Brewster angle, critical angle, Total internal reflection, surface impedance, Surface resistance and reactance, Poynting Vector and Poynting theorem – applications, Instantaneous, average and complex pointing vector, related problems.

UNIT V

TRANSMISSION LINES:

Definition, Types, Applications, equivalent circuit of two wire parallel transmission lines, Primary constants, Line Equations, Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities , Infinite Line Concept, Loss less and Low Loss Characterization, Distortion – Condition for Distortion less and Minimum Attenuation, Input Impedance Relations, SC and OC Lines, Reflection, Reflection

Coefficient, VSWR, Smith Chart – Construction and Applications, Impedance matching devices, types, Quadrature wave matching, Single stub, Related problems.

LABOROTORY:

(Any 10 experiments to be performed.)

1. Characteristics of point charges in electrostatics field.
2. Symbolize Laplacian in different coordinate systems in rectangular, cylindrical and spherical coordinate system.
3. Magnetic Field Computation Using Biot–Savart Law
4. Magnetic Field Computation Using Ampere's Law
5. Evaluation of influence of time varying field :Displacement Current
6. Propagation of wave in different medium.
7. Polarization of Electromagnetic Waves
8. Normal Incidence on a Perfectly Conducting Plane
9. Oblique Incidence on a Perfectly Conducting plane
10. Evaluate Telegrapher's Equations and Their Solution for transmission line.
11. Characterization of transmission line with losses.
12. Impedance matching of different structures using smith chart for transmission line.
13. A lab based project.

TEXT BOOKS

1. Elements of Electromagnetics – Matthew N.O. Sadiku, Oxford Univ. Press, 4th ed.,2007.
2. Electromagnetic Field Theory Fundamentals- by Bhag Singh Guru, Hüseyin R. Hiziroglu ,Cambridge university press, 3rd edition.

REFERENCES

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.
2. Engineering Electromagnetics by William H. Hayt Jr. and John A Buck, TMH, 7thEdition.
3. Electromagnetic waves and transmission lines – Y Mallikarjuna Reddy, University press private Ltd, 2nd edition.
4. Computational Electromagnetics with MATLAB, Fourth Edition - Matthew N.O. Sadiku, Oxford Univ. Press
5. https://nptel.ac.in/courses/108/104/108104087/
6. https://www.youtube.com/watch?v=G7TNFEG850w&list=PLyqSpQzTE6M_lqGSelDcZ6rAwW9BQHS22
7. https://www.youtube.com/playlist?list=PL4Pd7JNZ_gC--g2i47_B0jp5ewEqAoBO7
8. http://www.nptelvideos.in/2012/12/transmission-lines-and-em-waves.html

COURSE OUTCOMES : Student will able to

1.	Review of coordinate systems. States coulombs law and Gauss's law based on electrostatic fields.
2.	Explain about the relation between time varying electric and magnetic field and electromotive force.
3.	Analyze Maxwell's equations in different forms.
4.	Distinguishes the electromagnetic wave equations and study their characteristics propagated in different medias.
5	Analyzes reflection and refraction of electromagnetic waves propagated in normal and oblique incidences
6	Get an exposure to the properties of transmission lines and analysis of Electromagnetic wave propagation through transmission lines.
7	Design of high frequency transmission lines for point to point communication.

CO / PO Mapping

Course Title			**Electromagnetic Waves & Transmission Lines**											
Course Code			**A2ECI303**											
Course designed by			Department of Electronics and Communication Engineering											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			1						1		1	2	
CO2	3		1							1		1	2	
CO3	3		2							1		1	2	
CO4	3	1	2	1						1		1	3	1
CO5	3		2							1		2	3	2
CO6	3		2	1	1					1	1	2	3	1
CO7	1		2	1	1					1		3	3	2

1. Low 2. Medium 3. High

A2ECI303 :: Electromagnetic Waves and Transmission Lines

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of 7th Board of Studies held on 27-07-2021
	Ratified by: Meeting of Academic Council held on

A2ECI304	**Semester : V**	**L**	**T**	**P**	**C**
	Subject : DIGITAL COMMUNICATIONS	3	--	3	4.5
	Total Contact Hours : 48				
	Prerequisite: Analog Communication.				

UNIT I

PULSE DIGITAL MODULATION

Elements of digital communication systems, Advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems, DPCM

UNIT II

DELTA MODULATION

Delta modulation, its draw backs, slope overloading, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems, Q-level differential PCM systems, Comparison of Analog and Digital Communication Systems.

UNIT III

DIGITAL MODULATION TECHNIQUES AND DATA TRANSMISSION

Introduction, ASK, FSK, PSK, DPSK, DEPSK. Introduction to M-ary signaling, QPSK. coherent reception of ASK,FSK,PSK .

Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter. Calculation of probability of bit error rate of ASK, FSK, PSK, QPSK. Similarity between FSK and PSK.

UNIT IV

INFORMATION THEORY & SOURCE CODING

Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties, Advantages, Shannon's theorem, Shanon-Fano coding, Huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel, bandwidth –S/N trade off.

UNIT V

CHANNEL CODING

Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes. Introduction of convolution codes, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

TEXT BOOKS:

1. Principles of Communication Systems", Taub, Schilling and Saha, 4th edition, McGraw Hill Education
2. Digital and Analog Communication Systems by Sam Shanmugam, John Wiley, 2005

REFERENCES:

1. Digital communications by Simon Haykin, John Wiley, 2005.
2. Digital Communications by John Proakis, TMH, 1983.
3. Communication Systems Analog & Digital by Singh & Sapre, TMH, 2004.
4. https://www.youtube.com/playlist?list=PLOzRYVm0a65dhUUuWow3dmimcgOisQn4I
5. https://www.youtube.com/playlist?list=PLp6ek2hDcoNBOuRjTIoI_O_TSwTk2eTEj
6. https://www.youtube.com/playlist?list=PL706AF98A1C340551

LABORATORY:

List of Experiments

1. Time Division Multiplexing.
2. Pulse Code Modulation.
3. Differential Pulse Code Modulation.
4. Delta Modulation.
5. Frequency Shift Keying.
6. Phase Shift Keying.
7. Differential Phase Shift Keying.
8. Companding.
9. Study of Source- Encoder and Decoder.
10. Linear Block Code – Encoder and Decoder.
11. Binary Cyclic Code – Encoder and Decoder.
12. Convolution Code – Encoder and Decoder.

Additional Experiments.

Lab Based Project.

COURSE OUTCOMES: Students have the ability

1.	To list the advantages and different types of digital modulation systems.
2.	To describe different types of digital carrier modulation techniques.
3.	To describe source and channel coding used in digital communication systems.
4.	To distinguish between PCM and Differential PCM systems.
5.	To compare the optimum filter and matched filter performance in the digital receivers.
6.	To calculate the amount of information in the received message and also channel capacity of discrete channels.
7.	To design digital communication system and also calculate the bandwidth, efficiency, and probability of bit error of a digital communication system.

CO / PO Mapping

Course Title			**Digital Communications**											
Course Code			**A2ECI304**											
Course designed by			Department of Electronics and Communication Engineering											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			1						3		1	2	
CO2	3	3		3						3		1	2	
CO3	3	3		3						3		1	2	
CO4	3	3		3						3		1	3	1
CO5	1									3		2	3	2
CO6	1			3	1					3	1	2	3	1
CO7	1			3	1					3		3	3	2

1. Low 2. Medium 3. High

A2ECI304 :: Digital Communications

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of 7th Board of Studies held on 27-07-2021
	Ratified by: Meeting of Academic Council held on

A2ECT306	**Semester : V**	**L**	**T**	**P**	**C**
	Subject : CONTROL SYSTEMS	3	1	0	4
	Total Contact Hours : 48				
	Prerequisite : Mathematics				

UNIT I

INTRODUCTION

Block Diagram representation and Signal flow graph: Open Loop and Closed Loop Control Systems, Examples, Feed-back Characteristics, Effects of feedback, Types of feedback systems, Block Diagram Representation and its reduction, Signal Flow graph, Masons Gain formula. Modeling of Systems: Mathematical Modeling of Mechanical systems-Translational Motion, Mathematical Modelling of Mechanical systems- Rotational Motion, Mathematical Modelling of Electrical networks, Analogous systems-Force(Torque)-voltage analogy, Analogous systems-Force(Torque)-current analogy.

UNIT II

TIME RESPONSE ANALYSIS

Time response of first and second order systems: Standard test signals, first order systems-unit step response, first order systems-unit ramp and impulse response, Characteristic Equation of feedback control systems, Transient response of second order systems, Time domain specifications, Steady state response, Steady state errors and error constants. Controllers: Different types of controllers, Proportional controller, PI-controller, PD-controller, PID-controller.

UNIT III

STABILITY ANALYSIS IN S-DOMAIN

Routh and Hurwitz stability criterion: The concept of stability, Hurwitz stability criterion, Routh‘s stability Criterion, Routh‘s stability Criterion-special cases, qualitative stability and conditional stability, limitations of Routh‘s stability. Root Locus Technique: The root locus concept, construction of root loci-Magnitude condition, Angle condition, Properties of root loci-up to angle of asymptotes, Properties of root loci-up to break away points, effects of adding poles to G(s)H(s) on the root loci effects of adding zeros to G(s)H(s) on the root loci.

UNIT IV

FREQUENCY RESPONSE ANALYSIS

Frequency domain specifications and Bode plots: Introduction, Frequency domain specifications Bode plots of standard factors, construction of Bode plot for a given transfer function determination of transfer function from the Bode plots, Phase margin and Gain margin, Stability Analysis from Bode Plots. Stability Analysis in Frequency Domain:
Polar Plots, Gain margin and phase margin calculations, Nyquist Plots, Stability Analysis.

UNIT V

STATE VARIABLE ANALYSIS

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, State Transition Matrix and its Properties, State transition equation, Relationship between state equations and transfer functions, Characteristic equations, Eigenvalues and Eigenvectors, Derivation of state models from block diagrams and signal flow graphs.

Controllability and Observability: Similarity transformation-Controllability Canonical Form, Observability Canonical Form, Diagonal Canonical form, Decomposition of transfer functions-Direct, Parallel and Cascade decompositions, Concept of Controllability, Concept of Observability.

TEXT BOOKS:

1. Automatic Control Systems 8th Edition, by B.C. Kuo 2003, John Wiley and Son's.
2. Control Systems Engineering, by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Pub. 2nd edition.

REFERENCES:

1. Modern Control Engineering by Katushiko Ogata, Prentice Hall of India Pvt. Ltd.,3rd Edition, 1998.
2. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
3. https://nptel.ac.in/courses/107/106/107106081/
4. http://www.cdeep.iitb.ac.in/vod/vodCloud/login.php
5. https://engineeringmedia.com/videos.

COURSE OUTCOMES

1.	Formulate the mathematical model and transfer function of mechanical & electrical Systems.
2.	Understand the time response of first order and second order systems.
3.	Understand and analyze the stability of the system using Routh stability criteria
4.	Analyze the system stability using Root Locus Technique.
5.	Analyze the stability of open loop and closed loop control systems with frequency domain techniques.
6.	Understand the state variable techniques.
7.	Able to apply the control system concepts to design any system.

CO / PO Mapping

Course Title	**Control System**
Course Code	**A2ECT306**
Course designed by	**Department of Electronics and Communication Engineering**

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

1. Low 2. Medium 3. High

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of 7th Board of Studies held on 27-07-2021
	Ratified by: Meeting of Academic Council held on

A2ECT401	**Semester : V**	**L**	**T**	**P**	**C**
	Subject : INFORMATION THEORY AND CODING	3	0	0	3
	Total Contact Hours : 48				
	Prerequisites : Digital Communications, Random Variables				

UNIT I
SOURCE CODING
Introduction to information theory, Uncertainty and information, Average mutual information, Entropy, information measures for continuous random variables, source coding theorem, Lempel-Ziv algorithm, run length coding, rate distortion function, introduction to image compression.

UNIT II
CHANNEL MODELS
Introduction, Channel models, channel capacity, channel coding, Shannon's concept of information, Shannon Fano Coding, information capacity theorem, channel capacity for MIMO systems, Random selection of codes, Parity check matrix, Syndrome.

UNIT III
ERROR CONTROL CODING
Introduction to Error Correcting Codes, Basic Definitions, Equivalent Codes, Perfect Codes, Low Density Parity Check (LDPC) Codes, Maximum Distance Separable (MDS) Codes, Bounds on Minimum Distance, Hamming codes, Convolutional codes, Tree diagram.

TRELLIS CODED MODULATION
Introduction to TCM, Trellis State Diagram, The Concept of Coded Modulation, Mapping by Set Partitioning, Ungerboeck's TCM Design Rules, TCM Decoder, Performance Evaluation for AWGN Channel, Computation of dfree, Space Time Block Codes, Space Time Trellis Codes.

UNIT IV
CODING FOR SECURE COMMUNICATIONS
Introduction to Cryptography, An Overview of Encryption Techniques, Operations Used by Encryption Algorithms, Symmetric (Secret Key) Cryptography, Data Encryption Standard (DES), International Data Encryption Algorithm (IDEA), RC Ciphers, Asymmetric (Public-Key) Algorithms, The RSA Algorithm, Biometric Encryption, Cryptanalysis.

UNIT V
SPREAD SPECTRUM MODULATION
Introduction, Pseudo noise sequence, properties of maximum length sequence, Spreading technique, principle of Direct Sequence Spread Spectrum (DSSS), DSSS with coherent binary phase shift keying, frequency hop spread spectrum, Slow frequency hopping, fast frequency hopping, Applications.

TEXT BOOKS:

1. Information Theory, Coding and Cryptography by R Bose, TMH 2007.
2. Digital Communications by K N Hari Bhat and D Ganesh Rao, Pearson, 3E, 2010

REFERENCES:

1. Principles of Communication Systems by H. Taub and D. Schilling, TMH, 2003.
2. Digital Communications by John Proakis, TMH, 1983.
3. Communication Systems Analog & Digital by Singh & Sapre, TMH, 2004.
4. Channel Coding Techniques for Wireless Communications" K Deergha Rao, Springer, 2nd Edition, 2019
5. http://web.iitd.ac.in/~rbose/initiative/MOOCS.pdf
6. http://www.infocobuild.com/electronics/Information Theory, Coding and Cryptography
7. https://nptel.ac.in/courses/108/102/108102117
8. https://www.tutorialspoint.com/error-correcting-codes

COURSE OUTCOMES: Have the ability

1.	To state information and information-carrying capacity of the communication channel.
2.	To list different types of codes.
3.	To describe basic data encryptions methods and spread spectrum modulation concepts.
4.	To differentiate between source coding and channel coding.
5.	To distinguish between error control and space time codes.
6.	To design encryption algorithms and analyze spectrum techniques.
7.	To apply coding techniques in Information Theory

CO / PO Mapping

Course Title			**Information Theory and Coding**											
Course Title			**A2ECT401**											
Course designed by			**Department of Electronics and Communication Engineering**											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3													
CO2	3													
CO3	3													
CO4	3	3												
CO5	3													
CO6	3			2	2								2	
CO7	3	3	3	3	3	2		2			2	2	3	2

1. Low 2. Medium 3. High

A2ECT401 :: Information Theory and Coding

Course designed by	Department of Electronics and Communication Engineering
Approval	Approved by: Meeting of 7th Board of Studies held on 27-07-2021
	Ratified by: Meeting of Academic Council held on

A2ECT402	Semester : V	L	T	P	C
	Subject : VLSI DESIGN	3	0	0	3
	Total Contact Hours : 48				
	Prerequisite: Electronic Devices and Circuits				

UNITI

INTRODUCTION TO MOSFETs: Integrated circuit technology, MOS and related VLSI technology, Structure and operation of the MOS transistor: Enhancement mode, depletion mode, Fabrication process flow: NMOS, PMOS, Twin well CMOS;

BASIC ELECTRICAL PROPERTIES OF MOS CIRCUTS: Part-1

I-V and C-V characteristics, simple MOS capacitance model,detailed MOS capacitance model, diffusion MOS capacitance model.

UNIT II

BASIC ELECTRICAL PROPERTIES OF MOS CIRCUTS:PART-2

Aspects of MOS transistor Threshold Voltage, MOS transistor Transconductance and Output Conductance, MOS transistor Figure of Merit, The Pass transistor, nMOS Inverter, Determination of Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, Alternative forms of pull-up, The CMOS Inverter, Noise marginsMOS transistor circuit model, Latch-up in CMOS circuits.

UNIT III

INVERTER AND DESIGN RULES:

The CMOS Inverter, Noise margins MOS transistor circuit model, Latch-up in CMOS circuits.

Stick Diagrams, Layout design rules, Layout examples, Scaling models and scaling factors, Scaling factors for device parametersScaling effects.

COMBINATIONAL CIRCUIT DESIGN: Pseudo NMOS, (Differential) Cascode voltage switch logic, Dynamic logic, Domino logic, Pass transistor logic, transmission gate logic, differential circuits, sense amplifier and BiCMOS circuits.

UNIT IV

SEQUENTIAL CIRCUIT DESIGN: Sequencing static circuits- methods, maximum delay constraint and minimum delay constraint, Clock Skew, Circuit design of latches and flipflops- Conventional CMOS latches and flipflops, Resettable latches and flipflops, enabled latches and flipflops, differential flip-flops and True Single Phase Clock (TSPC) latches and flipflops.

UNIT V

VLSI design flow, VLSI design styles- FPGA, Standard cell, Full custom. Packaging technology, computer aided design technology, Trends in CMOS technology: SOI, FINFET,multi-gate FET and 2D materials based FETs.

TEXT BOOKS:

1. Neil H.E. Weste and David Harris, CMOS VLSI Design: A circuits and systems perspective, 4 th Edition, Pearson Education, 2015.
2. Essentials of VLSI Circuits and Systems - Kamran Eshraghian. Douglas and A. Pucknell and Sholeh Eshraghian. Prentice Hall of India Private Limited, 2005 Edition.

REFERENCES:

1. Sung-Mo Kang, Yusuf Leblebici, Chulwookim, Digital Integrated Circuits: Analysis and Design, 4 th Edition, McGraw Hill Education, 2016.
2. Jan M RABAEY, Digital Integrated Circuits, 2nd Edition, Pearson Education, 2003.
3. https://nptel.ac.in/courses/117/101/117101058/
4. http://ece-research.unm.edu/jimp/vlsi/slides/c1_intro.html.
5. https://www.egr.msu.edu/classes/ece410/salem/files/s16/lectures/Ch2_S2_N.pdf
6. https://www.tutorialspoint.com/vlsi_design/vlsi_design_digital_system.html

COURSE OUTCOMES

1	Have the ability to describe the fabrication process of ICs and characteristics of a MOSFET
2	Have the ability to draw CMOS layouts and describe about design aspects of combinational circuits.
3	Have the ability to describe about design aspects of sequential circuits and list out trends in CMOS technology
4	Have the ability to empathize about the fabrication process of ICs and characteristics of a MOSFET
5	Have the ability to explicate CMOS layouts and design aspects of combinational circuits.
6	Have the ability to explain design styles and design trends in VLSI Design
7	Have the ability to apply and bring to bear the full complement of fabrication process and characteristics of a MOSFET in VLSI to design various digital electronic circuits.

CO / PO Mapping

Course Title			**VLSI Design**											
Course Code			**A2ECT402**											
Course designed by			**Department of Electronics and Communication Engineering**											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		1									1		1
CO2	1		1		1							1		1
CO3	1		1									1		1
CO4	2	1	2									1	2	2
CO5	2	1	2		1							1	2	2
CO6	2	1	2									1	2	2
CO7	3	2	3		2	2	1	1		1	1	1	3	3

1. Low 2. Medium 3. High

A2ECT402 :: VLSI Design

Course designed by	Department of Electronics andCommunication Engineering
Approval	Approved by: Meeting of 7th Board of Studies held on 27-07-2021
	Ratified by: Meeting of Academic Council held on

A2ECT403	**Semester : V**	**L**	**T**	**P**	**C**
	Subject: SOFT COMPUTING TECHNIQUES	3	0	0	3
	Total Contact Hours : 48				
	Prerequisite: Mathematical Methods, Random Variables and Stochastic Process, Artificial Intelligence				

UNIT I

INTRODUCTION TO NEURAL NETWORK

Historical perspective, Biological neuron, Artificial neuron, basic McCulloch-Pitts model of NN, Models of Artificial Neural Network, Feed Forward and Feed backward networks, Single Layer Perceptron, Perceptron architecture — Perceptron training algorithm, Least Mean Square algorithm, learning curves, Learning rate and Annealing techniques.

UNIT II

Multilayer Perceptron:

Introduction, MLP (Multilayered Perceptron) network, Feed forward Neural Network, Back propagation, Backpropagation learning - input layer, output layer, hidden layer computations, Activation function, XOR problem, Error based Back Propagations, Limitations of Back-propagation algorithm, Gradient Descent Rule, Learning Tasks, Hebbian learning, Competitive learning, Boltzmann learning.

UNIT–III

Fuzzy Logic System:

Fuzzy Vs Crisp, Crisp sets, Introduction to classical sets – properties, operations and relations, cartesian product, other crisp relations, operations on relations

Fuzzy sets:

Membership functions, uncertainty, operations, properties, fuzzy relations, Fuzzy cartesian product, operations on Fuzzy relations.

Unit IV

Fuzzy Logic System Components: Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods, Fuzzy logic control, Inverted pendulum, Image processing, Home Heating system-Blood pressure during anesthesia, Introduction to neuro fuzzy controller.

UNIT V

Fundamentals of Evolutionary Techniques:

Introduction to GAs, working principle, Encoding, Fitness Function, Reproduction, Convergence criterion, Basic Operators-Representation, Selection, Crossover, Mutation and replacement.

TEXT BOOKS:

1. Introduction to Artificial Neural Systems - Jacek.M.Zurada, Jaico Publishing House, 1999.
2. Neural Networks and Fuzzy Systems - Kosko, B., Prentice-Hall of India Pvt. Ltd., 1994.
3. Neural Networks, Fuzzy Logic, Genetic Algorithms: Synthesis and Application by Rajasekharan and Pai, PHI Publications.

REFERENCES:

1. Introduction Neural Networks Using MATLAB 6.0 - S.N. Shivanandam, S. Sumati, S. N. Deepa,1/e, TMH, New Delhi.
2. Fuzzy Sets, Uncertainty and Information - Klir G.J. & Folger T.A., Prentice-Hall of India Pvt. Ltd., 1993.
3. Fuzzy Set Theory and Its Applications - Zimmerman H.J. Kluwer Academic Publishers
4. Artificial Neural Networks - Dr. B. Yagnanarayana, 1999, PHI, New Delhi.
5. Artificial Neural Network –Simon Haykin, 2nd Ed., Pearson Education.
6. www.myreaders.info/html/soft_computing.html

COURSE OUTCOMES	
1.	The students have the understanding of the basics of neural networks
2.	The students understand of the basics of Fuzzy Logic and Fuzzy sets
3.	The students understand the introductory concepts of genetic algorithm
4.	The students know the feedforward and feedback neural networks
5.	The students can explain the fuzzification and defuzzification
6.	The students know the basic operators of GA
7.	The students can apply soft computing concepts to solve engineering problems

CO-PO MAPPING

Course Title			**Soft Computing Techniques**											
Course Code			**A2ECT403**											
Course designed by			Department of Electronics and Communication Engineering											
CO / PO mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			3						2	3		
CO2	3	2	2	1									3	
CO3	3	2	2	1									1	
CO4	2	1			3							1		
CO5	3	2	2	1									2	
CO6	3	2	2	1									2	
CO7	3	2	2	1							1	2	3	

1. Low 2. Medium 3. High

A2ECT403 :: Soft Computing Techniques

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Open Elective-I

Open Elective-II