B.S. Abdur Rahman Crescent Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

Regulations 2021
Curriculum and
Syllabi (I – IV semesters)
(Amendments updated upto February 2022)

B.Tech.
(Electronics and Communication Engineering)

REGULATIONS 2021

CURRICULUM AND SYLLABI (I - IV Semesters)

(Amendments updated upto February 2022)

B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

VISION AND MISSION OF THE INSTITUTION

VISION

B.S.Abdur Rahman Crescent Institute of Science and Technology aspires to be a leader in Education, Training and Research in multidisciplinary areas of importance and to play a vital role in the Socio-Economic progress of the Country in a sustainable manner.

MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through quality and value-based education.
- To promote professional leadership and entrepreneurship.
- To achieve excellence in all its endeavors to face global challenges.
- To provide excellent teaching and research ambience.
- To network with global Institutions of Excellence, Business, Industry and Research Organizations.
- To contribute to the knowledge base through scientific enquiry, Applied Research and Innovation.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

VISION AND MISSION

VISION

Department of Electronics and Communication Engineering envisions to be a leader in providing state of the art education through excellence in teaching, training, and research in contemporary areas of Electronics and Communication Engineering and aspires to meet the global and socio economic challenges of the country.

MISSION

- The Department of Electronics and Communication Engineering endeavours to produce globally competent Engineers prepared to face challenges of the society.
- To enable the students to formulate, design and solve problems in applied science and engineering.
- To provide excellent teaching and research environment using state of the art facilities.
- To provide adequate practical training to meet the requirement of the Electronics & communication industry.
- To train the students to take up leadership roles in their career or to pursue higher education and research.

PROGRAMME EDUCATIONAL OBJECTIVES AND OUTCOMES

B.TECH. (ELECTRONICS AND COMMUNICATION ENGINEERING)

PROGRAMME EDUCATIONAL OBJECTIVES

PEO 1: Solve real world problems in Electronics and Communication Engineering with acquired knowledge in Basic Sciences and Engineering.

PEO 2: Become a creative, innovative and successful professional Engineer / Entrepreneur in core and related engineering disciplines both nationally and internationally.

PEO 3: Demonstrate professional, ethical behavior and engage in lifelong learning to develop socially relevant products

PEO 4: Pursue Higher Education to choose career path in teaching and research.

PEO 5: Attain leadership roles in industry and capable of handling large cross-functional teams.

PROGRAMME OUTCOMES

On successful completion of the programme, the graduates will be able to:

- **Engineering knowledge:** Apply the knowledge of Mathematics, Science and Electronics & communication Engineering fundamentals to solve the complex engineering problems.
- **Problem analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principle of Mathematics, Electronics and Communication Engineering sciences.
- **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal and environmental considerations.
- **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.
- **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
- **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

- **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
- **Communication Systems:** Analyze and assess various aspects of communication systems and communication mediums for efficient utilization of resources.
- **Signal Processing:** Apply the concepts of signal processing to real world data for effective analysis and optimization of Information systems.
- **Electronic Systems:** Design and develop appropriate electronic subsystem to address the application needs of complex engineering problems.

PROGRAMME SPECIFIC OUTCOMES

PSO1: Design and develop Electronics and communication subsystem to address complex engineering problems.

PSO2: Analyze and evolve solutions using signal processing, communication, networking, VLSI and embedded systems for contemporary applications

PSO3: Apply modern tools and appropriate techniques to work as an individual/team in multi-disciplinary domains.

REGULATIONS - 2021
B.TECH. DEGREE PROGRAMMES
(Under Choice Based Credit System)

1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) **"Programme"** means B.Tech. Degree Programme.

ii) **"Branch"** means specialization or discipline of B.Tech. Degree Programme like Civil Engineering, Mechanical Engineering, etc.,

iii) **"Course"** means theory / practical / laboratory integrated theory / seminar / internship / project and any other subject that is normally studied in a semester like English, Mathematics, Environmental Science, Engineering Graphics, Electronic Devices etc.,

iv) **"Institution"** means B.S. Abdur Rahman Crescent Institute of Science and Technology.

v) **"Academic Council"** means the Academic Council, which is the apex body on all academic matters of this Institute.

vi) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of the Institution who is responsible for the implementation of relevant rules and regulations for all the academic activities.

vii) **"Dean (Student Affairs**)" means the Dean (Students Affairs) of the Institution who is responsible for activities related to student welfare and discipline in the campus.

viii) **"Controller of Examinations"** means the Controller of Examinations of the Institution who is responsible for the conduct of examinations and declaration of results.

ix) **"Dean of the School"** means the Dean of the School of the department concerned.

x) **"Head of the Department"** means the Head of the Department concerned.

2.0 ADMISSION

2.1a) Candidates for admission to the first semester of the eight semester B. Tech. degree programme shall be required to have passed the Higher Secondary Examination of the 10+2 curriculum

(Academic stream) prescribed by the appropriate authority or any other examination of any University or authority accepted by the Institution as equivalent thereto.

2.1b) The student shall have studied at least any three of the following courses: Physics, Mathematics, Chemistry, Computer Science, Electronics, Information Technology, Biology, Informatics Practices, Biotechnology, Technical Vocational Subjects, Agriculture, Engineering Graphics, Business Studies, Entrepreneurship at 10+2 level. In case if the student has not studied any or all the courses viz., mathematics, physics and chemistry, he / she shall undergo bridge course(s) in the concerned course(s) at 10+2 level knowledge.

2.2 Notwithstanding the qualifying examination, the candidate might have passed at 10+2, the candidate shall also write an entrance examination prescribed by the Institution for admission. The entrance examination shall test the proficiency of the candidate in the courses considered eligible for admission on the standards prescribed for 10+2 academic stream.

2.3 Candidates for admission to the third semester of the eight semester B.Tech. programme under lateral entry category shall be required to have passed minimum Three years / Two years (Lateral Entry) Diploma examination in any branch of Engineering / Technology or passed B.Sc. Degree from a recognized University as defined by UGC and passed 10+2 examination with Mathematics as a subject or Passed three year Diploma of Vocation Stream (D.Voc) in the same or allied sector or any other examination of any other authority accepted by the Institution as equivalent thereto.

2.4 The Institution shall offer suitable bridge courses in Mathematics, Physics, Engineering drawing, etc., for the students of diverse backgrounds.

2.5 The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the Institution in adherence to the guidelines of regulatory authorities from time to time.

3.0 BRANCHES OF STUDY

3.1 Regulations are applicable to the following B.Tech. Degree

programmes in various branches of Engineering and Technology, each distributed over eight semesters, with two semesters per academic year.

1. Aeronautical Engineering
2. Artificial Intelligence and Data Science
3. Automobile Engineering
4. Biotechnology
5. Civil Engineering
6. Computer Science and Engineering
7. Computer Science and Engineering (Cyber Security)
8. Computer Science and Engineering (Internet of Things)
9. Electrical and Electronics Engineering
10. Electronics and Communication Engineering
11. Electronics and Instrumentation Engineering
12. Information Technology
13. Mechanical Engineering
14. Polymer Engineering

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every programme has a curriculum with syllabi consisting of theory and practical courses such as,

i) Basic Science Courses - BSC
ii) Humanities and Social Sciences including Management Courses - HSC
iii) Engineering Science Courses - ESC
iv) Professional Core Courses - PCC
v) Professional Elective Courses - PEC
vi) Open Elective Courses - OEC
vii) Laboratory Courses – LC
viii) Laboratory Integrated Theory Courses – LITC
ix) Mandatory Courses- MC
x) Project - PROJ (Project work, seminar and internship in industry or at appropriate workplace)

4.1.1 Mandatory Induction Programme for First year Students

The first year students upon admission shall undergo a mandatory three week induction programme consisting of physical activity, creative arts, universal human values, literary,

proficiency modules, lectures by eminent people, visits to local areas, familiarization with departments / schools and centres, etc.,

4.1.2 Personality and Character Development

All students shall enroll, on admission, in any of the following personality and character development programmes:

- National Cadet Corps (NCC)
- National Service Scheme (NSS)
- National Sports Organization (NSO)
- Youth Red Cross (YRC)
- Rotaract
- Crescent Indian Society Training Development (ISTD – C)
- Crescent Creative Strokes
- Crescent Technocrats club

The training activities / events / camp shall normally be organized during the weekends / vacation period.

4.1.3 Online Courses for Credit Transfer

Students are permitted to undergo department approved online courses under SWAYAM up to 20% of credits of courses in a semester excluding project semester with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean (Academic Affairs) during his / her period of study. The credits earned through online courses ratified by the respective Board of Studies shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

4.1.4 Value Added Courses

The students are permitted to pursue department approved online courses (excluding courses registered for credit transfer) or courses offered / approved by the department as value added courses.

The details of the value added course viz., syllabus, schedule of classes and the course faculty shall be sent to the Dean (Academic Affairs) for approval. The students may also undergo the valued added courses offered by other departments with the

consent of the Head of the Department offering the course.

These value added courses shall be specified in the consolidated mark sheet as additional courses pursued by the student over and above the curriculum during the period of study.

4.1.5 Industry Internship

The students shall undergo training for a period as specified in the curriculum during the summer vacation in any industry relevant to the field study.

The students are also permitted to undergo internship at research organizations / eminent academic institutions for the period prescribed in the curriculum during the summer vacation, in lieu of Industrial training.

In any case, the student shall obtain necessary approval from the Head of the Department / Dean of School and the training has to be taken up at a stretch.

4.1.6 Industrial Visit

The student shall undergo at least one industrial visit every year from the second year of the programme. The Heads of Departments / Deans of Schools shall ensure the same.

4.2 Each course is normally assigned certain number of credits:

- one credit per lecture period per week
- one credit per tutorial period per week
- one credit for two to three periods and two credits for four periods of laboratory or practical sessions per week
- one credit for two periods of seminar / project work per week
- one credit for two weeks of industrial training or 80 hours per semester.

4.3 Each semester curriculum shall normally have a blend of lecture courses, laboratory courses, laboratory integrated theory courses, etc.

4.5 The medium of instruction, examinations and project report shall be in English, except for courses in languages other than English.

5.0 DURATION OF THE PROGRAMME

5.1 A student is expected to complete the B.Tech. programme in eight semesters (six semesters in the case of lateral entry scheme), but

in any case not more than 14 continuous semesters reckoned from the date of first admission (12 semesters in the case of lateral entry students).

5.2 Each semester shall consist of a minimum of 90 working days including the days of examinations.

5.3 The maximum duration for completion of the programme as mentioned in clause 5.1 shall also include period of break of study vide clause 7.1 so that the student may be eligible for the award of the degree.

6.0 REGISTRATION AND ENROLLMENT

6.1 The students of first semester shall register and enroll for courses at the time of admission by paying the prescribed fees. For the subsequent semesters registration for the courses shall be done by the student one week before the last working day of the previous semester.

6.2 Change of a Course

A student can change an enrolled course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

6.3 Withdrawal from a Course

A student can withdraw from an enrolled course at any time before the first continuous assessment test for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

7.0 BREAK OF STUDY FROM PROGRAMME

7.1 A student may be allowed / enforced to take a break of study for two semesters from the programme with the approval of Dean (Academic Affairs) for the following reasons:

7.1.1 Medical or other valid grounds

7.1.2 Award of 'I' grade in all the courses in a semester due to lack of attendance

7.1.3 Debarred due to any act of indiscipline

7.2 The total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 5.1).

7.3 A student who has availed a break of study in the current semester (odd/even) can rejoin only in the subsequent corresponding (odd/even) semester in the next academic year on approval from the Dean (Academic affairs).

7.4 During the break of study, the student shall not be allowed to attend any regular classes or participate in any activities of the Institution. However, he / she shall be permitted to enroll for the 'I' grade courses and appear for the arrear examinations.

8.0 CLASS ADVISOR AND FACULTY ADVISOR

8.1 Class Advisor

A faculty member shall be nominated by the Head of the Department as class advisor for the class throughout the period of study except first year.

The class advisor shall be responsible for maintaining the academic, curricular and co-curricular records of students of the class throughout their period of study.

However, for the first and second semester, the class advisors (first year class advisors) are nominated by the first year coordinator.

8.2 Faculty Advisor

To help the students in planning their courses of study and for general counseling, the Head of the Department of the students shall attach a maximum of 20 students to a faculty member of the department who shall function as faculty advisor for the students throughout their period of study. Such faculty advisor shall guide the students in taking up the elective courses for registration and enrolment in every semester and also offer advice to the students on academic and related personal matters.

9.0 COURSE COMMITTEE

9.1 Each common theory course offered to more than one group of students shall have a "Course Committee" comprising all the course faculty teaching the common course with one of them nominated as a course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending on whether all the course faculty teaching the common course belong to a single department or from several departments. The course committee shall ensure

preparation of a common question paper and scheme of evaluation for the tests and semester end examination.

10.0 CLASS COMMITTEE

A class committee is constituted branch wise and semester wise by the Head of the Department / Dean of the School shall normally comprise of faculty members handling the classes, student representatives and a senior faculty member not handling the courses as chairman.

10.1 The composition of class committees for first and second semester is as follows:

i) The first year coordinator shall be the chairman of the class committee
ii) Faculty members of all individual courses of first / second semester
iii) Six student representatives (male and female) of each class nominated by the first year coordinator
iv) The class advisor and faculty advisors of the class

10.2 The composition of the class committee for each branch from 3rd to 8th semester is as follows:

i) One senior faculty member preferably not handling courses for the concerned semester appointed as chairman by the Head of the Department
ii) All the faculty members handling courses of the semester
iii) Six student representatives (male and female) of each class nominated by the Head of the Department in consultation with the relevant faculty advisors
iv) All faculty advisors and the class advisors
v) Head of the Department

10.3 The class committee shall meet at least three times during the semester. The first meeting shall be held within two weeks from the date of commencement of classes, in which the components of continuous assessment for various courses and the weightages for each component of assessment shall be decided for the first and second assessment. The second meeting shall be held within a week after the date of first assessment report, to review the students' performance and for follow up action.

10.4 During these two meetings, the student members shall

meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process, curriculum and syllabi, etc.

10.5 The third meeting of the class committee, excluding the student members, shall meet after the semester end examinations to analyse the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the course faculty concerned.

11.0 CREDIT LIMIT FOR ENROLLMENT & MOVEMENT TO HIGHER SEMESTER

11.1 A student can enroll for a maximum of 32 credits during a semester including Redo / Predo courses.

11.2 The minimum credits earned by the student to move to 7th semester shall not be less than 60 credits (40 credits for lateral entry students).

12.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

12.1 Every theory course shall have a total of three assessments during a semester as given below:

Assessments	Course Coverage in Weeks	Duration	Weightage of Marks
Assessment 1	1 to 6	1.5 hours	25%
Assessment 2	7 to 12	1.5 hours	25%
Semester End Examination	Full course	3 hours	50%

12.2 Theory Course

Appearing for semester end theory examination for each course is mandatory and a student shall secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

12.3 Laboratory Course

Every practical course shall have 60% weightage for continuous assessments and 40% for semester end examination. However, a

student shall have secured a minimum of 50% marks in the semester end practical examination for the award of pass grade.

12.4 Laboratory Integrated Theory Courses

For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical component. Grading shall be done for this consolidated mark. Assessment of theory components shall have a total of three assessments with two continuous assessments carrying 25% weightage each and semester end examination carrying 50% weightage. The student shall secure a separate minimum of 40% in the semester end theory examination. The evaluation of practical components shall be through continuous assessment.

12.5 The components of continuous assessment for theory / practical / laboratory integrated theory courses shall be finalized in the first class committee meeting.

12.6 Industry Internship

In the case of industry internship, the student shall submit a report, which shall be evaluated along with an oral examination by a committee of faculty members constituted by the Head of the Department. The student shall also submit an internship completion certificate issued by the industry / research / academic organisation. The weightage of marks for industry internship report and viva voce examination shall be 60% and 40% respectively.

12.7 Project Work

In the case of project work, a committee of faculty members constituted by the Head of the Department / Dean of the School will carry out three periodic reviews. Based on the project report submitted by the students, an oral examination (viva voce) shall be conducted as semester end examination by an external examiner approved by the Controller of Examinations. The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the viva voce examination.

12.8 Assessment of seminars and comprehension shall be carried out

by a committee of faculty members constituted by the Head of the Department.

12.9 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance shall be used for grading along with the marks scored in the arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination and the internal assessment marks secured during the course of study shall become invalid.

In case of laboratory integrated theory courses, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end examination for theory component. There shall be no arrear or improvement examination for lab components.

13.0 SUBSTITUTE EXAMINATIONS

13.1 A student who is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests of a course by paying the prescribed substitute examination fee. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Head of the Department / Dean of the School for that purpose. There is no substitute examination for semester end examinations.

13.2 A student shall apply for a substitute exam in the prescribed form to the Head of the Department / Dean of the School within a week from the date of assessment test. However, the substitute examination will be conducted only after the last instructional day of the semester.

14.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPETITION

14.1 A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% to become eligible to appear for the semester end examination in that course, failing which the student shall be awarded “I” grade in that course.

14.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in the concerned course to the class advisor. The class advisor shall consolidate and furnish the list of students who have earned less than 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department / Dean of the School. Thereupon, the Dean (Academic Affairs) shall officially notify the names of such students prevented from writing the semester end examination in each course.

14.3 If a student secures attendance between 65% and less than 75% in any course in a semester, due to medical reasons (hospitalization / accident / specific illness) or due to participation in the institution approved events, the student shall be given exemption from the prescribed attendance requirement and the student shall be permitted to appear for the semester end examination of that course. In all such cases, the students shall submit the required documents immediately after joining the classes to the class advisor, which shall be approved by the Head of the Department / Dean of the School. The Vice Chancellor, based on the recommendation of the Dean (Academic Affairs) may approve the condonation of attendance.

14.4 A student who has obtained an “I” grade in all the courses in a semester is not permitted to move to the next higher semester. Such students shall repeat all the courses of the semester in the subsequent academic year.

14.5 The student awarded “I” grade, shall enroll and repeat the course when it is offered next. In case of “I” grade in an elective course either the same elective course may be repeated or a new elective course may be taken with the approval of the Head of the Department / Dean of the School.

14.6 A student who is awarded “U” grade in a course shall have the option to either write the semester end arrear examination at the end of the subsequent semesters, or to redo the course when the course is offered by the department. Marks scored in the continuous assessment in the redo course shall be considered for grading along with the marks scored in the semester end (redo)

examination. If any student obtains “U” grade in the redo course, the marks scored in the continuous assessment test (redo) for that course shall be considered as internal mark for further appearance of arrear examination.

14.7 If a student with “U” grade, who prefers to redo any particular course, fails to earn the minimum 75% attendance while doing that course, then he / she is not permitted to write the semester end examination and his / her earlier “U” grade and continuous assessment marks shall continue.

15.0 REDO COURSES

15.1 A student can register for a maximum of three redo courses per semester without affecting the regular semester classes, whenever such courses are offered by the concerned department, based on the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

15.2 The number of contact hours and the assessment procedure for any redo course shall be the same as regular courses, except there is no provision for any substitute examination and withdrawal from a redo course.

16.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

16.1 All assessments of a course shall be made on absolute marks basis. The class committee without the student members shall meet to analyse the performance of students in all assessments of a course and award letter grades following the relative grading system. The letter grades and the corresponding grade points are as follows:

Letter Grade	Grade Points
S	10
A	9
B	8
C	7
D	6
E	5
U	0

W	-
I	-

"W" - denotes withdrawal from the course

"I" - denotes inadequate attendance in the course and prevention from appearance of semester end examination

"U" - denotes unsuccessful performance in the course.

16.2 A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be repeated by the student for improvement of grade.

16.3 Upon awarding grades, the results shall be endorsed by the chairman of the class committee and Head of the Department / Dean of the School. The Controller of Examinations shall further approve and declare the results.

16.4 Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester end theory examination answer scripts of one or more courses, on payment of prescribed fee, through proper application to the Controller of Examinations. Subsequently, the Head of the Department / Dean of the School offered the course shall constitute a revaluation committee consisting of chairman of the class committee as convener, the faculty member of the course and a senior faculty member having expertise in that course as members. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

16.5 After results are declared, grade sheets shall be issued to each student, which contains the following details: a) list of courses enrolled during the semester including redo courses / arrear courses, if any; b) grades scored; c) Grade Point Average (GPA) for the semester and d) Cumulative Grade Point Average (CGPA) of all courses enrolled from the first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the number of credits of all the courses in the

semester.

If C_i, is the number of credits assigned for the i^{th} course and GP_i is the Grade Point in the i^{th} course,

$$GPA = \frac{\sum_{i=1}^{n}(C_i)(GPi)}{\sum_{i=1}^{n} C_i}$$

Where n = number of courses

The Cumulative Grade Point Average (CGPA) is calculated in a similar manner, considering all the courses enrolled from first semester.

"I" and "W" grades are excluded for calculating GPA.

"U", "I" and **"W"** grades are excluded for calculating CGPA.

The formula for the conversion of CGPA to equivalent percentage of marks shall be as follows:

Percentage equivalent of marks = CGPA X 10

16.6 After successful completion of the programme, the degree shall be awarded to the students with the following classifications based on CGPA.

Classification	CGPA
First Class with Distinction	8.50 and above and passing all the courses in first appearance and completing the programme within the prescribed period of 8 semesters for all students (except lateral entry students) and 6 semesters for lateral entry students
First Class	6.50 and above and completing the programme within a maximum of 10 semesters for all students (except lateral entry students) and 8 semesters for lateral entry students
Second Class	Others

16.6.1 Eligibility for First Class with Distinction

- A student should not have obtained 'U' or 'I' grade in any course during his/her study
- A student should have completed the UG programme within the minimum prescribed period of study (except clause 7.1.1)

16.6.2 Eligibility for First Class

- A student should have passed the examination in all the courses not more than two semesters beyond the minimum prescribed period of study (except clause 7.1.1)

16.6.3 The students who do not satisfy clause 16.6.1 and clause 16.6.2 shall be classified as second class.

16.6.4 The CGPA shall be rounded to two decimal places for the purpose of classification. The CGPA shall be considered up to three decimal places for the purpose of comparison of performance of students and ranking.

17.0 SUPPLEMENTARY EXAMINATION

Final year students and passed out students can apply for supplementary examination for a maximum of three courses thus providing an opportunity to complete their degree programme. Likewise, students with less credits in VI semester can also apply for supplementary examination for a maximum of three courses to enable them to earn minimum credits to move to higher semester. The students can apply for supplementary examination within three weeks of the declaration of results in the even semester.

18.0 DISCIPLINE

18.1 Every student is expected to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which tends to affect the reputation of the Institution.

18.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the Head of the Department / Dean of the School concerned shall be referred to a Discipline and Welfare Committee constituted by the Registrar for taking appropriate action. This committee shall also address the grievances related to the conduct of online classes.

19.0 ELIGIBILITY FOR THE AWARD OF DEGREE

19.1 A student shall be declared to be eligible for the award of B.Tech. degree provided the student has:

i) Successfully earned the required number of total credits as specified in the curriculum of the programme of study within a maximum period of 14 semesters (12 semesters for lateral entry) from the date of admission, including break of study.

ii) Successfully completed the requirements of the enrolled professional development activity.

iii) No dues to the Institution, Library, Hostel, etc.

iv) No disciplinary action pending against him/her.

19.2 The award of the degree must have been approved by the Institution.

20.0 MINOR DEGREE PROGRAMMES OFFERED FOR STUDENTS

20.1 The students admitted in the following B.Tech. programmes can graduate with a minor degree, which is optional, along with a major degree:

- Civil Engineering
- Electronics and Communication Engineering
- Automobile Engineering
- Polymer Engineering
- Electronics and Instrumentation Engineering
- Information Technology
- Computer Science and Engineering (IoT)
- Mechanical Engineering
- Electrical and Electronics Engineering
- Aeronautical Engineering
- Biotechnology Engineering
- Computer Science and Engineering
- Artificial Intelligence and Data Science
- Computer Science and Engineering(Cyber Security)

20.2 The eligibility for choosing the minor degree is given as below:

Sl. No.	**Minor Degree**	**Eligible Major Degree Programmes (from other Departments)**
1.	Artificial Intelligence and Machine Learning	Mechanical Engineering Aeronautical Engineering
2.	Block Chain	Polymer Engineering
3.	Cyber Security	Automobile Engineering
4.	Data Science	Civil Engineering
5.	Internet of Things (IoT)	Biotechnology Electrical and Electronics Engineering Electronics and Instrumentation Engineering
6.	Virtual and Augmented Reality	Mechanical Engineering Aeronautical Engineering
		Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electrical and Electronics Engineering Electronics and Instrumentation Engineering Electronics and Communication

		Engineering
7.	Sensor Technology	Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electrical and Electronics Engineering
8.	Robotics	Artificial Intelligence and Data Science Computer Science and Engineering (Cyber Security) Computer Science and Engineering (IoT) Computer Science and Engineering Information and Technology Civil Engineering Biotechnology Electrical and Electronics Engineering Electronics and Instrumentation Engineering
9.	3D Printing	Artificial Intelligence and Data Science Computer Science and Engineering (Cyber Security) Computer Science and Engineering (IoT) Computer Science and Engineering Information and Technology Biotechnology Electrical and Electronics Engineering Electronics and Instrumentation Engineering Electronics and Communication Engineering
10.	Electric Vehicles	Artificial Intelligence and Data Science Computer Science and Engineering (Cyber Security) Computer Science and Engineering (IoT) Computer Science and Engineering Information and Technology Civil Engineering Biotechnology Electronics and Communication Engineering
11.	Industrial Automation	Artificial Intelligence and Data Science Computer Science and Engineering

		(Cyber Security) Computer Science and Engineering (IoT) Computer Science and Engineering Information and Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Biotechnology Electronics and Communication Engineering
12.	GIS and Remote Sensing	Artificial Intelligence and Data Science Computer Science and Engineering (Cyber Security) Computer Science and Engineering (IoT) Computer Science and Engineering Information and Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Biotechnology Electrical and Electronics Engineering Electronics and Instrumentation Engineering Electronics and Communication Engineering
13.	Computational Biology	Artificial Intelligence and Data Science Computer Science and Engineering (Cyber Security) Computer Science and Engineering (IoT) Computer Science and Engineering Information and Technology Mechanical Engineering Aeronautical Engineering Polymer Engineering Automobile Engineering Civil Engineering Electrical and Electronics Engineering Electronics and Instrumentation Engineering Electronics and Communication Engineering

20.3 A student shall earn an additional 18 to 20 credits for the award of a minor degree.

20.4 A student shall be awarded a minor degree only when he / she completes the requirements for the award of major degree stipulated in the respective programme.

21.0 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.

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B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY

B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING CURRICULUM & SYLLABI, REGULATIONS 2021

(Choice Based Credit System)

SEMESTER I

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	BSC	PHD1182	Engineering Physics *	3	0	2	4
2.	BSC	CHD1182	Chemistry for Electrical and Electronic Engineering *	3	0	2	4
3.	BSC	MAD1181	Algebra and Differential Calculus	3	1	0	4
4.	ESC	GED 1101	Engineering Graphics *	2	0	2	3
5.	ESC	GED 1102	Engineering Design	2	0	0	2
6.	ESC	GED 1103	Manufacturing Practice Laboratory	0	0	2	1
7.	ESC	GED 1104	Programming for Problem Solving **	1	0	2	2
			Credits				**20** #

SEMESTER II

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	HSC	END 1281	English for Engineers	3	0	0	3
2.	BSC	MAD 1283	Partial Differential Equations and Transforms	3	1	0	4
3.	ESC	GED 1201	Engineering Mechanics	3	1	0	4
4.	ESC	GED 1204	Basic Electrical and Instrumentation Engineering *	3	0	2	4
5.	PCC	ECD 1201	Electron Devices	3	0	0	3
6.	PCC	ECD 1202	Circuit and Network Analysis *	2	0	2	3
7.	PCC	ECD 1203	Electron Devices Laboratory **	0	0	2	1
8.	MC	GED 1206	Environmental Sciences	2	0	0	2
			Credits				**24**

SEMESTER III

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	HSC		Humanities Elective I	3	0	0	3
2.	BSC		Mathematics Elective	3	1	0	4
3.	PCC	ECD 2101	Analog Electronic Circuits	3	0	0	3
4.	PCC	ECD 2102	Digital Electronics	3	0	0	3
5.	PCC	ECD 2103	Electromagnetics and Transmission Line Theory	3	0	0	3
6.	PCC	ECD 2104	Signals and Systems *	3	0	2	4
7.	PCC	ECD 2105	Analog Electronic Circuits Laboratory **	0	0	2	1
8.	PCC	ECD 2106	Digital Electronics Laboratory **	0	0	2	1
9.	HSC	GED 2101	Essential Skills and Aptitude for Engineers	0	0	2	1
			Credits				**23**

SEMESTER IV

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PCC	ECD 2201	Communication Theory and Systems	3	0	0	3
2.	PCC	ECD 2202	Linear Integrated Circuits *	2	0	2	3
3.	PCC	ECD 2203	VLSI Design	3	0	0	3
4.	PCC	ECD 2204	Digital Signal Processing	3	1	0	4
5.	PCC	ECD 2205	Microcontroller Architecture and Programming	3	0	0	3
6.	PCC	ECD 2206	Microcontroller Programming Laboratory **	0	0	2	1
7.	PCC	ECD 2207	VLSI Design Laboratory **	0	0	2	1
8.	PCC	ECD 2208	Digital Signal Processing Laboratory **	0	0	2	1
9.	PEC	-	Professional Elective Courses	3	0	0	3
10.	MC	GED 2202	Indian Constitution and Human Rights	2	0	0	0
11.	HSC	GED 2201	Workplace Skills and Aptitude for Engineers **	0	0	2	1
			Credits				**23**

SEMESTER V

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PCC	ECD 3101	Python programming for Electronics Engineers *	1	0	2	2
2.	PCC	ECD 3102	Digital Communication	3	1	0	4
3.	PCC	ECD 3103	Computer Networks	3	0	0	3
4.	PCC	ECD 3104	Embedded Systems Design	3	0	0	3
5.	PCC	ECD 3105	Computer Networks Laboratory **	0	0	2	1
6.	PCC	ECD 3106	Analog and Digital Communication Laboratory **	0	0	2	1
7.	PCC	ECD 3107	Embedded Systems Design Laboratory **	0	0	2	1
8.	PEC	-	Professional Elective Courses				6
9.	HSC	GED 3101	Communication Skills for Career Success **	0	0	2	1
10.	PROJ	ECD 3108	Internship I ##	0	0	0	1
			Credits				**23**

SEMESTER VI

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	HSC	MSD 3281	Entrepreneurship	3	0	0	3
2.	BSC		Physics Elective	2	0	0	2
3.	HSC		Humanities Elective II	2	0	0	2
4.	OEC		Open Elective I	3	0	0	3
5.	PCC	ECD 3201	Microwave Engineering	3	0	0	3
6.	PCC	ECD 3202	Microwave and Optical Communication Laboratory **	0	0	2	1
7.	PEC	-	Professional Elective Courses				6
8.	HSC	GED 3201	Reasoning and Aptitude for Engineers **	0	0	2	1
			Credits				**21**

SEMESTER VII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	OEC		Open Elective II				3
2.	OEC		Open Elective III				3
3.	PCC	ECD 4101	Antennas and Wave propagation	3	0	0	3
4.	PEC	-	Professional Elective Courses				9
5.	PROJ	ECD 4102	Internship II ###				1
6.	HSC	GED 4101	Employability Skills $	0	0	2	1
			Credits				**19**

SEMESTER VIII

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PROJ	ECD 4201	Project Work				9
			Credits				**9**

Overall Total Credits – 162

* Laboratory Integrated Theory course

** Laboratory Course

Three Week Orientation Programme – Mandatory Non-Credit Course

15 days of Industrial training during the summer vacation of second year. The credit will be awarded in the 5th Semester.

15 days of Industrial training during the summer vacation of third year. The credit will be awarded in the 7th Semester.

$ Not a Mandatory Course - The student will take up this course during the Summer Holidays of III year as a comprehension of Soft Skills courses offered from semester III to VI. Upon successful completion, the course will be mentioned in grade sheet of VII semester.

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PROFESSIONAL ELECTIVE COURSES

SEMESTER IV

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C
1.	PEC	ECDX 001	Computer Architecture	3	0	0	3
2.	PEC	ECDX 002	Control Systems	3	0	0	3
3.	PEC	ECDX 003	Data structure and its algorithms *	2	0	2	3
4.	PEC	ECDX 004	Sensors and Actuators	3	0	0	3

For 5th to 7th Semester professional electives are under 'Four' different streams;

1. **RF COMMUNICATION AND SIGNAL PROCESSING**
2. **VLSI AND EMBEDDED SYSTEMS**
3. **ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING**
4. **AUTOMOTIVE ELECTRONICS AND ROBOTICS**

SEMESTER V TO VII

RF COMMUNICATION AND SIGNAL PROCESSING

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C	SEM
1.	PEC	ECDX 005	Image Processing	3	0	0	3	5
2.	PEC	ECDX 006	Introduction to Artificial Intelligence	3	0	0	3	5
3.	PEC	ECDX 007	Fundamentals of IoT	3	0	0	3	5
4.	PEC	ECDX 008	Multimedia Compression Techniques	3	0	0	3	5
5.	PEC	ECDX 009	Biomedical Signal Processing	3	0	0	3	5
6.	PEC	ECDX 015	Introduction to Satellite Communication	3	0	0	3	6
7.	PEC	ECDX 016	Electromagnetic Interference & Compatibility	3	0	0	3	6

8.	PEC	ECDX 017	Introduction to PCB Design	3	0	0	3	6
9.	PEC	ECDX 018	Radar & Navigational Aids	3	0	0	3	6
10.	PEC	ECDX 019	Advanced DSP	3	0	0	3	6
11.	PEC	ECDX 033	Remote Sensing	3	0	0	3	7
12.	PEC	ECDX 034	MIMO Communication	3	0	0	3	7
13.	PEC	ECDX 035	GPU Architecture and Programming	3	0	0	3	7
14.	PEC	ECDX 036	Nanoelectronics	3	0	0	3	7
15.	PEC	ECDX 037	RF MEMS Circuit Design	3	0	0	3	7
16.	PEC	ECDX 038	Cognitive Radio Network	3	0	0	3	7
17.	PEC	ECDX 039	Advanced Antenna Design	3	0	0	3	7
18.	PEC	ECDX 040	5G Communication	3	0	0	3	7
19.	PEC	ECDX 041	Cyber Security	3	0	0	3	7
20.	PEC	ECDX 042	Wireless and Mobile Communication	3	0	0	3	7

VLSI AND EMBEDDED SYSTEMS

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C	SEM
1.	PEC	ECDX 005	Image Processing	3	0	0	3	5
2.	PEC	ECDX 006	Introduction to Artificial Intelligence	3	0	0	3	5
3.	PEC	ECDX 007	Fundamentals of IoT	3	0	0	3	5
4.	PEC	ECDX 010	Advanced Digital Logic System Design	3	0	0	3	5
5.	PEC	ECDX 011	ARM Architecture and Programming	3	0	0	3	5
6.	PEC	ECDX 020	Introduction to System Verilog for Verification	3	0	0	3	6
7.	PEC	ECDX 021	Digital VLSI Testing	3	0	0	3	6
8.	PEC	ECDX 022	Introduction to RTOS	3	0	0	3	6
9.	PEC	ECDX 023	Introduction to Embedded Linux	3	0	0	3	6

10.	PEC	ECDX 024	Mechatronics	3	0	0	3	6
11.	PEC	ECDX 035	GPU Architecture and Programming	3	0	0	3	7
12.	PEC	ECDX 036	Nanoelectronics	3	0	0	3	7
13.	PEC	ECDX 041	Cyber Security	3	0	0	3	7
14.	PEC	ECDX 043	Automotive Networking and Protocols	3	0	0	3	7
15.	PEC	ECDX 044	Embedded Machine Learning	3	0	0	3	7
16.	PEC	ECDX 045	CMOS Analog Circuit Design	3	0	0	3	7
17.	PEC	ECDX 046	Multicore Architecture and Parallel Programming	3	0	0	3	7
18.	PEC	ECDX 047	Introduction to Cloud Computing and Edge Computing	3	0	0	3	7
19.	PEC	ECDX 048	Nanoscale Devices and Circuit Design	3	0	0	3	7
20.	PEC	ECDX 049	AI for VLSI	3	0	0	3	7

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C	SEM
1.	PEC	ECDX 005	Image Processing	3	0	0	3	5
2.	PEC	ECDX 006	Introduction to Artificial Intelligence	3	0	0	3	5
3.	PEC	ECDX 007	Fundamentals of IoT	3	0	0	3	5
4.	PEC	ECDX 012	Neural Networks and Fuzzy Logic	3	0	0	3	5
5.	PEC	ECDX 013	Principles of Robotics	3	0	0	3	5
6.	PEC	ECDX 025	R Programming	3	0	0	3	6
7.	PEC	ECDX 026	Machine Learning	3	0	0	3	6
8.	PEC	ECDX 027	Computer Vision	2	0	2	3	6
9.	PEC	ECDX 028	Essential Mathematics for Machine learning	3	0	0	3	6
10.	PEC	ECDX 029	Data Science	3	0	0	3	6
11.	PEC	ECDX 035	GPU Architecture and Programming	3	0	0	3	7
12.	PEC	ECDX 041	Cyber Security	3	0	0	3	7
13.	PEC	ECDX 044	Embedded Machine Learning	3	0	0	3	7

14.	PEC	ECDX 047	Introduction to Cloud Computing and Edge Computing	3	0	0	3	7
15.	PEC	ECDX 050	Pattern Recognition	3	0	0	3	7
16.	PEC	ECDX 051	AI for IoT	3	0	0	3	7
17.	PEC	ECDX 052	Deep Learning	3	0	0	3	7
18.	PEC	ECDX 053	Natural Language Processing	3	0	0	3	7
19.	PEC	ECDX 054	Autonomous Vehicle	3	0	0	3	7

AUTOMOTIVE ELECTRONICS AND ROBOTICS

Sl. No.	Course Group	Course Code	Course Title	L	T	P	C	SEM
1.	PEC	ECDX 005	Image Processing	3	0	0	3	5
2.	PEC	ECDX 006	Introduction to Artificial Intelligence	3	0	0	3	5
3.	PEC	ECDX 007	Fundamentals of IoT	3	0	0	3	5
4.	PEC	ECDX 013	Principles of Robotics	3	0	0	3	5
5.	PEC	ECDX 014	Fundamentals of Automotive Electronics	3	0	0	3	5
6.	PEC	ECDX 024	Mechatronics	3	0	0	3	6
7.	PEC	ECDX 027	Computer Vision	3	0	0	3	6
8.	PEC	ECDX 030	Sensors and Sensor Circuit Design	3	0	0	3	6
9.	PEC	ECDX 031	Programming for Robotics	3	0	0	3	6
10.	PEC	ECDX 032	Soft Computing Techniques for Automotive Applications	3	0	0	3	6
11.	PEC	ECDX 035	GPU Architecture and Programming	3	0	0	3	7
12.	PEC	ECDX 041	Cyber security	3	0	0	3	7
13.	PEC	ECDX 043	Automotive Networking and Protocols	3	0	0	3	7
14.	PEC	ECDX 054	Autonomous Vehicles	3	0	0	3	7
15.	PEC	ECDX 055	Automotive Embedded Systems	3	0	0	3	7

16.	PEC	ECDX 056	Introduction to Robotic Operating System	3	0	0	3	7
17.	PEC	ECDX 057	Augmented Reality and Virtual Reality	3	0	0	3	7
18.	PEC	ECDX 058	Industrial Robotics	3	0	0	3	7
19.	PEC	ECDX 059	AI for Robotics	3	0	0	3	7

MATHEMATICS ELECTIVES – III Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	MADX 01	Transforms and Partial Differential Equations	3	1	0	4
2	MADX 02	Discrete Mathematics	3	1	0	4
3	MADX 03	Probability and Statistics	3	1	0	4
4	MADX 04	Random Processes	3	1	0	4
5	MADX 05	Numerical Methods	3	1	0	4

HUMANITIES ELECTIVES – III Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	SSDX 01	Engineering Economics and Management	3	0	0	3
2	SSDX 02	Sociology of Science and Technology	3	0	0	3
3	SSDX 03	Industrial Economics and Management	3	0	0	3
4	SSDX 04	Dynamics of Indian Social Structure	3	0	0	3

HUMANITIES ELECTIVES – VI Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	SSDX 11	Economics of Sustainable Development	2	0	0	2

2	SSDX 12	Sociology of Industrial Relations.	2	0	0	2
3	SSDX 13	Professional Ethics and Human Values	2	0	0	2
4	SSDX 14	Gender, Technology and Development	2	0	0	2

PHYSICS ELECTIVES – VI Semester

Sl. No.	Course Code	Course Title	L	T	P	C
1	PHDX 01	Non Destructive Testing of Materials	2	0	0	2
2	PHDX 02	Materials Science for Engineering	2	0	0	2
3	PHDX 03	Biomaterials	2	0	0	2
4	PHDX 04	Optical Fibre Communication	2	0	0	2
5	PHDX 05	Semiconductor Physics for Information Technology	2	0	0	2
6	PHDX 06	Sensors and Actuators	2	0	0	2
7	PHDX 07	Fundamentals of Nanotechnology and its Applications	2	0	0	2

OPEN ELECTIVE COURSES FOR
B.TECH. PROGRAMMES R 2021 - VI SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
1	GEDX201	Application of Fluid Mechanics in Everyday Life	3	0	0	3	Aero
2	GEDX 202	Basics of Management and Organizational Behaviour	3	0	0	3	CSB
3	GEDX 203	Big Data Analytics	3	0	0	3	CA
4	GEDX 204	Biology for Engineers	3	0	0	3	SLS
5	GEDX 205	Consumer Electronics	3	0	0	3	ECE
6	GEDX 206	Creative Writing	2	1	0	3	English
7	GEDX 207	Cyber Forensics	3	0	0	3	CSE
8	GEDX 208	Cyber Security	3	0	0	3	IT
9	GEDX 209	Disaster Management	3	0	0	3	Civil
10	GEDX 210	English for Competitive Examination	2	1	0	3	English
11	GEDX 211	Enterprise Risk Management	3	0	0	3	CSB

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
12	GEDX 212	Fundamentals of Project Management	3	0	0	3	CSB
13	GEDX 213	Industrial Robotics	2	0	2	3	Mech.
14	GEDX 214	Internet of Things and its Applications	3	0	0	3	ECE
15	GEDX 215	Introduction to Health Care Analytics	3	0	0	3	CA
16	GEDX 216	IPR and Patent Laws	3	0	0	3	CSB
17	GEDX 217	Logistics and Supply Chain Management	3	0	0	3	CSB
18	GEDX 218	Nano Materials and Technology	2	0	2	3	Physics / Chemistry
19	GEDX 219	Numerical Computational Tools for Engineers	2	0	2	3	EIE
20	GEDX 220	Optimization Techniques	3	0	0	3	EEE
21	GEDX 221	Polymers for Emerging Technologies	3	0	0	3	Polymer
22	GEDX 222	Programming Language Principles	3	0	0	3	CSE
23	GEDX 223	Public Speaking and Rhetoric	2	1	0	3	English
24	GEDX 224	Python Programming	2	0	2	3	IT
25	GEDX 225	R Programming	3	0	0	3	CA
26	GEDX 226	Smart Sensors for Healthcare Applications	3	0	0	3	EIE
27	GEDX 227	Total Quality Management	3	0	0	3	Mech.
28	GEDX 228	Value Education	3	0	0	3	Commerce
29	GEDX 229	Waste Water Management	3	0	0	3	Civil
30	GEDX 230	Web Application Development	3	0	0	3	CA

OPEN ELECTIVE COURSES FOR B.TECH. PROGRAMMES R 2021 - VII SEMESTER

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
1	GEDX 101	Advanced Entrepreneurship	3	0	0	3	CSB
2	GEDX 102	Artificial Intelligence and Machine Learning Applications	3	0	0	3	CSE
3	GEDX 103	Automotive Technology	3	0	0	3	Automobile
4	GEDX 104	Behavioural Psychology	3	0	0	3	SSSH
5	GEDX 105	Building Repair Solutions	3	0	0	3	Civil
6	GEDX 106	Cloud Services and Management	3	0	0	3	CA
7	GEDX 107	Cost Management for Engineers	3	0	0	3	Commerce
8	GEDX 108	Cyber Law and Ethics	3	0	0	3	CSL
9	GEDX 109	Data Analytics and Visualization	3	0	0	3	CA
10	GEDX 110	Deep Learning Essentials	3	0	0	3	CSE
11	GEDX 111	Drone Technologies	2	0	2	3	Aero
12	GEDX 112	Electric Vehicle	3	0	0	3	EEE
13	GEDX 113	Emerging Technologies in Mobile Networks	3	0	0	3	ECE
14	GEDX 114	Fundamentals of Data Science and Machine Learning	3	0	0	3	IT
15	GEDX 115	Genetic Engineering	3	0	0	3	SLS
16	GEDX 116	Green Design and Sustainability	3	0	0	3	Civil
17	GEDX 117	Image Processing and its Applications	3	0	0	3	ECE
18	GEDX 118	Industrial Automation and Control	3	0	0	3	EIE
19	GEDX 119	Industrial Safety	3	0	0	3	Mech.
20	GEDX 120	Industry 4.0	3	0	0	3	Mech.
21	GEDX 121	Introduction to Artificial Intelligence	3	0	0	3	IT
22	GEDX 122	Introduction to Artificial Intelligence and Evolutionary Computing	3	0	0	3	EEE

Sl. No.	Course Code	Course Title	L	T	P	C	Offering Department
23	GEDX 123	Motor Vehicle Act and Loss Assessment	3	0	0	3	Automobile
24	GEDX 124	National Service Scheme	3	0	0	3	SSSH
25	GEDX 125	National Cadet Corps	3	0	0	3	SSSH
26	GEDX 126	Personal Finance and Investment	3	0	0	3	Commerce
27	GEDX 127	Soft Computing Techniques	3	0	0	3	CSE
28	GEDX 128	Value Analysis and Engineering	3	0	0	3	Mech.
29	GEDX 129	Vehicle Maintenance	3	0	0	3	Automobile

SEMESTER I

PHD 1182	**ENGINEERING PHYSICS**	**L**	**T**	**P**	**C**
SDG: 4		**3**	**0**	**2**	**4**

COURSE OBJECTIVES:

COB1: To equip the students on the knowledge of electromagnetic waves.

COB2: To make the students in understanding the importance of mechanics.

COB3: To introduce the basics of oscillations, optics and lasers.

COB4: To acquire basic knowledge about the principle and theory of solids.

COB5: To understand the importance of physics behind semiconductor devices.

MODULE I ELECTROMAGNETIC WAVES 9

Gauss's law – Faraday's law - Ampere's law–Properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Reflection and transmission of electromagnetic waves from a non-conducting medium.

MODULE II QUANTUM MECHANICS 9

Black body radiation – Planck's theory of radiation – Deduction of Wien's displacement law and Rayleigh-Jean's law– Matter waves–Physical significance of wave function – Schrodinger wave equation – Time independent and time-dependent wave equation – Applications: Particle in one-dimensional box –Introduction to quantum computing.

MODULE III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance - waves on a string - standing waves - traveling waves - Energy transfer of a wave - Anti-reflection coating - Air Wedge – Michelson's Interferometer – Determination of wavelength of light and thickness of thin transparent sheet-Characteristics of Laser – Spontaneous and Stimulated Emissions – Einstein's Coefficients - Population inversion – Pumping Mechanism – Laser Action – Types of Laser: Nd:YAG laser He-Ne laser and semiconductor laser - Applications : Laser Materials Processing - Holography.

MODULE IV INTRODUCTION TO SOLIDS 9

Free electron theory of metals- Expression for electrical conductivity of metal-Fermi level-Fermi distribution function-Effect of Fermi function with temperature-Density of energy states-carrier concentration in metals - Effect of temperature on Fermi energy- Energy distribution of electrons- Work function of a metal-Electron in a periodic potential (Kronig and Penny model) - Brillouin Zones-Fermi surface-Effective mass of electron and hole-Energy bands in solids.

MODULE V PHYSICS OF SEMICONDUCTORS 9

Elemental and compound semiconductors –Direct and Indirect band gap semiconductors- Drift and diffusion current – Intrinsic semiconductors: Intrinsic carrier concentration (derivation) – Fermi energy – Variation of Fermi energy level with temperature – Mobility and electrical conductivity – Band gap determination – Extrinsic semiconductors – Carrier concentration in n-type and p-type semiconductor (derivation) – Variation of Fermi level with temperature and impurity concentration – Variation of Electrical conductivity with temperature – Hall effect – Experiment and applications of Hall effect.

PRACTICALS

List of Experiments

1. Determination of thickness of a thin wire / sheet using Air Wedge method.
2. Determination of wavelength of laser light using semiconductor laser diffraction.
3. Determination of angle of divergence of a laser beam using semiconductor diode laser and He-Ne laser.
4. Resistivity measurement of a semiconductor using four point probe method.
5. Determination of band gap of a semiconductor diode.
6. Determination of Hall coefficient of a given semiconductor material.
7. Determination of frequency of a tuning fork using Melde's string arrangement in transverse and longitudinal modes.
8. Determination of particle size of lycopodium powder using semiconductor laser.

L – 45; P – 30 ; Total Hours– 75

TEXT BOOKS:

1. P K. Palanisamy, Engineering Physics Vol I and II Scitech Publications (India) Pvt Ltd, 2018.
2. Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat

Rai Publications (P) Ltd., New Delhi, 2013.

REFERENCES:

1. D.J.Griffiths. Introduction to Electrodynamics. Pearson Education, 2015.
2. Serway R.A. and Jewett, J.W., Physics for Scientists and Engineers with Modern Physics, Brooks/cole Publishing Co., 2010.
3. Tipler P.A. and Mosca, G.P., Physics for Scientists and Engineers with Modern Physics, W.H. Freeman, 2007.
4. Markert J.T., Ohanian. H. and Ohanian, M., Physics for Engineers and Scientists, W.W. Norton & Co., 2007.
5. Palanisamy P.K., “Semiconductor physics and optoelectronics” Scitech Publications, 2003.
6. Linear Integrated Circuits by D. Roy Choudhury and Shail Jain - New Age International (P) Ltd.(2003).
7. Integrated Electronics by J.Millman and C.Halkias, Tata McGraw Hill, New Delhi (2001).

COURSE OUTCOMES:

CO1: Express the knowledge of electromagnetic waves.

CO2: Comprehend the importance &principles of quantum mechanics and apply it to understand ideas of quantum computing.

CO3: Grasp ideas related to oscillations, interference phenomenon, apply it to understandoptical based devices and classify the different laser systems used forvarious applications.

CO4: Conceptualize the electron theory of metals and band structure of solids.

CO5: Understand the principles of physics behind semiconductors, Hall effectand apply the same to identify type of any semiconductor sample, evaluate no. of charge carriers.

Board of Studies (BoS) :
BOS of Physics was held on 21.6.21

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	M	L	L	M	M	M	L	L	L	M	M	M	M	M
CO2	H	M	M	L	L	M	L	L	L	L	L	M	M	M	M
CO3	H	M	M	L	L	L	L	L	L	L	L	M	M	M	M
CO4	H	M	M	L	M	M	M	L	L	L	M	M	M	M	M
CO5	H	M	M	L	M	M	M	L	L	L	M	M	M	M	M

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensuring inclusive and equitable quality education for all persons and promote lifelong learning opportunities.

Statement: The modules and topics mentioned in this course are designed to ensure all inclusive and thorough education with equity to all persons and promote learning opportunities at all times.

CHD 1182	**CHEMISTRY FOR ELECTRICAL**	**L**	**T**	**P**	**C**
SDG: 9	**AND ELECTRONIC ENGINEERING**	**3**	**0**	**2**	**4**

COURSE OBJECTIVES:

To make the students conversant with

COB1: preparation, properties and applications of polymers and moulding techniques.

COB2: synthesis, properties and applications of nanomaterials

COB3: classification and description of different types of batteries and their applications.

COB4: concepts of photochemistry related to photophysical processes, chemical reactions and its applications.

COB5: types of corrosion and its prevention.

MODULE I POLYMERS FOR ELECTRICAL AND ELECTRONIC APPLICATIONS **10**

Classification: source, heat, composition – glass transition temperature – preparation, properties and applications of polyethene (LDPE, HDPE), poly(vinyl chloride), PMMA, polycarbonate, teflon, ABS, bakelite, urea-formaldehyde, epoxy resin - conducting polymers: polyaniline, polyacetylene and poly(phenylene vinylene), rubber- vulcanised rubber, ebonite, EPDM, polymer blends and alloys - moulding techniques: injection moulding, compression moulding.

MODULE II NANOMATERIALS **10**

Introduction – classification based on dimension with examples – properties of nanomaterials (surface to volume ratio and size quantisation effect) - synthesis of nanomaterials (Top-down and Bottom-up)– role of capping & reducing agents - CVD (CNT), laser ablation (Ag, Ag_2O), electrodeposition (semiconductor materials), precipitation (Ag, Au), thermolysis: solvothermal (CuO, CeO_2) and hydrothermal (TiO_2, ZnO, carbon dots), microwave method (metal oxide), biogenic method – nanocomposite.

MODULE III BATTERIES **8**

Electrochemical and electrolytic cell – batteries: types (primary, secondary and flow cell) – primary batteries: dry cell, alkaline battery – secondary batteries: nickel cadmium cell – lead acid storage cell - lithium battery: primary and secondary type - PN junction solar cell, thin film solar cell.

MODULE IV PHOTOCHEMISTRY 9

Introduction: absorption and emission – laws of photochemistry: Grotthus-Draper law, Stark Einstein law – quantum efficiency – determination of quantum yield (problems) – Jablonski diagram: photo physical processes – IC, ISC, fluorescence and phosphorescence –(electronic states and transitions) – quenching – chemiluminescence – bioluminescence – photosensitization: principle and applications(photosynthesis and artificial photosynthesis) – photoelectrolysis.

MODULE V CORROSION AND ITS PREVENTION 8

Types of corrosion – dry and wet corrosion – galvanic corrosion – differential aeration corrosion – Prevention of corrosion: choice of materials, electroplating, electrolesss plating of PCB, coatings : paints: constituents and function – hot dipping – galvanizing, tinning – powder coating – anodising – special coatings: water repellent coatings, fire-retardant coatings, temperature indicating coatings.

PRACTICALS

1. Free radical polymerization of PMMA.
2. Preparation of phenol-formaldehyde.
3. Preparation of urea-formaldehyde.
4. Synthesis of epoxy resin.
5. Determination of molecular weight and degree of polymerisation of polyvinyl alcohol using viscometer
6. Electrochemical synthesis of graphene oxide
7. Synthesis of nano-ZnO by precipitation
8. Demonstration of Laser ablation techniques for nanomaterials
9. Construction of dry cell and alkaline battery
10. Measurement of EMF for different batteries.
11. Electroplating of copper
12. Determination of corrosion of mild steel in acidic, neutral and basic medium.

L – 45 ; P – 30 ; Total Hours– 75

TEXT BOOKS:

1. Jain P.C and Renuka Jain, Physical Chemistry for Engineers, Dhanpat Rai and Sons, New Delhi. 2016.

REFERENCES:

1. Gowarikar V.R., Viswanathan N.V and Jayadev Sreedhar, Polymer Science, Wiley Eastern Limited, Madras, 1986.

2. Michael L. Berins, Plastics Engineering Hand Book, 5th Edition, Chapman and Hall, New York, 1991.
3. G.A. Ozin and A.C. Arsenault, “Nanochemistry: A Chemical Approach to Nanomaterials”, RSC Publishing, Thomas Graham House, Cambridge, 2005.
4. Principles of molecular photochemistry: An introduction, Nicholas J. Turro, V.Ramamurthy and Juan C. Scaiano, University Science Books, Sausalito, CA, 2009.

COURSE OUTCOMES:

The students will be able to

CO1: summarise the preparation, properties and applications of plastics used in electrical and electronic applications

CO2: synthesize different types of nanomaterials based on its size and applications.

CO3: illustrate construction and working of various types of batteries with the aid of a diagram.

CO4: state laws of photochemistry and elaborate the various types of photophysical processes and concepts of photochemistry.

CO5: explain the different types of corrosion and elaborate the methods of various coating techniques.

Board of Studies (BoS) :
11th BoS of Chemistry held on 17.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1		H		M					L						L
CO2		H		M					L						L
CO3		H													
CO4		M													
CO5		M	M			L	L								L

Note: L - Low Correlation M -Medium Correlation H - High Correlation

SDG 9 : Industry, Innovation & Infrastructure

Statement : The synthesis and use of polymers and nanomaterials supports the industrial growth and innovation activities of the nation. The aspects of corrosion and its prevention will lead to corrosion free environment in the industry and infrastructure.

MAD 1181	**ALGEBRA AND DIFFERENTIAL CALCULUS**	**L**	**T**	**P**	**C**
SDG: 4		**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

COB1: To introduce matrix algebra techniques for engineers to apply in practical problems

COB2: To find the roots of polynomial equations using different techniques

COB3: To demonstrate the concepts of limits, continuity and application of differential calculus.

COB4: To familiarize the students with the functions of several variables

COB5: To develop the use of differential equations necessary for engineering applications

MODULE I MATRICES 9+3

Characteristic Equation- Eigenvalues and Eigenvectors of a real matrix – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton Theorem (without proof) – Orthogonal matrices – orthogonal transformations of a symmetric matrix to diagonal form – Reduction of quadratic form to canonical form by orthogonal transformation

MODULE II THEORY OF EQUATIONS 9+3

Introduction - Surds and irrational roots – simple problems – Equations whose roots are in A.P,G.P and in H.P – Relations between the roots and coefficients – symmetric functions – Formation of equations – Decreasing and Increasing the roots – transformation of equation – Reciprocal equations

MODULE III DIFFERENTIAL CALCULUS 9+3

Limits of functions - one sided limits – Continuity - Curvature – Cartesian and polar coordinates – center and radius of curvature – Circle of curvature – Involutes and evolutes – Envelopes

MODULE IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 9+3

Laws of limits –Functions of two variables – partial derivatives – total differential – Implicit Functions – Jacobian - Taylor's series expansion – Optima of two variables – Lagrange's multiplier method

MODULE V ORDINARY DIFFERENTIAL EQUATIONS 9+3

Linear equations of second order with constant and variable coefficients –

Simultaneous first order linear equations with constant coefficients – homogeneous equations of Euler's type – method of undetermined coefficients- method of variation of parameters

L - 45 ; T-15; Total Hours– 60

TEXT BOOKS:

1. Ramana, B.V, "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co. New Delhi, 2010.
2. Grewal B.S., "Higher Engineering Mathematics" 44th edition, Khanna Publishers, New Delhi, 2017.
3. Kreyszig, E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2011

REFERENCES:

1. Veerarajan.T., "Engineering Mathematics" (5th edition) Tata Mc Graw Hill Publishing Co. New Delhi, 2012
2. Jain, R.K. & Iyengar, S. R. K., "Advanced Engineering Mathematics", Narosa Publishers, 5th edition, 2016.
3. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
4. Venkataraman, M.K., "Engineering Mathematics", Volume I, 2nd edition, National Publishing Co., Chennai, 2003.
5. James Stewart ," Calculus" 7th edition, Brooks/Cole Cengagelearning, UK

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: use the matrix algebra methods for finding eigenvalues, eigenvectors and diagonalization

CO2: solve equations using the relations between roots and coefficients

CO3: apply differential calculus in various engineering problems

CO4: use differential calculus on several variable functions

CO5: solve various types of differential equations that arise in many applications

Board of Studies (BoS) :
12th BOS of Mathematics & AS held on 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	H	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4 : Ensure inclusive and equitable quality education and promote lifelong opportunities for all

Learning of various mathematical techniques like matrices and calculus will lead to knowledge of applications in Communication Engineering

GED 1101	ENGINEERING GRAPHICS	L	T	P	C
		2	0	2	3

SDG: 9

COURSE OBJECTIVES:

COB1: To introduce the basic concepts of engineering drawing, and familiarize with conic sections, special curves and orthographic projection of points and straight lines

COB2: To get practical exposure on projection of planes and solids

COB3: To be familiar with sectioning of solids, and development of surfaces

COB4: To conversant with 3D isometric projection, and perspective projection of simple solids

COB5: To introduce computerized drafting using CADD for drawing the orthographic views of simple solids

MODULE I BASICS, ENGINEERING CURVES AND ORTHOGRAPHIC PROJECTION OF POINTS AND STRAIGHT LINES **L: 7 P: 7**

Drawing instruments, dimensioning, BIS conventions, types of lines, simple geometric constructions.

Conic sections: ellipse, parabola, hyperbola. Special curves: cycloid, epicycloid, hypocycloid and involutes.

Orthographic projection – first angle, second angle, third angle and fourth angle projections. Orthographic projection of points in all quadrants. Projection of straight lines in first quadrant – true length and true inclinations – traces of straight line.

MODULE II PROJECTION OF PLANES AND SOLIDS **L: 7 P: 7**

Projection of plane lamina in first quadrant and its traces

Projection of solids in first quadrant: Axis inclined to one reference plane only- prism, pyramid, cone, and cylinder – change of position method

MODULE III SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES **L:5 P:5**

Section of solids: prism, pyramid, cone and cylinder– sectional view – true shape of section- cutting simple position solids - plane inclined to one reference plane only.

Development of surface of truncated solids: prism, pyramid, cone and cylinder – frustum of cone, pyramid and simple sheet metal parts.

MODULE IV THREE DIMENSIONAL PROJECTIONS L:4 P: 4

Isometric projection: Isometric scale – isometric axes- Isometric projection and view of prism, pyramid, cylinder, cone and frustums.

Perspective projection: station point – vanishing point – Perspective projection and views of prism, pyramid by Visual ray method.

MODULE V ORTHOGRAPHIC PROJECTION USING CADD L:7 P:7

Introduction to CADD - Basic commands for sketching - Editing sketches - creating texts and tables - Basic dimensioning and editing dimensions - Sketching orthographic views of simple solids and machine parts as per first angle projection - Plotting drawings.

L – 30; P – 30; Total Hours– 60

TEXT BOOKS:

1. N.D. Bhatt, “Engineering Drawing”,Charotar Publishing house, 53rdEdtion, 2014.
2. Venugopal. K, and V. Prabhu Raja, “Engineering Graphics”, New Age International (P) Ltd., Publication, Chennai, Edition 15, 2017.

REFERENCES:

1. K.V. Natarajan, “A text book of Engineering Graphics”, Dhanalakshmi publishers, Chennai, 31st Edition, 2018.
2. Agrawal B. & Agrawal C. M., “Engineering Graphics”, TMH Publication, 2012.
3. Jeyapoovan, T., “Engineering Graphics using AutoCAD”, Vikas Publishing House Pvt. Ltd., New Delhi, 2015.
4. AutoCAD Software Theory and User Manuals
5. Engineering graphics You tube Lecture videos link: https://www.youtube.com/user/BSAUNIV/videos

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: identify the specifications and standards of technical drawing and draw conic sections, special curves and orthographic projection of points and straight lines

CO2: apply the concept of orthographic projection to draw the orthographic views of plane figures and simple solids

CO3: draw the sections of solids and development of solid surfaces

CO4: apply the concept of isometric and perspective projection to draw the 3-D views of simple solids

CO5: draw the orthographic views of simple objects using drafting software

Board of Studies (BoS): 18th BoS of MECH held on 21.06.2021

Academic Council: 17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO2	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO3	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO4	M	L	L	-	-	-	-	-	-	L	-	-	-	-
CO5	M	L	L	-	M	-	-	-	-	L	-	-	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The various industrial standards of technical drawing and the application of orthographic projections to draw simple solids helps to innovate a new design for sustainable industrialization

GED 1102	ENGINEERING DESIGN	L	T	P	C
		2	0	0	2

SDG:9

COURSE OBJECTIVES:

COB1: To learn the basic concepts of design in engineering

COB2: To study the basic design thinking principles in problem solving

COB3: To encourage the students to develop a prototype using design concepts

COB4: To introduce the role of innovation in engineering

MODULE I INTRODUCTION TO DESIGN 08

Introduction to Engineering design – Design thinking – Problem identification - Design of Product, Process, System and Software – Case studies on Product, Process, Systems and Software design.

MODULE II DESIGN THINKING PROCESS 08

Empathy – Ideate - Need analysis - Voice of customers - product specification - concept generation - Bench marking - Quality function deployment - Concept evaluation - Case studies

MODULE III PROTOTYPE DESIGN 07

Product form and function – High level design – Design detailing - Sketch models – Prototypes - 3D printing - Case studies.

MODULE IV INNOVATION 07

Creativity and innovation – Role of innovation in Engineering – incremental changes and systemic changes; scientific approach to driving innovation – Intellectual property rights - case studies on innovative products.

L – 30; Total Hours– 30

TEXT BOOKS:

1. Clive L. Dym, Patrick Little, and Elizabeth J. Orwin, “Engineering Design: A Project Based Introduction”, 4th Edition, Wiley, 2014.
2. Eppinger, S. and Ulrich, K., “Product design and development”, McGraw-Hill Higher Education, 2015.

REFERENCES:

1. Nigel Cross, “Design Thinking”, Berg Publishers, 2011.

2. Tom Kelley, “The Art of Innovation”, Profile Books Ltd, London, 2016.
3. Tim Brown, “Change by Design”, HarperCollins e-books, 2009.
4. Cliff Matthews, “Case Studies in Engineering Design”, John Wiley & Sons Pvt. Ltd, New York, 1998.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: explain the basic concepts of design in engineering products / process / Service

CO2:analyse the problems and perform design thinking process

CO3: correlate the basic principles of design thinking to solve engineering problems and develop prototypes

CO4: apply innovative approaches to engineering problems and provide design solutions

Board of Studies (BoS):
18th BoS of MECH held on 21.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	H	-	-	-	-	-	-	-	-	-	-	-	-
CO3	H	-	H	-	M	-	-	-	-	L	-	L	-	-
CO4	-	-	M	-	-	-	-	-	-	L	-	L	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The holistic understanding of basic knowledge in Engineering design and its process in the development of prototypes results in satisfying industrial challenges.

GED 1103	**MANUFACTURING PRACTICES**	**L**	**T**	**P**	**C**
SDG: 9	**LABORATORY**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

COB1: To learn the basics of pipe connections used in household and industrial systems

COB2: To educate the usage of welding equipment's and machining methods

COB3: To impart knowledge onsand mould preparation for simple components

COB4: To explorevarious tools, instruments and methods used in electrical wiring

COB5: To impart knowledge onDesign, assembly and testing of electronic circuits

PRACTICALS

List of Experiments:

CIVIL ENGINEERING PRACTICE:

1. Study of plumbing in general household and industrial systems: Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
2. Making a small window frame with Lap and Mortise & Tenon Joints by sawing planing and cutting.
3. Introduction to power tools

MECHANICAL ENGINEERING PRACTICE

1. Fabrication of a small Table frame with Butt, Lap and Fillet Joints using Arc Welding - Gas cutting (Demo)
2. Machining of a component using simple turning and drilling practices.
3. Foundry operations such as sand mold preparation for simple component.
4. Plastic Component Manufacturing (Demo on Injection / Blow moulding)

ELECTRICAL ENGINEERING PRACTICE:

1. Comparison of incandescent, fluorescent, CFL and LED lamps.
2. Domestic, staircase and go down wiring.
3. Measurement of earth resistance.
4. Study of protection devices (small relay, fuse, MCB, HRC, MCCB,

ECCB).

5. Familiarization of household electrical gadgets (Iron Box, Wet Grinder).
6. Study of inverter fed UPS/Emergency lamp

ELECTRONICS ENGINEERING PRACTICE:

1. Identifications and symbolic representation of active and passive electronic components
2. Soldering and tracing of electronic circuits and checking its continuity
3. Design and testing of electronic circuits using active and passive electronic components

P – 30; Total Hours– 30

TEXT BOOK:

1. S.Gowri and T.Jeyapoovan, “Engineering Practices Lab Manual – Civil, Mechanical, Electrical, Electronics included”, Vikas Publishing, 5th Edition,2019.

REFERENCES:

1. SubhransuSekhar Dash & K.Vijayakumar, “Electrical Engineering Practice Lab Manual”, Vijay Nicole Imprints Private Ltd., First Edition, 2013.
2. Raghbir Singh Khandpur, “Printed Circuit Boards: Design, Fabrication, and Assembly”, Tata McGraw-Hill Education, 2005.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: demonstrate Plumbing requirements of domestic buildings.

CO2: use welding equipment’s to join the structures and to carry out machining operations

CO3: perform the task of making sand mould for simple components

CO4: execute simple electrical wiring and comprehend the construction and working of household appliances.

CO5: assemble and test simple electronic circuits used in day-to-day life

Board of Studies (BoS):	**Academic Council:**
18thBoS of MECH held on 21.06.2021	17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	H	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	M	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	L	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The holistic understanding of welding, moulding, machining, wiring and electronic circuit increases the access of small-scale industrial and other enterprises in developing countries.

GED 1104	**PROGRAMMING FOR**	**L**	**T**	**P**	**C**
SDG: 8	**PROBLEM SOLVING**	**1**	**0**	**2**	**2**

COURSE OBJECTIVES:

COB1: To explore the hardware and software components of the computer

COB2: To learn the structured and procedural programming concepts using C.

COB3: To study the constructs of decision making in branching and iteration statements

COB4: To learn Functions for effective reusability and readability of the code.

COB5: To understand pointer and file operation concepts.

MODULE I INTRODUCTION TO C PROGRAMMING 05

Introduction to components of a computer system: disks, primary and secondary memory, processor, operating system, system software, compilers, creating, compiling and executing a program, Introduction to Algorithms: steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming - Structure of C - C Tokens – Data Types – Declaration of Variables and Storage class – Operators – Expressions - Type Conversion.

MODULE II DECISION MAKING AND ARRAY 05

Decision Making and Branching: Simple if Statements, The if..else statements, Nesting of if..else statements, else…if Ladder, switch Statements, goto Statements, Looping: while, do…while, for Statements, Array: One-Dimensional, Two-Dimensional and Multi-Dimensional operations.

MODULE III USER-DEFINED FUNCTIONS AND FILE OPERATIONS 05

Definition of Functions - Function Types – Nesting of Functions – Recursion – Structures and Unions – Pointers - File handing operations.

PRACTICALS

LIST OF PROGRAMS IN C:

1. Computer organization –Hardware in a typical computer Identification – Booting error messages and what it means
2. Structure of a basic program - Hello world program
3. Data types and Type conversions
4. Input / Output: Formatted functions – Unformatted functions – Library functions

5. Properties of operators – Priority of operators – Arithmetic relational logical and bitwise operators
6. Conditional Statements: If – if else- nested if else- goto- switch case – nested switch case
7. Iteration Statements: for loops – nested for loops – while loop – do-while loop – break and continue statement
8. I/O operations of one- and two-dimensional arrays
9. Bubble Sort and Linear Search using arrays.
10. Functions and its types, Recursion Function
11. Pointers File Operations

L – 15; P – 30 ; Total Hours– 45

TEXT BOOKS:

1. Richard L. Stegman, “Focus on Fundamentals of Programming with C”, Ninth Edition, ISBN -170077395X, 9781700773951, 2019.
2. E.Balagurusamy, “Programming in ANSI C”, McGraw Hill Education, Eighth Edition, ISBN-13: 978-93-5316-513-0, ISBN-10: 93-5316-513-X, 2019.

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, “ The C Programming Language”, Prentice Hall, ISBN 0-13-110362-8, 2015.
2. Ashok N Kamthane, “Computer Programming”, Pearson Education, 2nd Edition, ISBN 13: 9788131704370, 2012.
3. Paul J. Deitel, Deitel & Associates, “C How to Program”, Pearson Education, 7th Edition, ISBN-13: 978-0132990448, 2012.

COURSE OUTCOMES:

Students who complete this course will be able to

CO1: identify the hardware components and describe the software components of computer.

CO2: bring out the importance of structural and procedural programming

CO3: write C coding using conditional and iteration statements

CO4: develop programs using Functions, Pointers and Files

CO5: implement program to build a real time application.

Board of Studies (BoS) : 18th BoS of CSE held on 26.07.2021

Academic Council: 17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	M	L	H	-	L	-	-	M	-	-	-	-	-
CO2	H	M	M	-	-	H	M	-	M	-	-	-	-	-
CO3	H	M	H	-	-	H	-	-	H	-	-	-	-	-
CO4	H	H	H	H	M	H	-	-	H	-	-	-	-	-
CO5	H	H	H	H	H	H	H	H	H	L	H	H	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Statement: The students can have productive employment and decent work by learning this computer fundamentals and programming course.

SEMESTER II

END 1281	ENGLISH FOR ENGINEERS	L	T	P	C
SDG: 4		3	0	0	3

COURSE OBJECTIVES:

COB1: To train students to use appropriate vocabulary in academic and technical contexts

COB2: To facilitate students to speak effectively while exchanging ideas and making presentations

COB3: To develop students' listening skill for comprehending and analysing information

COB4: To develop their reading skill through sub skills like skimming, scanning and critical reading of a text

COB5: To sharpen their academic writing skills

COB6: To expose them to the correct usage of language and help them to apply that knowledge appropriately

MODULE I HUMAN RESOURCES 10

L: Listening to short texts – short formal & informal conversations.

S: Introducing one self – exchanging personal info.

R: Process of reading purposes, Reading comprehension, improving comprehension skills, Reading activities – short comprehension passages, practice in skimming & scanning.

W: Scientific & Technical Writing, Editing skills, Activities – completing sentences, developing hints - Paragraph Writing

Voc. development: Prefixes, Suffixes

Lang. development: Articles, Countable and Uncountable nouns, Present tense, Wh– Questions, Yes or No questions.

MODULE II TRANSPORT 10

L: Listening to long scientific talks

S: Sharing personal information – greeting, leave taking.

R: Comprehension passages with multiple choice questions / Wh–questions/ openended questions - Reading longer technical texts & completing exercises based on them.

W: Use of reference words & discourse markers on a text, jumbled sentences, describing a process – flow chart, use of sequence words.

Voc. development: Guessing meanings of words in context, vocabulary used

in formal letters, e-mails & reports.

Lang. development: Preposition of Time, Place & Date, Past tense, Conjunctions, Impersonal passive voice, Question tags, Numerical Adjectives.

MODULE III ENERGY 9

L:Listening to talk on the topic & completing tasks.

S: Asking about routine actions & expressing opinions.

R: Locating Specific Information

W: Letter seeking permission for Industrial Visit / symposium – Letter of invitation

Voc. development: Sequence words, misspelt words.

Lang. development: Adverbs, Degrees of comparison, Future tense, Homophones

MODULE IV OUR LIVING ENVIRONMENT 8

L: Listening to scientific texts & making notes – Effective ways of making notes.

S: Speaking about one's friend.

R: Reading texts & magazines for detailed comprehension. (Students can be asked to read any book of their choice to encourage reading habit)

W: Argumentative writing.

Voc. Development: Synonyms, antonyms, phrasal verbs.

Lang. development: If clauses, Subject - Verb Agreement

MODULE V TECHNOLOGY 8

L: Listening to talks (General & Scientific).

S: Short group conversations.

R: Reading and understanding technical articles, Short narratives & articles from Newspaper including conversations.

W: Short essays, Dialogue writing.

Voc. Development: Idioms & Phrases.

Lang. development: Modal verbs.

L – 45; Total Hours– 45

TEXT BOOKS:

1. Board of Editors. Using English A Coursebook for Undergraduate Engineers and Technologists. Orient BlackSwan Limited, Hyderabad:2015
2. Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.

REFERENCES:

1) Perry, Carol Rosenblum(2011). The Fine Art of Technical Writing, Create Space Independent Publishing Platform, New Delhi.
2) Dutt, P.K. Rajeevan G. andPrakash, C.L.N. (2007). A course in Communication Skills, Cambridge Univesity Press, India.
3) Sen, Leena(2004). Communication Skills, Prentice Hall, New Delhi.
4) Matt Firth, Chris Sowton et.al (2012). Academic English An Integrated Skills Course for EAP, Cambridge University Press, Cambridge.
5) Bailey,Stephen2011. Academic Writing: A practical guide for students, New York, Rutledge.
6) Redston, Chris&Gillies (2005). Cunningham Face2Face (Pre-intermediate Student's Book&Workbook) Cambridge University Press, New Delhi.
7) Dutt P. Kiranmai and RajeevanGeeta (2013). Basic Communication Skills, Foundation Books.

COURSE OUTCOMES:

CO1: Read articles of a general kind in magazines and newspapers

CO2:Participate effectively in conversations, introduce themselves and their friends and express opinions in English

CO3: Comprehend conversations and short talks delivered in English

CO4: Write short essays of a general kind and letters and emails in English

CO5: Express through speaking and writing using appropriate vocabulary and grammar

Board of Studies (BoS) :
13thBoS of Department of English held on 17.6.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	-	-	-	-	-	-	-	-	M	-	-
CO2	-	-	-	-	-	-	-	-	-	H	-	-
CO3	-	-	-	-	-	-	-	-	-	M	-	-
CO4	-	-	-	-	-	-	-	-	-	H	-	-
CO5	-	-	-	-	-	-	-	-	-	M	-	-

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG No. 4 : Give Quality Education to all the Engineers

Statement: In future, substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

MAD 1283	**PARTIAL DIFFERENTIAL**	**L**	**T**	**P**	**C**
SDG: 4	**EQUATIONS AND TRANSFORMS**	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

COB1: To formulate and solve partial differential equation of first, second and higher orders

COB2: To introduce basics and engineering applications of Fourier series

COB3: To develop Fourier transform techniques

COB4: To introduce techniques and engineering applications of Laplace Transforms

COB5: To acquaint with Z -Transform techniques for discrete time systems

MODULE I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients

MODULE II FOURIER SERIES 9+3

Fourier Series and Dirichlet's conditions - General Fourier series – Even and Odd functions - Half range Fourier series - Parseval's identity - Harmonic Analysis

MODULE III FOURIER TRANSFORMS 9+3

Fourier integral theorem (without proof) - Fourier transform pair - Fourier Inverse Transform – Properties - Convolution theorem - Parseval's identity

MODULE IV LAPLACE TRANSFORM 9+3

Introduction to Laplace transform - Existence of Laplace Transform - Properties of Laplace Transforms - Initial & Final Value Theorems - Inverse Laplace Transform - Convolution Theorem – Circuits to signal square wave: Integral equations with unrepeated complex factors – Damped forced vibrations: repeated complex factors – Resonance - Solution of differential equations

MODULE V Z – TRANSFORM 9+3

Introduction and Definition of Z-transform - Properties of Z- Transform - Convolution Theorem of Z-Transform - Inverse Z–transform - Convolution

Theorem of Inverse Z-Transform - Formation of difference equations - Solving Difference Equations using Z-Transform

L – 45; T – 15; Total Hours– 60

TEXT BOOKS:

1. Kreyszig .E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2011.
2. Grewal B.S., "Higher Engineering Mathematics", 44th edition, Khanna Publishers, New Delhi, 2017.
3. Ramana, B.V, "Higher Engineering Mathematics" Tata Mc Graw Hill Publishing Co. New Delhi, 2010.

REFERENCES:

1. Veerarajan.T., "Engineering Mathematics", 5th edition, Tata Mc Graw Hill Publishing Co. New Delhi, 2012.
2. Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
3. Dennis G. Zill, Warren S. Wright, "Advanced Engineering Mathematics", 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
4. Alan Jeffrey, "Advanced Engineering Mathematics", Academic Press, USA, 2002.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1: form and solve the partial differential equations

CO2: derive a Fourier series of a given periodic function by evaluating Fourier coefficients

CO3: apply integral expressions for the forward and inverse Fourier transform to a range of non-periodic waveforms

CO4: solve ordinary differential equations using Laplace transforms

CO5: solve difference equations using Z-transform

Board of Studies (BoS) :	**Academic Council:**
12th BOS of Mathematics & AS held on 23.06.2021	17th AC held on 15.07.2021

	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	M	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	H	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	H	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	H	L	-	-	-	-	-	-	-	-	-	-	-	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4 : Ensure inclusive and equitable quality education and promote lifelong opportunities for all

Learning of various mathematical techniques like Partial differential equations and transform techniques will help to solve complicated engineering problems

GED 1201	ENGINEERING MECHANICS	L	T	P	C
SDG: 9		3	1	0	4

COURSE OBJECTIVES:

COB1: To impart knowledge about the basic laws of mechanics, resolution of forces, equilibrium of particles in 2D and 3D force systems.
COB2: To learn about supports, reactions and equilibrium of rigid bodies
COB3: To educate surface properties such as centroid and moment of inertia
COB4: To impart knowledge on friction and its applications
COB5: To study the laws of motion, impulse, momentum and elastic bodies

MODULE I VECTOR APPROACH AND EQUILIBRIUM OF PARTICLE **L: 11 T: 3**

Introduction - Vectors – Vectorial representation of forces and moments – Vector Algebra and its Physical relevance in Mechanics – Laws of Mechanics – Parallelogram and triangular Law of forces- Coplanar Forces Principle of transmissibility, Resolution and Composition of forces- Forces in plane and space - Lame's theorem - Equilibrium of a particle in 2D plane - Equilibrium of a particle in 3D space - Equivalent systems of forces – Single equivalent force

MODULE II EQUILIBRIUM OF RIGID BODY **L: 7 T: 3**

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis –Vectorial representation of moments and couples – Scalar components of a moment –Varignon's theorem - Equilibrium of Rigid bodies in two dimensions –Examples

MODULE III PROPERTIES OF SURFACES **L:10 T:3**

Determination of Areas – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, Angle section, Hollow section using standard formula – second and product moments of plane area – Physical relevance - Standard sections: Rectangle, triangle, circle- composite sections, Hollow section using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia

MODULE IV FRICTION **L:9**
T:3

Introduction to friction- types of friction- Laws of Coloumb friction- Frictional force – simple contact friction –Block friction– Rolling resistance –ladder friction and wedge friction

MODULE V LAWS OF MOTION **L:8**
T:3

Review of laws of motion – Newton's second law – D'Alembert's principle and its applications in plane motion; Work Energy Equation of particles– Impulse and Momentum – Impact of elastic bodies.

L – 45; T – 15; Total Hours– 60

TEXT BOOKS:

1. Beer, F.P and Johnston Jr. E.R, "Vector Mechanics for Engineers", McGraw Hill Education, 10th Edition, 2017.
2. R.K. Bansal., "A Text Book of Engineering Mechanics", Laxmi Publications, 6th Edition, 2015.

REFERENCES:

1. Russell C Hibbeler, "Engineering Mechanics: Statics & Dynamics", 14th Edition, Pearson, 2015.
2. Irving H. Shames, "Engineering Mechanics – Statics and Dynamics", 4th Edition, Pearson Education India, 2005.
3. R.S. Khurmi., "A Text Book of Engineering Mechanics", S. Chand Publishing, 22nd Edition, 2018.

COURSE OUTCOMES:

After completion of the course, students should be able to

CO1: resolve composite forces, apply concept of equilibrium to particles and solve problems

CO2: apply the concept of equilibrium to rigid bodies and solve problems

CO3: determine the properties of surfaces

CO4: analyse and evaluate the frictional forces between the bodies

CO5: apply the laws of motion in solving dynamics problems

Board of Studies (BoS):
18th BOS held on 21.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	L	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	-	-	-	-	-	-	M	-	-	-
CO3	-	-	L	-	-	-	-	-	-	-	-	-	-	-
CO4	-	M	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	L	-	-	-	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

The understanding of force systems and its components leads to construction of robust engineeringsystems.

GED 1204	**BASIC ELECTRICAL AND**	**L**	**T**	**P**	**C**
SDG: 3, 5, 8, 12	**INSTRUMENTATION ENGINEERING**	**3**	**0**	**2**	**4**

COURSE OBJECTIVES:

COB1: To make the students understand the basic calculations and measurements in DC circuits.

COB2: To provide the basic knowledge on AC circuit calculations and measurements.

COB3: To familiarize with working and characteristics of different DC and AC machines.

COB4: To impart knowledge on the fundamentals of measuring electrical quantities.

COB5: To expose the students to various sensors and transducers to measure non-electrical quantities.

MODULE I DC CIRCUITS AND MEASUREMENTS 13

The concept of voltage and current-Electric circuit elements: R, L, C – Independent and dependent sources - Ohm's law- Kirchhoff's law- series and parallel resistive circuits – Voltage and current division – Star-delta transformation - Mesh and nodal analysis of resistive circuits – simple problems - Measurement ofvoltage, current and power in DC circuits.

MODULE II AC CIRCUITS AND MEASUREMENTS 17

Sinusoidal voltage - RMS, average, peak value, peak factor and form factor - single phase RL, RC and RLC circuits –phasor representation - complex power – power factor - simple problems - Resonance in RLC circuits – 3 phase balanced circuit calculations– star and delta connections - Principles of measurement of AC voltage, current, power and energy - Measurement of three phase power - Protection of AC circuits: Fuse and Miniature Circuit Breakers(MCB)

MODULE III ELECTRICAL MACHINES 18

Construction, principle of operation, basic equations, characteristics and applications of DC generators, DC motors, single phase transformers and three phase induction motors. Working principle of BLDC Motor and its applications in home appliances.

(Qualitative treatment only).

MODULE IV ELECTRICAL MEASUREMENTS 14

Functional blocks of a measurement system - types of measurements - Direct and indirect measurements – Classification of instruments – Induction type – dynamometer type wattmeters - Types of indicating Instruments Principles of Electrical Instruments – Multimeters, Oscilloscopes - Static and Dynamic characteristics of an instrumentation system – Errors in Measurement – Calibration and Standards.

MODULE V TRANSDUCERS AND SENSORS 13

Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect – electromagnetic flow transducers - Level transducers – Ultrasonic and fiber optic transducers – Smart transducers - Types of sensors – elastic sensors – viscosity – moisture and pH sensors – sensors based on semiconductor junctions - charge coupled and CMOS image sensors – Biosensors.

PRACTICALS

List of Experiments

1. Verification of KCL and KVL (ii) Measurement of voltage, current and power in DC circuits.
2. Resonance of RLC series circuit (ii) Measurement of voltage, current, power and power factor in single phase & three phase AC circuits.
3. Magnetization characteristics of DC generator (ii) Characteristics of DC shunt motor, single phase transformer and three phase induction motor.
    (i) Measurement of AC voltages and currents in CRO – magnitudes, time period, frequency and phasor difference
    (ii) Capturing the transients in RC / RL / RLC circuits in a storage oscilloscope.
4. Characteristics of resistive, inductive and capacitive transducers.

L – 45 ; P – 30 ; Total Hours– 75

REFERENCES:

1. D P Kothari and I.J Nagarath, “Basic Electrical and Electronics Engineering”, McGraw HillEducation(India) Private Limited, Third Reprint,2016.
2. Giorgio Rizzoni, “Principles and Applications of Electrical Engineering”, McGraw HillEducation(India) Private Limited, 2010.

3. S.K.Bhattacharya, “Basic Electrical and Electronics Engineering”, Pearson India, 2011.
4. Del Toro, “Electrical Engineering Fundamentals”, Pearson Education, New Delhi, 2015.
5. Leonard S Bobrow, “Foundations of Electrical Engineering”, Oxford University Press, 2013.
6. Rajendra Prasad, “Fundamentals of Electrical engineering”, Prentice Hall of India, 2006.
7. Mittle N., “Basic Electrical Engineering”, Tata McGraw Hill Edition, 24th reprint 2016.
8. Sawhney, A. K., and Puneet Sawhney “A Course in Electrical and Electronic Measurements and Instrumentation” Dhanpat Rai & Company, 2016.

COURSE OUTCOMES:

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

CO1: perform the basic calculations in DC circuits and measure the various quantities associated with DC circuits.

CO2: measure and compute the rms current and voltage, power, power factor and energy in AC circuits.

CO3: choose appropriate motor for specific applications based on the motor characteristics.

CO4: use the CRO and other measuring devices for measuring electrical quantities.

CO5: select appropriate transducer or sensor for applications involving non-electrical quantities.

Board of Studies (BoS) :
15th meeting of BoS of EEE held on 25.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	H		H	L	M		M		L	L	M	L	-	-	-
CO 2	H		H	L	M		M		L	L	M	L	-	-	-
CO 3	H		H	L			M		L	L	M	L	-	-	-
CO 4	H		H	L			M		L	L	M	L	-	-	-
CO 5	H		H	L			M		L	L	M	L	-	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 3 : Good health and well-being.
Statement :Understanding of the fundamentals of electrical and instrumentation systems can help in designing systems to promote good health and well-being.

SDG 5: Gender equality
Statement: Acquiring the interdisciplinary knowledge help overcome the gender barriers in work place.

SDG 8: Descent work and economic
Statement: The learners of this course can get descent work and earn financial benefits and they can work in interdisciplinary areas.

SDG 12: Responsible consumption and production.
Statement: Use of right and energy efficient electric and instrumentation components and devices results is reasonable consumption and production.

ECD 1201	ELECTRON DEVICES	L	T	P	C
SDG: 4, 9		3	0	0	3

COURSE OBJECTIVES:

COB1 : To describe fundamental concepts of semiconductors and electronic components

COB2 : To discuss about various semiconductor devices and its applications

COB3 : To explain the process of PCB design

COB4 : To use different types of power control devices in a appropriate applications.

COB5 : To analyze the characteristics of optoelectronic and nano electronic devices

PREREQUISITES:

- Fundamentals of Semiconductor physics

MODULE I INTRODUCTION TO DIODES AND PCB DESIGN 9

Overview of Electronic components- Semiconductors – Construction, Characteristics and applications of PN junction diode: Rectifiers - Construction, Characteristics and applications of Special purpose diodes: Zener Diode, Varactor Diode, Tunnel Diode, Schottky Diode -Process of PCB design: Schematic and Layout.

MODULE II BIPOLAR JUNCTION TRANSISTORS 9

Construction, Configurations and Characteristics of BJT - Current components - Hybrid Model - Biasing of BJT - Transistor switching times -Applications of BJT.

MODULE III FIELD EFFECT TRANSISTORS 9

Construction, Configuration and Characteristics of JFET - JFET biasing - Applications of JFET. Construction, Configuration and Characteristics of MOSFET -MOSFET biasing –Types of FET - Applications of MOSFET.

MODULE IV POWER CONTROL DEVICES 9

Construction, characteristics, and applications: UJT, SCR, TRIAC and DIAC - IGBT - Power MOSFET.

MODULE V OPTOELECTRONIC AND NANOELECTRONICS DEVICES **9**

Optoelectronic devices- Laser diodes,Photoresistors,Photo diodes, Solar cell, Display Devices: Liquid Crystal Display, LED, OLED, AMOLED – Nano electronic Devices.

L – 45; Total Hours– 45

TEXT BOOKS:

1. J.Millman, C.C.Halkias, and Satyabratha Jit, “Electronic Devices and Circuits” Tata McGraw Hill, 2nd Ed., 2010.
2. Thomas L. Floyd ,”Electronic Devices”, Global Edition, Pearson Education, 2017.
3. Pallab Bhattacharya, “Semiconductor Optoelectronic Devices”, 2017, 2nd Edition, Pearson Education, India.
4. William Liu, “Fundamentals of III-V Devices: HBTs, MESFETs, and HFETs/ HEMTs”, Wiley-Interscience; 1st edition ,1999.
5. Byung-Gook Park, Sung Woo Hwang, Young June Park,” Nano electronic devices”, Stanford publishing, 2012.

REFERENCES:

1. Donald A.Neaman, “Semiconductor Physics and Devices” 3rd Ed., Tata McGraw Hill 2003.
2. Nandita Das Gupta and Amitava Das Gupta, “Semiconductor Devices – Modeling and Technology”, Prentice Hall of India, 2004.
3. David A Bell, ‘Electronic Devices and Circuits’, 5th edition, Oxford University Press, 2008.

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO1 : recall the classification of electronic components and concepts of semiconductors.

CO2 : identify the applications of PN junction diode and various special diodes.

CO3 : apply the process of PCB design.

CO4 : analyze the characteristics of Bipolar junction transistor and Field effect transistor.

CO5 : choose various power control devices, switches and nanoelectronic devices for different applications.

CO6 : summarize the characteristics of optoelectronic and display devices.

Board of Studies (BoS) :
21st BOS of ECE held on 23.6.2021

Academic Council:
17th Academic council held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	M	M	-	-	-	-	-	M	-	-	M	L	L	H
CO2	M	H	M	-	-	-	-	-	M	-	-	M	L	L	H
CO3	M	H	M	-	H	-	-	-	M	-	-	M	H	L	H
CO4	L	L	L	-	-	-	-	-	M	-	-	M	M	L	M
CO5	M	M	M	-	-	-	-	-	M	-	-	M	M	L	M
CO5	M	M	M	-	-	-	-	-	M	-	-	M	M	L	M

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: This course enables the student to understand the basic characteristics of electronic components, method of biasing, applications helps for lifelong learning of newer technologies and concepts related to the electronic devices.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the theoretical concepts of electronic devices for the various application of electronic sub domains.

ECD 1202	CIRCUIT AND NETWORK ANALYSIS	L	T	P	C
SDG: 4, 8,9		2	0	2	3

COURSE OBJECTIVES:

COB1 : To apply the fundamental theorems of electrical circuit and network

COB2 : To discuss the concepts of steady state and transient analysis in RL, RC and RLC circuits.

COB3 : To analyze the significance of two port networks

COB4 : To design and analyze the circuits using simulation tools.

PREREQUISITES:

- Mathematical knowledge in linear algebra and Matrix theory.
- Basic knowledge about voltage, current and power relationship.

MODULE I NETWORK THEOREMS 8+8

Thevenin's Theorem - Norton's Theorem - Superposition theorem - Maximum power transfer theorem- Substitution theorem-Reciprocity theorem.

Laboratory Practice: Circuit Simulation of verification of Thevenin's Theorem- Norton's Theorem - Maximum power transfer theorem.

MODULE II ANALYSIS OF NETWORKS 8+6

Mesh analysis and nodal analysis of circuits - Formation of matrix equations and analysis.- introduction to network topology: Tree and co-tree- Twigs and links- Incidence matrix

Laboratory Practice: Circuit Simulation of Mesh analysis and Nodal analysis methods.

MODULE III TRANSIENT ANALYSIS 8+10

Steady state and transient response – DC response of an RL, RC and RLC circuits -Sinusoidal response of an RL, RC and RLC circuits.

Laboratory Practice: Circuit Simulation of DC response of an RL, RC, RLC circuits and Sinusoidal response of RL, RC and RLC circuits.

MODULE IV TWO PORT NETWORKS 6+6

Open circuit Impedance (Z) Parameters - short Circuit Admittance(Y) Parameters, Transmission (ABCD) Parameters and Inverse Transmission Parameters-Hybrid (h) Parameters and Inverse Hybrid Parameter Conversion between parameters- interconnection of two-port networks

Laboratory Practice: Study the network parameters for various types of network connections using simulation

L – 30; P – 30; Total Hours– 60

TEXT BOOKS:

1. William H.Hayt, Jr, J.E.Kemmerly& Steven M.Durban, "Engineering Circuit Analysis" 9th Edition, Mc Graw Hill, 2020
2. A.Sudhakar &ShyammohanS.Palli "Circuits &Network; Analysis& Synthesis", 5th Edition, Tata Mc Graw Hill, 2017
3. Someshwar C. Gupta, Jon W. Bayless, Behrouz Peikari, “Circuit Analysis - with computer applications to problem-solving", WileyEastern Ltd., 1991
4. Van Valkenburg, "Network Analysis", Prentice Hall of India Pvt. Ltd., New Delhi, 2015.

REFERENCES:

1. M.L Soni & J.C. Gupta, "Electric Circuit Analysis", Dhanpat Rai& Sons, New Delhi, 1999.
2. Joseph Edminister, "Electric Circuits", Schaum's Outline Series, Mc Graw Hill 5th Edition, 2011

COURSE OUTCOMES:

CO1 : Describe and apply fundamental concepts of networks in solving and analyzing different electrical networks.

CO2 : Reconstruct the electrical networks using graph theory

CO3 : Analyze the electrical networks using various network reduction techniques.

CO4 : Apply appropriate theorems and techniques for solving electrical networks

CO5 : Analyze networks in steady state and transient conditions.

CO6 : Use simulation tools for the analysis of circuits.

Board of Studies (BoS) :
21st BOS of ECE held on 23.6.2021

Academic Council:
17th Academic council held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	H	H	M	M	L	L	M	M	M	M	M	H	H	H
CO2	M	M	M	M	M	L	L	M	M	M	M	M	H	H	H
CO3	M	M	3	M	M	L	L	M	M	M	M	M	H	H	H
CO4	M	M	3	M	H	L	L	M	M	M	M	M	H	H	H
CO5	M	M	3	M	M	L	L	M	M	M	M	M	H	H	H
CO5	M	L	3	M	H	L	L	M	H	M	M	M	H	H	H

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Analysis and design circuits and networks promote Engineering skills and quality education.

SDG 8: Development of new technologies with circuits and networks provides sustainable economic growth and productive employment.

SDG 9: Analysis of circuits and networks fosters innovation and sustainable industrialization.

Statement: Analysis and design of circuits promote sustained economic growth.

ECD 1203	**ELECTRON DEVICES**	**L**	**T**	**P**	**C**
SDG: 4 & 9	**LABORATORY**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

COB1: To identify various electronic components and devices

COB 2: To apply the PCB design process

COB3: To analyze the working characteristics and applications of various Semiconductor Devices

PRACTICALS

List of Experiments:

1. Study Of Electronic Components, Data Sheet and Equipments
2. PCB Design Process - Schematic capture, Simulation, Schematic to layout transfer
3. PN junction diode characteristics and its application
4. Zener Diode characteristics and its application
5. Bipolar Junction Transistor (BJT) characteristics and its application
6. Field Effect Transistor (FET) characteristics and its application
7. Silicon Controlled Rectifier (SCR) characteristics and its application
8. Light Dependent Resistor(LDR) characteristics and its application

P – 30; Total Hours– 30

TEXT BOOKS:

1. David Bell. Fundamentals of Electronic Devices and Circuits Lab Manual,Oxford University Press 22, November 2009
2. J.Millman, C.C.Halkias, and Satyabratha Jit, “Electronic Devices and Circuits” Tata McGraw Hill, 2nd Ed., 2010.
3. Thomas L. Floyd ,”Electronic Devices”, Global Edition, Pearson Education, 2017.

REFERENCES:

1. Donald A.Neaman, “Semiconductor Physics and Devices” 3rd Ed., Tata McGraw Hill 2003.
2. Nandita Das Gupta and Amitava Das Gupta, “Semiconductor Devices – Modeling and Technology”, Prentice Hall of India, 2004.
3. David A Bell, ‘Electronic Devices and Circuits’ , 5th edition, Oxford University Press, 2008.

COURSE OUTCOMES:

CO1: Construct electronic circuits using simulation software and obtain their characteristics

CO2: Apply the process of PCB design

CO3: Test and troubleshoot various semiconductor devices

CO4: Apply various electronic components and devices in circuit design for practical applications

CO5: Associate with a team and implement applications using electronic devices

CO6: Use device and components data sheet to select the appropriate components.

Board of Studies (BoS) :
21st BOS of ECE held on 23.6.2021

Academic Council:
17th Academic council held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO 3
CO1	M	M	M						M			M	H	M	H
CO2	H	M	H						M			M	H	M	H
CO3	H	H	H						M			M	H	M	H
CO4	H	H	H						M			M	H	M	H
CO5	H	M	H						H			M	M	L	M
CO6	H	H	H	M	M				H			M	H	L	M

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: This course enables the student to understand practically the basic VI characteristics of electronic devices, method of biasing, applications and helps for lifelong learning of newer technologies and concepts related to the electronic devices.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the practical concepts of electronic devices and its applications in various fields of electronic sub domains.

GED 1206	ENVIRONMENTAL SCIENCES	L	T	P	C
SDG: All		2	0	0	2

COURSE OBJECTIVES:

To make the student conversant with the

COB1: various natural resources, availability, utilisation and its current scenario.

COB2: diverse ecosystems and its function, importance of biodiversity, its values, threats and conservation.

COB3: types of pollutants and its impacts on the environment and the effects of natural disasters.

COB4: impacts of human population, human health, diseases and immunisation for a sustainable lifestyle.

MODULE I NATURAL RESOURCES 8

Natural Resources: Renewable and non-renewable resources: Natural resources and associated problems - (a) Land resources: Land degradation soil erosion and desertification - (b) Forest resources: Use and over-exploitation, deforestation (c) Water resources: Use and over-utilisation of surface and ground water, conflicts over water, dams: benefits and problems, effects on forest and tribal people - (d) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, mining (e) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture (f) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources.

MODULE II ECOSYSTEMS AND BIODIVERSITY 8

Concept of an ecosystem - Food chains, food webs, Energy flow in the ecosystem - ecological pyramids - Ecological succession - Characteristic features, structure and function of (a) Terrestrial Ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem (b) Aquatic fresh water ecosystems: Ponds and lakes, rivers and streams (c) Aquatic salt water ecosystems: oceans and estuaries Biodiversity and its conservation - Types: genetic, species and ecosystem diversity - Values of biodiversity - India as a mega-diversity nation - Invasive, endangered, endemic and extinct species - Hot sports of biodiversity and Red Data book - Threats to biodiversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

MODULE III ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT **8**

Sources, cause, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear pollution (h) ill-effects of fireworks and upkeep of clean environment, types of fire and fire extinguishers- Solid waste Management: types, collection, processing and disposal of urban waste, industrial waste, e- waste and biomedical wastes - Disaster management: flood, drought, cyclone, landslide, avalanche, volcanic eruptions, earthquake and tsunami.

MODULE IV HUMAN POPULATION, HEALTH AND SOCIAL ISSUES **6**

Human Population - Population growth, Population explosion, population pyramid among nations - Family Welfare Programme - Human Rights - Value Education - Environment and human health: air-borne, water borne, infectious diseases, contagious diseases and immunisation (all types of vaccines from birth), risks due to chemicals in food and water, endocrine disrupting chemicals, cancer and environment - Sustainable development - Resettlement and rehabilitation of people - Environment Legislative laws- Women and Child Welfare, Public awareness.

Case studies related to current situation.

L – 30; Total Hours– 30

TEXT BOOKS:

1. Erach Bharucha, “Textbook for Environmental Studies for Undergraduate Courses of all Branches of Higher Education for University Grants Commission”, Orient Blackswan Pvt. Ltd., Hyderabad, India, 2013.
2. Benny Joseph, “Environmental Studies”, Tata McGraw-Hill Education, India, 2009.
3. Ravikrishnan A, “Environmental Science and Engineering”, Sri Krishna Publications, Tamil Nadu, India, 2018.
4. Raman Sivakumar, “Introduction to Environmental Science and Engineering”, McGraw Hill Education, India, 2009.
5. Venugopala Rao P, “Principles of Environmental Science and Engineering”, Prentice Hall India Learning Private Limited; India, 2006.
6. Anubha Kaushik and Kaushik C.P., “Environmental Science and Engineering”, New Age International Pvt. Ltd., New Delhi, India, 2009.

REFERENCES:

1. Masters G.M., “Introduction to Environmental Engineering and Science”, Prentice Hall, New Delhi, 1997.
2. Henry J.G. and Heike G.W., “Environmental Science and Engineering”, Prentice Hall International Inc., New Jersy, 1996.
3. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Co. Boston, USA, 2016.
4. “Waste to Resources: A Waste Management Handbook”, The Energy and Resources Institute, 2014.
5. https://www.teriin.org/article/e-waste-management-india-challenges-and-opportunities.
6. https://green.harvard.edu/tools-resources/how/6-ways-minimize-your-e-waste.
7. https://www.aiims.edu/en/departments-and-centers/central-facilities/265-biomedical/7346-bio-medical-waste-management.html.
8. https://tspcb.cgg.gov.in/Shared%20Documents/Guidelines%20for%20Management%20of%20Healthcare%20Waste%20Waste%20Management%20Rules,%202016%20by%20Health%20Care%20Facilities.pdf.

COURSE OUTCOMES:

The student will be able to

CO1: analyse the current scenario of various natural resources and their depletion and suggest remedies to curb the exploitation.

CO2: identify food chains and web and its function in the environment, assess the impacts on the biodiversity and propose solutions to conserve it.

CO3: analyse the types and impacts of pollutants in the environment and propose suitable methods to alleviate the pollutants and the natural disasters.

CO4: assess on the impact of human population and the health related issues and immunisation practices and sustainable developments for a healthy life

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Board of Studies (BoS) :	**Academic Council:**
11th BoS of Chem held on 17.06.2021	17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	L	M	-	-	L	M	-	-	-	-	-	-	-	-
CO2	-	-	-	M	H	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	-	-	M	M	-	-	L	-	M	-	-
CO4	-	-	-	-	-	M	M	M	-	-	-	L	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SDG All: No Poverty, Zero Hunger, Good Health and Well-Being, Quality Education, Gender Equality, Clean Water and Sanitation, Affordable & Clean Energy, Decent Work and Economic Growth, Industry, Innovation & Infrastructure, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action, Life Below Water, Life on Land, Peace, Justice and Strong Institutions, Partnerships for the Goals.

Statement: This course discuss about the environment, all the natural resources available, sharing of resources, effective utilisation, effects of over utilisation, health and environmental issues pertained to that, global warming and related issues, climates, disasters, impact assessments, population, human rights, societal welfare, laws to conserve the environment and sustainability.

SEMESTER III

ECD 2101	ANALOG ELECTRONIC CIRCUITS	L	T	P	C
		3	0	0	3

SDG: 4,9

COURSE OBJECTIVES:

COB1: To design and analyze the performance of BJT and FET amplifiers

COB2: To design and test the feedback amplifiers and oscillators

COB3: To design and estimate tuned amplifiers and power amplifiers.

COB4: To apply and analyze the concepts of Multivibrator circuits.

COB5: To design and analyze the blocking oscillator & Time base generating circuits.

PREREQUISITES:

Fundamentals of Semiconductor physics, Electron Devices.

MODULE I SMALL SIGNAL ANALYSIS AND FREQUENCY RESPONSE OF AMPLIFIERS **9**

Small signal models of BJT and MOSFET, Small signal Analysis of Common Emitter, Common Collector and common Base amplifiers. Small signal analysis of FET amplifiers, Differential amplifiers. Low frequency response of BJT and FET amplifiers-high frequency response of BJT and FET amplifiers.

MODULE II FEEDBACK AMPLIFIERS AND OSCILLATORS **9**

Basic feedback concepts - Properties of Negative feedback -Four feedback topologies with amplifier circuit - Analysis of series - shunt feedback amplifiers. Oscillators: Barkhausen criteria for oscillator - Analysis of RC oscillators - LC oscillators - Crystal Oscillator.

MODULE III POWER AMPLIFIERS AND TUNED AMPLIFIERS **9**

Classification of large signal amplifiers – Class A amplifier– Class B amplifier – Class AB amplifier– Class C amplifier and Efficiency – Analysis of Single tuned amplifier - Double tuned amplifier - Synchronously tuned amplifiers.

MODULE IV MULTIVIBRATOR CIRCUITS **9**

Collector coupled and Emitter coupled Astable multivibrator – Monostable multivibrator- Bistable multivibrators. Triggering methods: Storage delay and calculation of switching times - Speed up capacitors - Schmitt trigger circuit.

MODULE V BLOCKING OSCILLATORS AND TIME BASE GENERATORS 9

Pulse transformers - Monostable Blocking Oscillators using Emitter and base timing - Astable blocking oscillator - Voltage sweep generators - Current sweep generators

L – 45; Total Hours– 45

TEXT BOOKS:

1. Boylested and Nashlesky, Electronic Devices and Circuit theory, 11th edition, Prentice Hall of India, 2015.
2. Donald .A.Neamen, Electronic Circuit Analysis and Design, 2nd edition, Tata McGraw Hill, 2009.
3. Millman .J. and Halkias C.C, Integrated Electronics, McGraw Hill, 2nd Edition, 2017.
4. Robert Boylestad , Introductory Circuit Analysis, Pearson; 13th edition, 2015.

REFERENCES:

1. Adel.S.Sedra, Kenneth C. Smith, Micro Electronic circuits, 8th Edition, Oxford University Press, 2020.
2. David A. Bell,Electronic Devices and Circuits, Oxford Higher Education press, 5th Edition, 2010
3. David A. Bell, "Solid State Pulse Circuits", 4th edition, Eastern economic edition, Prentice Hall of India, 2010.
4. Millman J. and Taub H., "Pulse Digital, Switching waveform", 3rd Edition, McGraw-Hill International, 2017.

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO1: Design and analyze the BJT and FET amplifiers

CO2: Classify and construct the feedback amplifiers and oscillators.

CO3: Design and analysis of tuned amplifiers and power amplifiers

CO4: Design and develop circuits to generate non-sinusoidal waveforms

CO5: Design the circuits to generate Time base waveforms.

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	H	H	H	L	M	L	L	M	M	M	M	M	L	L	H
CO 2	H	H	H	M	M	L	L	M	M	M	M	M	L	L	H
CO 3	H	H	H	H	M	L	L	M	M	M	M	M	L	L	H
CO 4	H	H	H	H	M	L	L	M	M	M	M	M	L	L	H
CO 5	H	H	H	H	M	L	L	M	M	M	M	M	L	L	H

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Quality Education.

Statement: It is a fundamental course, which explains the basics of electronic circuit design and its applications. It is essential to understand the modern electronic systems and industrial automation in turn provides quality education.

SDG 9: Industry, Innovation and Infrastructure

Statement: This course will deliver the concepts to design and invent electronic circuits for modern electronic devices which will enhance quality of life and to meet industry requirements.

ECD 2102	DIGITAL ELECTRONICS	L	T	P	C
SDG: 4, 8, 9		3	0	0	3

COURSE OBJECTIVES:

COB1 : To discuss the methods for simplifying Boolean expressions.

COB2 : To design and analyze the combinational circuits.

COB3 : To design and test the performance of sequential circuits.

COB4 : To characterize and select the memories and programmable logic devices.

COB5 : To analyze the digital circuits using simulation tools.

PREREQUISITES:

- Fundamentals of Boolean Algebra
- Knowledge on Number System

MODULE I DIGITAL FUNDAMENTALS 9

Number systems - Binary codes-Boolean algebra and theorems- Logic gates - Boolean functions - Karnaugh map and Quine - McCluskey Method- Implementations of Logic functions using universal gates.

MODULE II DESIGN OF COMBINATIONAL CIRCUIT 9

Analysis and design procedures- Circuits for arithmetic operations –Magnitude comparator-Multiplexer- Demultiplexer- Encoder-decoder - Parity generator and checker- Code converters.

MODULE III SYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN 10

Analysis and Design of synchronous sequential circuits -Flip flops- SR, JK, T, D, Master slave FF-Counters-Shift registers –-Design of rolling display-Moore and Mealy circuits.

MODULE IV ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN 8

Analysis and Design of Asynchronous sequential circuits- Fundamental mode sequential circuits- Pulse mode sequential circuits-cycles and races-Hazards - Design of Hazard free circuits.

MODULE V MEMORY DEVICES AND VERILOG HDL 9

Basic memory structure- Programmable Logic Devices — Programmable Logic Array (PLA) — Programmable Array Logic (PAL) — Field Programmable Gate Arrays (FPGA) — Implementation of combinational logic circuits using PROM, PLA and PAL. Introduction to Verilog HDL-Types of Modeling.

L – 45 ; Total Hours– 45

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Pearson Education, New Delhi, 6th edition, 2017.
2. D. P. Kothari and J. S Dhillon, “Digital Circuits and Design”, Pearson Education, New Delhi, 2016.

REFERENCES:

1. Charles H.Roth and J.S.Dhillon, “Fundamentals of logic design”, Cengagei, 7th edition, 2019.
2. Donald D. Givone, "Digital Principles and Design", Tata McGraw Hill, New Delhi, 2003.
3. Thomas L. Floyd, "Digital Fundamentals", Pearson Education, New Delhi, 10th Edition 2008
4. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, New Delhi, 4th Edition, 2010.
5. Donald P. Leach and Albert Paul Malvino, "Digital Principles and Applications", Tata McGraw Hill, New Delhi, 6th Edition, 2009.

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO1 : Apply the concepts and terminology of digital electronics

CO2 : Formulate and employ Karnaugh map and tabulation method to reduce Boolean expressions

CO3 : Analyze and design combinational circuits

CO4 : Design different types of sequential circuits.

CO5 : Implement combinational logic circuits using programmable logic devices.

Board of Studies (BoS) :

22nd BOS of ECE held on 14.12.2021

Academic Council:

18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	M	L	L	L	L	L	L	M	M	M	L	M	M	H
CO2	H	H	H	H	M	L	L	L	M	M	M	L	M	M	H
CO3	H	H	H	H	M	L	L	L	M	M	M	L	M	M	H
CO4	H	H	H	H	M	L	L	L	M	M	M	L	M	M	H
CO5	M	M	H	L	M	L	L	L	M	M	M	L	M	M	H

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: Understanding of the digital electronics course will bring a global impact on quality education.

SDG 8: Development of new technologies provides sustainable economic growth and productive employment.

Statement: Analysis and design of digital circuits promote sustained economic growth.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the design concepts of digital circuits in IC based design.

ECD 2103	ELECTROMAGNETICS AND TRANSMISSION LINE THEORY	L	T	P	C
		3	0	0	3

SDG: 4, 7, 9, 11

COURSE OBJECTIVES:

COB1 : To apply the basic laws and theorems of Static electric and magnetic fields.

COB2 : To interpret the relation between the fields under time varying conditions

COB3 : To analyze principles of propagation of uniform plane waves.

COB4 : To discuss about the propagation of signals through transmission lines

COB5 : To analyze the characteristics of transmission lines and waveguides

PREREQUISITES:

- Fundamentals of Engineering Mathematics
- Fundamentals of Semiconductor physics.

MODULE I ELECTROMAGNETIC FIELDS 8

Coulomb's Law - Electric Field - Electric Scalar Potential-Gauss Law- Biot-Savart Law - Magnetic Field intensity - Ampere's circuital law. Displacement current - Modified form of Ampere's circuital law- Maxwell’s Equation.

MODULE II ELECTROMAGNETIC WAVES 9

Poynting Vector and Poynting Theorem - Derivation of Wave Equation - Uniform Plane Waves - Skin effect. Linear, Elliptical and circular polarization - Reflection Plane Waves - normal and oblique incidence. Dependence on Polarization. Brewster angle.

MODULE III TRANSMISSION LINE THEORY 9

General theory of Transmission lines – The infinite line -Wavelength, velocity of propagation – Input and transfer impedance – the distortion-less line – Loading and different methods of loading – Reflection coefficient – Open and short circuited lines – reflection factor and reflection loss.

MODULE IV HIGH FREQUENCY TRANSMISSION LINES 10

Transmission line equations at radio frequencies – Line of Zero dissipation – Standing Waves, Standing Wave Ratio – Input impedance– Open and short circuited lines – Power and impedance measurement on lines – Reflection losses – Measurement of VSWR and wavelength. Impedance matching– Smith chart.

MODULE V WAVEGUIDES 9

Planar waveguides, TE and TM waves - characteristics, velocities of propagation, Rectangular waveguides - TE and TM waves – characteristics, dominant mode, cut-off wavelength, phase velocity, group velocity, and characteristic impedances.

L – 45 ; Total Hours- 45

TEXT BOOKS:

1. M.N.O.Sadiku: "Elements of Engineering Electromagnetics", 6th Edition, Oxford University Press, 2016.
2. John D Ryder, "Networks, Lines and Fields", 2nd Edition, Pearson India, 2015.
3. William H.Hayt "Engineering Electromagnetics", 8th Edition, Tata McGraw - Hill, 2014.

REFERENCES:

1. Edward C. Jordan and Kenneth G. Balmain, "Electromagnetic Waves and Radiating Systems", 2nd Edition, Prentice Hall Int., 2015.
2. John D Kraus, Ronald J Marhefka, Ahmad S Khan, "Antennas and Wave Propagation", 5th Edition, Tata McGraw Hill, 2017.
3. David M.Pozar, "Microwave Engineering", 4th Edition, John Wiley, 2013.
4. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics", 3rd Edition, John Wiley & Sons, 2003.

COURSE OUTCOMES:

On completion of the course, the students will be able to

CO1 : Apply and analyze the basic laws of Electromagnetic theory

CO2 : Solve the static and time varying electric and magnetic fields for practical applications.

CO3 : Characterize the EM waves in free space and at different boundaries.

CO4 : Explain the basic concepts of Transmission lines and waveguides.

CO5 : Analyze the wave propagation in different mediums.

Board of Studies (BoS) : 22nd BOS of ECE held on 14.12.2021

Academic Council: 18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	M	L	L	L	L	L	L	L	L	L	H	L	M
CO2	H	H	H	L	L	L	M	L	L	L	M	M	H	L	M
CO3	H	H	H	H	L	L	L	M	L	L	L	L	H	H	H
CO4	H	H	H	H	H	L	L	L	L	L	L	L	H	M	H
CO5	H	H	H	H	H	L	L	L	L	H	M	M	M	L	M

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Quality Education

Statement: A fundamental concept of electromagnetic properties and its characteristic analysis provides a global impact on quality education in the area of RF & Communication.

SDG 7: Affordable and Clean Energy

Statement: Practical applications of static and time varying electromagnetic fields offers an impact on affordable and clean energy in overall environment.

SDG 9: **Industry, Innovation and Infrastructure**

Statement: Build resilient Infrastructure; promote inclusive and sustainable industrialization through EM wave propagation within the industry.

SDG 11: Sustainable Cities and Communities

Statement: The resilient communication through EM wave propagation signifies the efficient mode of information transmission across the world and within the smart city.

ECD 2104	SIGNALS AND SYSTEMS	L	T	P	C
SDG: 3, 9		3	0	2	4

COURSE OBJECTIVES:

COB1: To analyze the concepts of Signals and Linear Time-Invariant Systems

COB2: To execute various Transform analysis such as Fourier, Laplace, Z-Transform for a specific signal processing applications

COB3: To apply transforms in the analysis of LTI Systems.

COB4: To construct discrete-time LTI systems for applications.

COB5: To interpret the signals and it's processing through computer simulation.

PREREQUISITES:

- Fundamentals of Engineering Mathematics
- Basic knowledge in computer programming

MODULE I INTRODUCTION TO SIGNALS 8

Time-Domain Representation of Continuous-Time (CT) and Discrete-Time (DT) signals. Standard elementary signals - and complex signal. Basic Time-Domain operations on signals. Energy, Power and Correlation of signals. Signal Classification and Symmetry. Periodicity of discrete-time signals. Synthesis of simple signals.

MODULE II INTRODUCTION TO LTI SYSTEMS 8

Continuous-Time and Discrete-Time Systems. Characteristics of Systems. Linear and Time-Invariant (LTI) Systems and its Properties. Impulse Response, convolution sum and convolution integral. Interconnection of LTI Systems. Differential and Difference Equation representation of LTI systems.

MODULE III TRANSFORM ANALYSIS OF CT SIGNALS 10

Fourier Series representation of signals. Properties of Fourier Series. Continuous Time Fourier Transform and its properties. Frequency Response of CT-LTI Systems.

Unilateral and Bilateral Laplace Transform. Region of Convergence (ROC), Properties of Laplace Transforms. Poles and Zeros. Inverse Laplace Transformation. The Transfer Function and Frequency Response of CT-LTI Systems.

MODULE IV TRANSFORM ANALYSIS OF DT SIGNALS 10

Discrete-Time Fourier Transform (DTFT) and its properties. Discrete Fourier Transform (DFT) and its properties.

Z-Transform - Z-Plane and ROC. Properties of Z-Transform. Poles and Zeros. Methods for Inverse Z-Transform. Transfer Function of DT-LTI Systems. Causality and Stability.

MODULE V APPLICATION OF TRANSFORMS 9

Application of Fourier Transform to communication systems - Spectrum of AM, DSB and SSB AM. Sampling Theorem, Computational Structures for Implementing Discrete-Time LTI systems using z-Transform.

PRACTICALS 30

1. Generation of standard Continuous-Time and Discrete-Time Signals using MATLAB
2. Determination of Energy & Power Estimation of signals.
3. Extraction of Even and Odd Components of signals.
4. Estimation of Auto Correlation and Cross Correlation of CT and DT signals
5. Convolution of Discrete-Time signals
6. Functional Implementation of a given LTI System
7. DFT of CT and DT signals
8. Fast Fourier Transform
9. Estimation of Power Spectral Density
10. Implementation of First Order Low-Pass and High Pass-Filters
11. Study of Laplace & Inverse Laplace Transforms
12. Plotting of poles and zeros of Laplace Transforms
13. Determination and plotting of Z- Transform for Time limited signals
14. Plotting of poles and zeros of Z-Transform.
15. Impulse response of given DT Systems.

L –45 ; P – 30 ; Total Hours – 75

TEXT BOOKS:

1. Alan V. Oppenheim, Alan S. Willsky, with S. Hamid Nawab, "Signals and Systems", 2nd Edition, Pearson Education, 2015.
2. Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley India Pvt Ltd., 2007.
3. Won Young Yang, "Signals and Systems with MATLAB", 1st Edition, Springer, 2011.

REFERENCES:

1. Hwei P. Hsu, "Signals And Systems", 3rd Edition,Schaum's Outlines, McGraw Hill Education, 2017.
2. Luis Chaparro & Aydin Akan, "Signals and Systems using MATLAB", 3rd Edition, Academic Press, (2018)
3. Simon Haykin & Michael Moher, “Communication Systems”, 5th Edition, Wiley India Pvt Ltd., 2009.
4. John G. Proakis & Dimitris G Manolakis, “Digital Signal Processing : Principles, Algorithms, and Applications”, 4th Edition, Pearson India, 2007.

COURSE OUTCOMES:

CO1: Mathematically represent and classify the different types of signals.

CO2: Evaluate and manipulate signals mathematically.

CO3: Identify, and characterize common LTI Systems.

CO4: Apply the tools such as Fourier Transform, Laplace Transform, and Z-Transform in signal processing problems.

CO5: Synthesize discrete-time systems from basic component blocks.

Board of Studies (BoS) :

22nd BOS of ECE held on 14.12.2021

Academic Council:

18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
CO1	H	H	M	L	L	L	L	L	L	L	L	L	L	H	L
CO2	M	H	H	M	L	L	L	L	L	L	L	L	L	H	L
CO3	M	H	H	M	L	L	L	L	L	L	L	L	L	H	L
CO4	L	M	H	H	M	L	L	L	L	L	L	L	L	H	L
CO5	L	L	L	M	H	L	L	L	L	L	L	L	L	H	L

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 3 : Good Health and Well-Being

Statement: Signal processing plays a major role in medical instrumentation. A sound knowledge in these could lead to a substantial research and development in health and well being.

SDG 9 : Industry, Innovation and; Infrastructure

Statement: Signals and its processing forms the basis of control systems and automation.

		L	T	P	C
ECD 2105	**ANALOG ELECTRONIC**				
SDG: 4, 9	**CIRCUITS LABORATORY**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

COB1 : To analyze the characteristics of common emitter and common collector amplifiers

COB2 : To obtain the frequency analysis of various amplifiers

COB3 : To design and analyze characteristics of feedback amplifiers.

COB4 : To design multistage amplifiers and oscillators.

COB5 : To use modern tools for PCB layouts of electronic circuits

PREREQUISITE:

- Electron Devices Lab

LIST OF EXPERIMENTS:

1. To design and test the Emitter follower and Common Emitter amplifier (BJT) using voltage divider bias and determine input, output impedance, gain and bandwidth.
2. To design, test and plot the frequency response of Common Source and Common drain JFET/MOSFET amplifier, and to determine its bandwidth.
3. Determination of frequency response, input impedance and output impedance of two stages RC Coupled Amplifier.
4. Determination of CMRR of Differential amplifier.
5. Design and Analysis of Feedback Amplifiers
6. Design of Class C Single Tuned Amplifier
7. To design and test the RC and LC Oscillator using BJT for the given frequency.
8. Design of Multi vibrator.
9. Simulation of above experiments using Multisim/Cadence/or any EDA tools.

P – 30; Total Hours – 30

TEXT BOOKS:

1. Paul Horowitz and Thomas C. Hayes, “Learning the Art of Electronics: A Hands-On Lab Course Book”, Cambridge university press, first edition, 2016.
2. S.V. Subramanian, “Experiments in Electronics Paperback” New Central Book Agency Pvt Ltd, 2011.

REFERENCES:

1. K. A. Navas, “Electronics Lab Manual”, Volume II, PHI, 6th Edition, 2015.
2. S.Poorna Chandra, B.Sasikala, “Electronics Laboratory Primer: A Design Approach”, S Chand, 2nd edition, 2005.

COURSE OUTCOMES:

The Students will be able to

CO1 : Design the circuit to obtain the frequency response for BJT and FET circuits for the given specifications

CO2 : Design RC coupled amplifier and Darlington amplifiers for better gain values

CO3 : Design RC and LC type oscillators for different frequency.

CO4 : Design tuned amplifier for any given frequency

CO5 : Simulate the circuit to meet the given specifications.

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	M	L	L	M	M	L	L	L	L	L	L	L	L	H
CO2	M	M	L	L	M	M	L	L	L	L	L	L	L	L	H
CO3	M	M	L	L	M	M	L	L	L	L	L	L	L	L	H
CO4	M	M	L	L	M	M	L	L	L	L	L	L	L	L	H
CO5	M	M	L	L	M	M	L	L	L	L	L	L	L	L	H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: This course explains the basics of electronic circuits design and its applications which provides impact on quality education

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement. This course will deliver the concepts to design and innovate electronic circuits for modern electronic devices which will enhance quality of life and to meet industry requirements.

ECD 2106	**DIGITAL ELECTRONICS LABORATORY**	**L**	**T**	**P**	**C**
SDG: 4, 8, 9		**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

COB1: To perform the design of Combinational circuits.

COB2: To verify the functionalities of Flip-flops.

COB3: To design and implement counters.

COB4: To design and analyse the function of shift registers

COB5: To simulate the Verilog programs.

PREREQUISITE:

- Fundamentals of Boolean Algebra
- Knowledge on Number System

PRACTICALS

1. Design and implementation of combinational circuits using logic gates
2. Design and implementation of binary Adder/ subtractor and BCD adder
3. Design and implementation of Magnitude Comparator using logic Gates & 8 Bit magnitude Comparator.
4. Design and implementation of odd/even parity checker generator.
5. Verification of R-S flip-flop, J-K flip-flop, T Flip-Flop, D Flip-Flop Using logic gates.
6. Design and implementation of asynchronous circuits.
7. Design and implementation of synchronous circuits.
8. Design and Implementation of shift registers using Flip - flops.
9. Design and implementation of a simple digital system
10. Simulation of digital circuits using Verilog HDL.
11. Mini project

P – 30 ; Total Hours – 30

TEXT BOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Pearson Education, New Delhi, 6th edition, 2017.
2. D. P. Kothari and J. S Dhillon, “Digital Circuits and Design”, Pearson Education, New Delhi, 2016.

REFERENCES:

1. Charles H.Roth and J.S.Dhillon, “Fundamentals of logic design”, Cengagei, 7th edition, 2019.
2. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, New Delhi, 4th Edition, 2010.

COURSE OUTCOMES:

CO1: Analyze and design digital logic circuits. encoder and decoder.

CO2: Design combinational circuits containing logic gates, multiplexer, demultiplexer

CO3: Design sequential circuits containing latch and flip-flops.

CO4: Identify, formlate and solve engineering problems in the area of digital logic circuit design.

CO5: Use the techniques, skills and modern engineering tools like Verilog HDL

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	H	H	H	L	M	L	H	M	H	M	L	M	H
CO2	H	H	H	H	H	L	M	L	H	M	H	M	L	M	H
CO3	H	H	H	H	H	L	M	L	H	M	H	M	L	M	H
CO4	H	H	H	H	H	L	M	L	H	M	H	M	L	M	H
CO5	M	M	H	H	H	L	M	L	H	M	H	M	L	M	H

Note: L- Low Correlation M -Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: Understanding of the digital electronics course will bring a global impact on quality education.

SDG 8: Development of new technologies provides sustainable economic growth and productive employment.

Statement: Analysis and design of digital circuits promote sustained economic growth.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the design concepts of digital circuits in IC based design.

GED 2101	**ESSENTIAL SKILLS AND APTITUDE**	**L**	**T**	**P**	**C**
SDG: 17	**FOR ENGINEERS**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

COB1: To enable them to make effective business presentations

COB2: To train them to participate in group discussions

COB3: To enhance the problem-solving skills

COB4: To train students in solving analytical problems

MODULE I ORAL DISCOURSE 07

Importance of oral communication-verbal and non-verbal communication, Presentation Strategies- one minute presentation (using Audacity/vocaro) - Effective listening skills, listening for specific information

MODULE II VERBAL COMMUNICATION 08

Understanding negotiation, persuasion & marketing skills - Listening to short conversations & monologues - Group Discussion techniques - Role plays - Interview techniques

MODULE III BASIC NUMERACY 08

Simplification and Approximation – Competitive Examination Shortcut Techniques - Number Systems - Simple and Compound Interest-Progression

MODULE IV ANALYTICAL COMPETENCY 07

Blood Relations – Clocks and Calendars – Coding and Decoding – Analytical Reasoning(Linear Arrangement, Circular Arrangement, Cross Variable Relationship and Linear Relationship)– Directions .

L – 30; TOTAL HOURS 30

REFERENCES:

1. Whitby, Norman (2014). Business Benchmark: Pre-Intermediate to Intermediate. Cambridge University Press, UK
2. Swan, Michael (2005). Practical English Usage, Oxford University Press
3. Bhattacharya. Indrajit (2008). An Approach to Communication Skills, DhanpatRai& Co., (Pvt.) Ltd. New Delhi.
4. Tyra .M, Magical Book On Quicker Maths, BSC Publishing Company Pvt. Limited, 2009
5. R. S. Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Limited, 2017

6. R. S. Aggarwal , A Modern Approach to Verbal & Non-Verbal Reasoning , S. Chand Limited, 2010
7. Khattar Dinesh , The Pearson Guide to Quantitative Aptitude for Competitive Examinations, 3e, Pearson India , 2016
8. Rajesh Verma , Fast Track Objective Arithmetic Paperback , Arihant Publications (India) Limited , 2018
9. Arun Sharma Teach Yourself Quantitative Aptitude Useful for All Competitive Examinations, McGraw Hill Education (India) Pvt. Limited, 2019.

COURSE OUTCOMES:

CO1: Make effective business presentations

CO2: Speak English intelligibly, fluently and accurately in group discussions

CO3: To apply the various problem-solving techniques

CO4: Understand and solve aptitude problem

Board of Studies (BoS) :
13thBoS of the Department of English held on 17.6.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1										H					
CO2									M	H					
CO3					L	L									
CO4		M		L											
CO5															

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Statement: This course ensures capacity building and skills development requisite for implementing global partnership.

SEMESTER IV

ECD 2201	**COMMUNICATION THEORY**	**L**	**T**	**P**	**C**
SDG: 2,3,4,8,11,15,17	**AND SYSTEMS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1 : To describe various continuous wave modulation techniques

COB2: To analyze different types of modulation techniques.

COB3: To compare the performance of communication system with and without noise.

COB4: To Distinguish various pulse modulation and Multiplexing techniques.

COB5: To analyze the effect of multiplexing in the RF chain

PREREQUISITES:

- Basic Mathematics
- Fundamentals of electron devices and circuits.
- Knowledge on Signals and Systems and Random Process

MODULE I AMPLITUDE MODULATION 10

Overview of communication systems-electromagnetic spectrum-ranges and application areas. Need for modulation, Principles of amplitude modulation. Generation of AM wave: square law modulator, switching modulator. Detection of AM waves: square law detector, envelop detector. Generation of DSBSC waves: balanced modulator, ring modulator. Coherent detection of DSBSC modulated waves. Costas loop.

MODULE II SSB AND VSB MODULATION 9

Single side-band modulation - Phase discrimination method for generating an SSB modulated wave, Demodulation of SSB waves. Vestigial side band modulation - Generation of VSB modulated wave, Envelop detection of VSB wave plus carrier, Frequency translation, Frequency division multiplexing, Application: Radio broadcasting, AM radio.

MODULE III ANGLE MODULATION 9

Introduction to angle modulation - Frequency modulation, transmission bandwidth of FM signals, frequency spectrum, phase modulation, relationship between FM&PM, narrow band FM & wide band FM. Generation of FM waves: direct method, indirect method. Detection of FM waves: Balanced frequency discriminator, Zero crossing detectors, Phase locked loop, Superhetrodyne Receivers, Fosterseely discriminator, ratio detector. Noise in FM receivers, Threshold effect, Capture effect, FM Threshold reduction.

MODULE IV NOISE THEORY 9

Sources of noise - shot noise, thermal noise, white noise, Noise bandwidth, Noise temperature, Noise figure - Measurement of noise figure, Signal in presence of noise, Narrow band noise. Noise in continuous wave modulation - Noise in SSB and DSB - SC receiver, Noises in AM receiver threshold effect.
Pre-emphasis and De-emphasis.

MODULE V PULSE MODULATION AND MULTIPLEXING TECHNIQUES 8

Sampling of Signals- Pulse modulation - Generation and detection of PAM, PWM and PPM. Multiplexing- TDM, FDM.

L – 45 ; Total Hours – 45

TEXT BOOKS:

1. Simon Haykin, "Communication System", 5th Edition, John Wiley & Sons, 2009.
2. A. Bruce Carlson, Paul B. Crilly, “Communication Systems” McGraw-Hill , 5th Edition, 2011
3. Taub & Schilling, Gautam Sahe, "Principles of Communication Systems", 4th Edition, TMH, 2012.
4. Wayne Tomasi, "Electronic Communication Systems: Fundamentals Through Advanced", 6th Edition, Pearson Education, 2007.

REFERENCES:

1. Roddy and Coolen, "Communication Systems", 4th Edition, PHI learning, New Delhi, 2003.
2. George Kennedy and Bernard Davis, "Electronic Communication Systems", 4th Edition, Tata McGraw Hill, 2008.
3. K.N.Hari Bhat & Ganesh Rao, "Analog communications", 2nd Edition, Pearson Publication, 2008.
4. R.R. Gulati “Modern Television Practice: Principles, Technology and Servicing” 2nd edition, New Age International Publications – 2011

COURSE OUTCOMES: At the end of the course the student will be able to

CO1: Analyze the need for modulation in Communication systems.

CO2: Choose appropriate modulation based on application.

CO3: Estimate the performance of communication system with and without noise.

CO4: Analyze the effect of multiplexing in communication.

CO5: Recommend the suitable broadcast system based on its performance measures.

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	M	H	L	M	L	L	L	M	M	L	H	M	M
CO2	H	H	M	H	L	M	L	L	L	M	M	L	H	H	M
CO3	H	H	M	H	L	M	L	L	L	M	M	L	H	M	M
CO4	H	H	M	H	L	M	L	L	L	M	M	L	H	H	M
CO5	H	H	M	H	L	M	L	L	L	H	H	M	H	M	H

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 2: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

Statement: The holistic understanding of communication engineering leads to a connected world with better communication across the globe. This ensures essential meteorological and geo information to farmers at the right time helping those who are facing famine or adverse effects of nature like storm or flood and plan well. Advanced communication techniques help the farmers across the globe to share agriculture ideas to increase production.

SDG3: Ensure healthy lives and promote well-being for all.

Statement: The real understanding of this basic course on communication engineering will make the students to innovate better technologies. This leads to a doctor in New York perform operation for a patient in rural areas of India.

SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

Statement: The holistic understanding of the course will bring global impact on quality education. Advanced communication technology can improve the quality of life style.

SDG8 Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

Statement: The understanding of the Communication engineering course helps in providing Safe and inclusive work environment for professionals during pandemic period.

SDG11: Make cities and human settlements inclusive, safe, resilient and sustainable.

Statement: the principles of communication engineering help to develop systems and processes globally, it ensures safety, and security across engineered systems by connecting all through wired or wireless.

SDG15 Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.

Statement: The course will lay strong foundation to develop advanced communication techniques like solar operated sensors that can communicate the environmental (forest/trees) conditions to take precautionary steps and avoid forest fire and deforestation.

SDG17 Strengthen the means of implementation and revitalize the global partnership for sustainable development

Statement: The holistic understanding of the course will enable the engineers to design sustainable solutions on telecommunications.

ECD 2202	LINEAR INTEGRATED CIRCUITS	L	T	P	C
SDG: 4, 9		2	0	2	3

COURSE OBJECTIVES:

COB1: To describe the characteristics and internal circuit of op-amps**.**

COB2: To design the various linear and non-linear applications of op-amps.

COB3: To design and characterize the data converters and active filters.

COB4: To explain and characterize the Timer IC and PLL.

COB5: To explain and characterize the special purpose ICs like voltage regulators, switched capacitor filters.

PREREQUISITES:

- Comprehensive knowledge in Network Analysis and Synthesis
- Basics of Electronic circuits

MODULE I INTRODUCTION AND CIRCUIT CONFIGURATION OF LINEAR ICS **5**

OP-AMP fundamentals, ac and dc characteristics, basic building blocks of OP-AMP. Op-Amp functionality: virtual ground, Inverting and non-inverting modes.

MODULE II APPLICATIONS OF OPERATIONAL AMPLIFIERS **8**

Linear circuits: adder, subtractor, difference amplifier; Differentiator, Integrator, V to I converter and I to V converter, Instrumentation Amplifier, sine wave Oscillators. Non-linear circuits: Precision rectifier, Comparator, Schmitt trigger, Multivibrators, Triangular wave generator, Multiplier and phase detector.

MODULE III CONVERTERS AND FILTERS **9**

Analog switches, High speed Sample and Hold circuit. DAC techniques: Weighted Resistor, R-2R ladder, Inverted R-2R ladder, ADC techniques: Flash type, Counter type, Successive approximation, Single slope and Dual slope.DAC and ADC specifications - Linearity, accuracy, Monotonicity, Settling time and stability.

Active filters: First order and Second order LPF and HPF

MODULE IV TIMER IC AND SPECIAL PURPOSE ICS **8**

555 timer IC, Applications: Astable and Monostable operation, Active filters, PLL and Closed loop analysis of PLL, Applications of PLL: IC Voltage regulators – General purpose, variable regulator Switched capacitor filter- IC MF10, Frequency to Voltage and Voltage to Frequency converters.

PRACTICALS

1. Inverting and Non-Inverting Amplifiers and Voltage follower – Application as Buffer/Isolator.
2. Adder, Subtractor, Difference amplifier, Integrator, Differentiator – Application of Analog computation.
3. Instrumentation Amplifier – Signal extraction from sensor and measurement of CMRR
4. Active Butterworth Filters – As distortion eliminators in Audio amplifiers
5. Multivibrators and Schmitt Trigger using operational amplifier – Function generator
6. Phase shift and Wien bridge oscillators using operational amplifier – Variable low frequency generator.
7. Design of Multivibrators using 555 timer – Clock Pulse generator.
8. PLL characteristics and its application as Frequency Multiplier.
9. DC power supply using LM317 and LM723.
10. Simulation using PSpice, Netlist of above experiments
    Mini project using above experiments

L –30 ; P – 30 ; Total Hours – 60

TEXT BOOKS:

1. D. Roy Choudhry, Shail Jain, "Linear Integrated Circuits", 5th Edition, New Age International Pvt. Ltd., 2018.
2. Gray and Meyer, 'Analysis and Design of Analog Integrated Circuits', 4th Edition, Wiley International, 2009.
3. Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, TMH. 2007.

REFERENCES:

1. Ramakant A. Gayakwad, 'OP-AMP and Linear IC's', 4th Edition, Prentice Hall / Pearson Education,2015.
2. Millman.J. and Halkias.C.C. 'Integrated Electronics', 2ndEdiiton, McGraw-Hill, 1972.
3. William D.Stanely, 'Operational Amplifiers with Linear Integrated Circuits'.4th Edition, Pearson Education, 2004.
4. Sedra & Smith, "Micro Electronic Circuits", 5th Edition, Oxford University Press, 2004.

COURSE OUTCOMES:

CO1: Determine the difference between ideal and practical AC & DC characteristics of an Operational Amplifier.

CO2: Differentiate linear and non-linear applications of operational amplifiers

CO3: Design a circuit to generate waveforms using Op-Amp.

CO4: Apply IC 555 and PLL for different applications

CO5: Identify the special purpose ICs

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	M	L	L	L	L	L	L	L	L	L	H	L	M
CO2	H	H	H	L	H	L	H	L	M	L	L	M	H	L	M
CO3	H	H	M	M	M	L	L	L	M	L	L	L	H	L	M
CO4	H	H	M	M	M	L	M	L	M	L	L	L	H	L	M
CO5	H	H	M	H	H	M	L	M	H	L	M	M	H	L	H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: The holistic understanding of the course will bring global impact on quality education. Integrated circuit design and analysis can improve the quality of life style.

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the design concepts of linear integrated circuit design in designing IC technology.

ECD 2203	VLSI DESIGN	L	T	P	C
SDG: 4,9,12		3	0	0	3

COURSE OBJECTIVES:

COB1: To discuss fundamentals of MOS technology

COB2: To design the basic building blocks of digital integrated circuits.

COB3: To analyse the performance of combinational sequential logic circuits

COB4: To describe the subsystem of ASICs and FPGAs

COB5: To develop the VLSI digital system using Verilog

PREREQUISITES:

Fundamentals of Digital Electronics and its applications

Fundamentals of Electronic Devices and Circuits.

MODULE I INTRODUCTION TO VLSI DESIGN 10

VLSI design methodology, VLSI technology- NMOS, PMOS, CMOS fabrication, Layout design rules, Stick diagram, MOSFET as a switch, Threshold Voltage of MOSFET, Current-Voltage characteristics, Transfer Characteristics, Second Order Effects, Interconnect Parameters — Capacitance, Resistance, and Inductance.

MODULE II COMBINATIONAL LOGIC CIRCUITS USING CMOS 9

The Static CMOS Inverter — An Intuitive Perspective, Evaluating the Robustness of the CMOS Inverter: The Static Behavior, Performance of CMOS Inverter: The Dynamic Behavior, Power, Energy, and Energy-Delay, Static CMOS Design, Dynamic CMOS Design.

MODULE III SEQUENTIAL LOGIC CIRCUITS USING CMOS 9

Static Latches and Registers, Dynamic Latches and Registers, Pipelining: An approach to optimize sequential circuits, Non-Bistable Sequential Circuits.

MODULE IV SUB SYSTEM DESIGN 8

Data path circuits, Architectures for Adders, Accumulators, Multipliers, Barrel Shifters, An overview of the features of FPGAs, IP cores, Soft core processors, Comparison of ASICs, FPGAs.

MODULE V DESIGN OF VLSI SYSTEMS 9

Design of MAC Unit using Verilog, Design of Vending Machine Block using Verilog, Design of FIR Filter using Verilog, Design of ALU using verilog.

L – 45; Total Hours –45

TEXT BOOKS:

1. John P. Uyemura: Introduction to VLSI Circuits and Systems, J.Wiley, 2nd Edition, New York, 2009
2. Rabaey, Jan M., Anantha P. Chandrakasan, and Borivoje Nikolić. Digital integrated circuits: a design perspective. Prentice Hall of India, 3rd edition,New Jersey, 2014.
3. Smith, Michael John Sebastian. Application-specific integrated circuits. Vol. 7.MA: Addison-Wesley, 1997.
4. Samir Palnitkar, Verilog HDL, A guide to digital design and synthesis, PHI, 2010.

REFERENCES:

1. Neil H. E Weste, David Harris, Ayan Banerjee,CMOS VLSI Design – A Circuits and Systems Perspective, 4th Ed, Pearson Education,Noida, India, 2014.
2. Sung-Mo (Steve) Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits Analysis & Design 3rd Edition, Mc Graw-Hill 2003.J.
3. Adel S. Sedra, Kenneth C. Smith : Microelectronics Circuits, 5th Ed., Oxford University Press, 2004
4. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, “Essentials of VLSI circuits and systems” , PHI, 2005.
5. Frank Vahid, Roman Lysecky, “Verilog for Digital Design”, Wiely, 2007
6. Joseph Cavanagh, Digital Design and Verilog HDL fundamentals, CRC Press, 2007.

COURSE OUTCOMES:

CO1: Describe the techniques used for VLSI fabrication

CO2: Analyse the characteristics of VLSI circuits and its performance measures

CO3: Implementation of combinational and sequential logic circuits at the transistor level

CO4: Design the subsystem blocks for processor

CO5: Develop the Verilog programs for VLSI systems

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	M	H	H	L	M	M	H	L	H	M			H
CO2	H	L	M	M	L	L	M	M	H	L	H	M			H
CO3	H	L	M	M	L	L	M	M	H	L	H	M			H
CO4	H	L	H	M	L	L	M	M	H	L	H	M			H
CO5	H	H	H	M	H	L	M	M	H	L	H	M			H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4 : Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
Statement: This course enables the student to understand the basic characteristics of MOS devices, design of combinational and sequential circuits.

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation
Statement: Able to apply the design concepts of VLSI system design in designing processor based design.

SDG 12 : Responsible Consumption and Production
Statement: Understand the market needs based on current technology trends in Integrated circuits market.

ECD 2204	DIGITAL SIGNAL PROCESSING	L	T	P	C
SDG: 3, 9		3	1	0	4

COURSE OBJECTIVES:

COB1: To use the discrete Fourier transform in digital Filter design.

COB2: Familiarize on design of FIR and IIR Digital filters.

COB3: To analyse the concept of quantization noise and its effects in digital system design.

COB4: To discuss signal processing concepts in systems having more than one sampling frequency.

COB5: To describe the architecture and features of digital signal processors

PRE-REQUISITES:

Knowledge on Signals and systems

MODULE I DISCRETE FOURIER TRANSFORM 9+3

Introduction to Discrete Fourier Transform, Direct computation of DFT and Inverse DFT, Properties of DFT, Radix-2 FFT algorithms -Decimation in Time, Decimation in Frequency algorithms, Applications of FFT- IFFT in LTE and 5G-NR

MODULE II DESIGN AND IMPLEMENTATION OF IIR AND FIR FILTERS 12+3

Design of Low Pass Butterworth filters - analog to analog transformation - Analog to digital transformation, Bilinear transformation - Impulse invariant transformation.
Frequency response of FIR filters, Linear phase filters - Windowing techniques for design of Linear phase FIR filters Application

MODULE III FINITE WORD LENGTH EFFECTS 9+3

Representation of numbers - Fixed point and binary floating point number representation - comparison, errors due to truncation and rounding- off, Quantization noise - derivation for quantization noise power at the input and output of a digital filter, Coefficient quantization error -product quantization error, Round-off effects in digital filters, Limit cycle oscillation.

MODULE IV MULTIRATE DIGITAL SIGNAL PROCESSING 9+3

Interpolation and Decimation, Decimation by an integer factor, Interpolation by an integer factor, Sampling rate conversion by a rational factor, Time and frequency domain descriptions - Quadrature Mirror Filter banks - Sub-band Coding.

MODULE V DIGITAL SIGNAL PROCESSORS 6+3

Introduction to DSP processor, Architecture of TMS320C5X and C54X, Blackfin Processor, Overview of instruction set of DSP processor.

L – 45; T-15; Total Hours – 60

TEXT BOOKS:

1. J. G. Proakis, D.G. Manolakis and D.Sharma, Digital Signal Processing Principles, Algorithms and Applications, 2012, 4th edition, Pearson Education, Noida, India
2. S.K.Mitra, Digital Signal Processing, 2013, 4th edition, TMH, New Delhi, India.
3. B.Venkataramani, M. Bhaskar, "Digital Signal Processor Architecture, Programming and Application", 2nd Edition, TMH 2002.

REFERENCES:

1. Emmanuel C. Ifeachor, Digital Signal Processing A Practical Approach, 2011, 2nd edition reprint, Prentice Hall, New Jersey, US.
2. Oppenhiem V.A.V and Schaffer R.W, Discrete – time Signal Processing, 2013, 3rd edition, Prentice Hall, New Jersey, US.
3. Richard G Lyons and D.Lee Fugal, The Essential Guide to Digital Signal Processing, 2014, Prentice Hall, New Jersey, US.

COURSE OUTCOMES:

CO1: Apply the transform on discrete-time signals

CO2: Analyze the basic forms of FIR and IIR filters and, to design filters with desired frequency responses.

CO3: Analyze the effect of finite word length in the DSP systems.

CO4: To apply sampling rat of finite word length in the DSP system.

CO5: Apply digital signal processing concepts in audio, video signals.

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	M	L									L	H	L
CO2	M	H	H	M	L									H	
CO3	M	H	H	M	L								L	H	
CO4		M	H	H	M									H	
CO5				M	H								L	H	

Note: L- Low Correlation M - Medium Correlation H -High Correlation

SDG 3 : Good Health and Well-Being

Statement : Digital signal processing plays a major role in medical instrumentation. A sound knowledge in these could lead to a substantial research and development in health and well-being.

SDG 9 : Industry, Innovation & Infrastructure

Statement : Signals and its processing forms the basis of control systems and automation.

ECD 2205	**MICROCONTROLLER**	**L**	**T**	**P**	**C**
SDG: 4, 9	**ARCHITECTURE AND PROGRAMMING**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To analyze the internal organization, addressing modes and instruction sets of 8086 processor

COB2:To describe the programming concepts and interfacing techniques of 8086 microprocessor

COB3: To explain the basic concepts and programming of 8051 microcontroller

COB4:To analyze peripheral devices and interfacing with 8051 microcontroller

COB5: To describe ARM processor architecture and its instructions sets

PREREQUISITES:

- Digital Electronics

MODULE I 8086 MICROPROCESSOR 9

8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Timing Diagram, interrupts of 8086.

MODULE II PROGRAMMING in 8086 9

Addressing modes - Instruction set – Data transfer instructions, Arithmetic Instructions, Logical instructions, String manipulation instructions and control

transfer instructions - Assembly language Programming- interfacing with 8255 PPI.

MODULE III 8051 MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers (SFRs) – I/O Ports and Memory organization – Instruction set – Addressing modes – Assembly language programming.

MODULE IV INTERFACING WITH 8051 MICROCONTROLLER 9

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD & Keyboard Interfacing – ADC, DAC & Sensor Interfacing-External Memory Interface- Stepper Motor interface.

MODULE V ARM PROCESSOR 9

ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, conditional execution, Introduction to Thumb instructions.

L – 45 ; Total Hours - 45

TEXT BOOKS:

1. Barry B.Brey, “The Intel Microprocessors: Architecture, Programming, and Interfacing”, Pearson Education India; 8th edition, 2008.
2. Kenneth. J. Ayala, “The 8051 Microcontroller Architecture Programming and Application”, Cengage Learning, 3rd Ed, 2004.
3. Steve Furber, “ARM System-on-Chip Architecture”, 2nd Edition, University of Manchester, Addison-Wesley Professional, 2001.

REFERENCES:

1. Doughlas V. Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012.
2. Mohammed Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education Asia, New Delhi, 2003.
3. Stephen Smith, “Programming with 64-Bit ARM Assembly Language: Single Board Computer Development for Raspberry Pi and Mobile Devices”, Apress; 1st ed. Edition 2020.

COURSE OUTCOMES:

On completion of the course, students will be able to

CO1: Analyze the organization of registers and memory in microprocessors and microcontroller

CO2: Prioritize interrupts for executing the respective ISR.

CO3: Identify the addressing mode and calculate the number of T- states required for the execution of an instruction

CO4: Develop assembly language programs suitable for real time applications using microprocessors / microcontroller.

CO5: Design and develop applications using Microcontroller boards

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	M	M	-	-	-	-	-	M	-	-	M	L	L	H
CO2	M	H	M	-	-	-	-	-	M	-	-	M	L	L	H
CO3	M	H	M	-	H	-	-	-	M	-	-	M	H	L	H
CO4	L	L	L	-	-	-	-	-	M	-	-	M	M	L	M
CO5	M	M	M	-	-	-	-	-	M	-	-	M	M	L	H

Note: L - Low Correlation M - Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
Statement: This course enables the student to understand the assembly language programming concepts of microprocessor and microcontrollers helps for lifelong learning of newer technologies and concepts related to the microcontroller based system.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation
Statement: Able to apply the programming concepts of microcontroller based system for the various real time applications.

ECD 2206	MICROCONTROLLER PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	1

SDG: 4, 9

COURSE OBJECTIVES:

COB1: To apply the concept of Assembly Language Programming (ALP)

COB2: To develop skills in assembly language programming to program using 8086 instruction sets.

COB3: To analyze the microcontroller programming and interfacing of 8051 Microcontroller.

COB4: To access and program on chip peripherals in 8051

COB5: To select and use the advanced microcontroller boards in appropriate electronic systems.

PREREQUISITES:

- Knowledge on Digital Electronics
- Instruction sets of 8086 Microprocessor & 8051 Microcontroller

PRACTICALS:

List of Experiments:

1. Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations using 8086
2. Interfacing 8255 PPI with 8086
3. Arithmetic, Logical and bitwise operation using 8051
4. I/O Port programming in 8051
5. Programming 8051 Timers and Counters
6. Programming onchip UART
7. Sensor Interfacing with 8051
8. Interface 8279 with 8051
9. Stepper motor interfacing with 8051
10. Interfacing Traffic Light Control System with 8051
11. Study on Atmel AVR, PIC and ARM Processor boards.

P – 30; Total Hours – 30

REFERENCES:

1. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware”, TMH, 2012.
2. Mohammed Ali Mazidi and Janice Gillispie Mazidi, "The 8051 Microcontroller and Embedded Systems", 2nd Edition, Pearson Education Asia, New Delhi, 2003.
3. Subrata Ghoshal, “8051 Microcontroller: Internals, Instructions, Programming & Interfacing”, Pearson Education,2010.

COURSE OUTCOMES:

CO1: Develop the assembly language program for the basic arithmetic and logical operations of 8086 Microprocessor and 8051 Microcontroller.

CO2: Interface different peripheral devices with Microprocessor / Microcontroller

CO3: Interface Microcontroller and PC.

CO4: Analyze the 16 bit and 32bit microcontroller boards

CO5: Develop applications using Microprocessor/Microcontroller based systems.

Board of Studies (BoS):
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	M	M	-	-	-	-	-	M	-	-	M	L	L	H
CO2	M	H	M	-	-	-	-	-	M	-	-	M	L	L	H
CO3	M	H	M	-	H	-	-	-	M	-	-	M	H	L	H
CO4	L	L	L	-	-	-	-	-	M	-	-	M	M	L	M
CO5	M	M	M	-	-	-	-	-	M	-	-	M	M	L	M

Note: L - Low Correlation M - Medium Correlation H -High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: This course enables the student to understand the architecture of microprocessor and microcontrollers, Instructions sets, Memory mapping, addressing modes, applications helps for lifelong learning of newer technologies and concepts related to the design of electronic products.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the theoretical and programming concepts of different microcontrollers for the various real time application.

ECD 2207	VLSI DESIGN LABORATORY	L	T	P	C
SDG: 4,9,12		0	0	2	1

COURSE OBJECTIVES:

COB1: To test the function of combinational and sequential circuits using Verilog HDL

COB2: To simulate and synthesis on FPGAs.

COB3: To estimate power and delay of logic circuits in FPGAs

COB4: To design CMOS circuits for functional verification

COB5: To estimate power and delay of logic circuits in full custom design

PREREQUISITES:

- Principles of Digital Electronics and its systems
- VLSI Design

PRACTICALS

List of Experiments:

1. Design, simulate and synthesis of adders and subtractors using HDL.
2. Design, simulate and synthesis of Multiplexers & demultiplexers using HDL.
3. Design, simulation and synthesis of multipliers using HDL.
4. Design, simulation and synthesis of flip flops using HDL.
5. Design, simulation and synthesis of shift registers and counters using HDL.
6. Design, simulation and synthesis of Simple Processor Design using HDL.
7. EDA Tool Demonstration for front end design
8. Design of Basic Cell structure (NMOS & PMOS) using conventional MOS using EDA tool
9. Design of CMOS inverter using EDA tool.
10. Adder Design using conventional CMOS using EDA tool.
11. Multiplier using conventional CMOS using EDA tool.
12. Design and Analysis of CMOS circuits (Analysis: Power, Delay, NM, PDP)

P – 30 ; Total Hours – 30

TEXT BOOKS:

1. Samir Palnitkar, Verilog HDL, A guide to digital design and synthesis, PHI, 2010.
2. John P. Uyemura: Introduction to VLSI Circuits and Systems, J.Wiley, 2nd Edition, New York, 2009

REFERENCES:

1. Rabaey, Jan M., Anantha P. Chandrakasan, and Borivoje Nikolić. Digital integrated circuits: a design perspective. Prentice Hall of India, 3rd edition, New Jersey, 2014.
2. Digital Design: With an Introduction to the Verilog HDL, 5th Edition by M Morris Mano and Michael Ciletti, Pearson publications, 2013.
3. Fundamentals of Digital Logic with Verilog Design, Third Edition, Stephen Brown, Mc, Graw Hill, 2014

COURSE OUTCOMES:

CO1: Write Verilog code for combinational circuits and sequential circuits

CO2: Simulate the combinational circuits and sequential circuits using Xilinx ISE

CO3: Synthesize the designed digital circuits using Spartan FPGA kits.

CO4: Implement the full custom design of VLSI circuits in EDA tools.

CO5: Estimate the power and delay of the digital circuit

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	M	H	H	L	M	M	H	L	H	M			H
CO2	H	L	M	M	L	L	M	M	H	L	H	M			H
CO3	H	L	M	M	L	L	M	M	H	L	H	M			H
CO4	H	L	H	M	L	L	M	M	H	L	H	M			H
CO5	H	H	H	M	H	L	M	M	H	L	H	M			H

Note: L - Low Correlation M -Medium Correlation H - High Correlation

SDG 4 : Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Statement: This course enables the student to understand the basic characteristics of MOS devices, design of combinational and sequential circuits.

SDG 9 : Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation

Statement: Able to apply the design concepts of VLSI system design in designing processor based design.

SDG 12 : Responsible Consumption and Production

Statement: Understand the market needs based on current technology trends in Integrated circuits market

.

ECD 2208	**DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
SDG: 3, 9	**LABORATORY**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

COB1: To implement digital signal processing systems in the time domain.

COB2: To Compute convolution and the discrete Fourier transform (DFT) of discrete-time signals.

COB3: To design digital filters

COB4: To evaluate the multi rate signal processing

COB5: To analyse the architecture of DSP processor and implement digital systems using the DFT

PREREQUISITES:

- Basic concepts of Signals and systems
- Fundamentals of various transforms

PRACTICALS

LIST OF EXPERIMENTS USING SIMULATION TOOL

1. Frequency response of LTI system.
2. Linear convolution/Circular convolution
3. Discrete Fourier Transform & Fast Fourier Transform
4. Design of IIR filter using Impulse invariant and Bilinear transformation
5. Design of FIR filter using windows
6. Sampling and reconstruction of a signal
7. Sampling rate conversion-interpolation & decimation.

LIST OF EXPERIMENTS USING DSP PROCESSOR

8.Linear convolution using TMS320C54X

9.Circular convolution using TMS320C54X

10. Discrete Fourier Transform using TMS320C54X
11. Inverse Discrete Fourier Transform using TMS320C54X
12. Mini project

P – 30 ; Total Hours – 30

TEXT BOOKS:

1. S.K.Mitra, "Digital Signal Processing- A Computer based approach", 4th Edition Tata McGraw-Hill, New Delhi, 2013.

REFERENCES:

1. Nasser kehtarnavaz and Namjin Kim, “Digital Signal processing system-level design using LabVIEW”, Newnes- Elsevier,2005.
2. B.Venkataramani, M. Bhaskar, "Digital Signal Processor Architecture, Programming and Application", 2nd Edition, TMH 2002.

COURSE OUTCOMES:

CO1: Use DSP tools to analyze discrete time signals and systems

CO2: Analyze the properties of discrete time signals and systems and identify its implication for practical systems.

CO3: Evaluate the discrete Fourier transform (DFT) & FFT of a sequence

CO4: Design digital IIR and FIR filter.

CO5: Implement convolution using DSP processor.

Board of Studies (BoS) : 22nd BOS of ECE held on 14.12.2021

Academic Council: 18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	H	M	L									L	H	L
CO2	M	H	H	M	L									H	
CO3	M	H	H	M	L								L	H	
CO4		M	H	H	M									H	
CO5				M	H								L	H	

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 3 : Good Health and Well-Being

Statement: Signal processing plays a major role in medical instrumentation. Sound knowledge in these could lead to substantial research and development in health and well-being.

SDG 9 : Industry, Innovation & Infrastructure

Statement : Signals and its processing forms the basis of control systems and automation.

GED 2201	**WORKPLACE SKILLS AND APTITUDE**	**L**	**T**	**P**	**C**
SDG: 8	**FOR ENGINEERS**	**0**	**0**	**2**	**1**

COURSE OBJECTIVES:

COB1: To expose them to reading for specific purposes, especially in professional contexts

COB2: To expose them to the process of different kinds of formal writing

COB3: To prepare the students to be successful in their career

COB4: To familiarize various problem-solving techniques in aptitude and puzzles.

MODULE I EXTENSIVE READING & WRITING 07

Reading for comprehension - inferring and note-making – Process of writing-paragraph development - elements of business writing: Email, memos.

MODULE II INTENSIVE READING & WRITING 08

Intensive reading and reviewing - Interpretation of charts, graphs - Résumé - Letter of enquiry, thanksgiving letters.

MODULE III QUANTITATIVE APTITUDE 08

Percentage - Ratio and Proportion - Profit and Loss – Averages, Allegations and Mixtures.

MODULE IV LOGICAL COMPETENCY 07

Syllogism – Blood Relations- Number, Alpha and Alpha numeric series - Puzzles – Cubes and Dice - Odd One Out-Coding and Decoding

L – 30; TOTAL HOURS - 30

REFERENCES:

1. Sharma, R.C. and Mohan, Krishna (2010). Business Correspondence and Report Writing. 4th edition. Tata McGraw Hill Education Private Limited, New Delhi
2. Whitby, Norman (2014). Business Benchmark: Pre-Intermediate to Intermediate. Cambridge University Press, UK
3. Tyra .M, Magical Book On Quicker Maths, BSC Publishing Company Pvt. Limited, 2009
4. R. S. Aggarwal , Quantitative Aptitude for Competitive Examinations, S. Chand Limited, 2017
5. R. S. Aggarwal , A Modern Approach to Verbal & Non-Verbal

Reasoning , S. Chand Limited, 2010
6. Khattar Dinesh , The Pearson Guide to Quantitative Aptitude for Competitive Examinations, 3e, Pearson India , 2016
7. Rajesh Verma , Fast Track Objective Arithmetic Paperback , Arihant Publications (India) Limited , 2018
8. Arun Sharma Teach Yourself Quantitative Aptitude Useful for All Competitive Examinations, McGraw Hill Education (India) Pvt. Limited, 2019.

COURSE OUTCOMES:

CO1: Demonstrate reading skills with reference to business related texts

CO2: Draft professional documents by using the three stages of writing

CO3: Apply various short cut techniques for solving complicated aptitude problems

CO4: To understand various problems and patterns of different ways to solve it

Board of Studies (BoS) :
13thBoS of the Department of English held on 17.6.2021

Academic Council:
17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		L		H						H					
CO2			L							H					
CO3			L				M								
CO4		H		M											
CO5															

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Statement: Demonstrating, Drafting and applying various techniques for sustainable growth to employment.

GED 2202	**INDIAN CONSTITUTION AND**	**L**	**T**	**P**	**C**
SDG: 16	**HUMAN RIGHTS**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

COB1: To explicate the emergence and evolution of Indian Constitution.

COB2: To have an insight into the philosophy of fundamental rights and duties, and Directive Principles.

COB3: To differentiate the structure of executive, legislature and judiciary.

COB4: To understand human rights and its implication - local and international and redressal mechanism.

MODULE I INTRODUCTION AND BASIC INFORMATION ABOUT INDIAN CONSTITUTION **8**

Meaning of the constitution law and constitutionalism - Historical Background of the Constituent Assembly - Government of India Act of 1935 and Indian Independence Act of 1947 - The Constituent Assembly of India - Enforcement of the Constitution - Indian Constitution and its Salient Features - The Preamble of the Constitution. Citizenship.

MODULE II FUNDAMENTAL RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES **7**

Fundamental Rights and its Restriction and limitations in different complex situations - Directive Principles of State Policy (DPSP) & its present relevance in our society with examples- Fundamental Duties and its Scope and significance in nation building - Right to Information Act 2005.

MODULE III GOVERNANCE IN INDIA **8**

The Union Executive – the President and the Vice-President – The Council of Ministers and the Prime Minister – Powers and functions. The Union legislature – The Parliament – The Lok Sabha and the Rajya Sabha, Composition, powers and functions – Government of the State - The Governor – the Council of Ministers and the Chief Minister – Powers and Functions-Elections-Electoral Process and Election Commission of India - Indian judicial system.

MODULE IV HUMAN RIGHTS AND INDIAN CONSTITUTION **7**

Human rights – meaning and significance - Covenant on civil and political rights - Covenant on Economic, Social and Cultural rights - UN mechanism

and agencies - The Protection of Human Rights Act, 1993 – watch on human rights and enforcement - Roles of National Human Rights Commission of India - Special Constitutional Provisions for SC & ST, OBC - Special Provision for Women, Children & Backward Classes.

L – 30; TOTAL HOURS – 30

TEXT BOOKS:

1. B.K. Sharma, Introduction to the Constitution of India, 6th ed., PHI Learning Private Limited, New Delhi 2011
2. Durga Das Basu “Introduction to the Constitution on India”, (Students Edition.) Prentice –Hall EEE, 19th / 20th Edn. 2008
3. M.P. Jain, Indian Constitutional Law, 7th ed., LexisNexis, Gurgaon. 2014.

REFERENCES:

1. Fadia B.L “Indian Government and Politics”, Sahitya Bhavan Publications. 2010
2. Kashyap Subhash C “Our Constitution: An Introduction to India’s Constitution and constitutional Law, NBT. 2017
3. M.V.Pylee “An Introduction to Constitution of India”, Vikas Publishing. 2002
4. Sharma Brij Kishore “Introduction to the Indian Constitution”, 8th Edition, PHI Learning Pvt. Ltd. 2015
5. Latest Publications of NHRC - Indian Institute of Human Rights, New Delhi.

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

CO1: describe the emergence and evolution of Indian Constitution.

CO2: realize the status and importance of fundamental rights, fundamental duties and directive principles of state policy and relation among them by understanding the articulation of its basic values under the Constitution of India.

CO3: compare the various structure of Indian government.

CO4: recognize the human rights, cultural, social and political rights and its relationship with Indian constitution. .

Board of Studies (BoS) : 4th BoS of SSSH held on 28.06.2021

Academic Council: 17th AC held on 15.07.2021

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1			M			H	M	L	M		M	
CO2			H			M	H	M			H	
CO3			M			H	M	L			L	
CO4			H			H	H	M	M			H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

Application of human, legal and political rights leading to empowerment in real-life situations for protection of fundamental freedoms and freedom from violence, abuse, trafficking and exploitation are at the core of human rights.

PROFESSIONAL ELECTIVES

IV SEMESTER

ECDX 001	COMPUTER ARCHITECTURE	L	T	P	C
SDG: 4,9		3	0	0	3

COURSE OBJECTIVES:

COB1: To discuss the characteristics of functional units of computer system and its operations

COB2: To apply the concept of memory interfacing and various I/O devices

COB3: To select the specific hardware components and analyze its performance

COB4: Apply the algorithms to implement arithmetic and logic operations

COB5: To analyze the concepts of pipelining and the hierarchy of memory system

MODULE I INTRODUCTION **9**

Classes of Computing Applications and Their Characteristics, Eight Great Ideas in Computer Architecture, High-level language to the language of hardware, Under the covers, Function and structure of a computer, Functionality of computer hardwares, Communicating with other computers, Technologies for building Processors and memory, Performance, the power wall, the switch from uniprocessors to multicore processors.

MODULE II ARITHMETIC OPERATIONS **9**

Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword parallelism, streaming SIMD Extensions and Advanced Vector Extensions in x86.

MODULE III PROCESSOR SUBSYSTEMS **9**

Logic Design Conventions, Building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, ARM Cortex-A8 and Intel Core i7 Pipelines

MODULE IV MEMORY ORGANIZATION **9**

Memory Technologies, Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, Parallelism and Memory Hierarchies: Cache Coherence

MODULE V OVERVIEW OF OPERATING SYSTEM 9

Computer-System Organization-Operating-System Structure -Operating-System Operations - Process Management - Memory Management -Storage Management - Protection and Security - Kernel Data Structures - Computing Environments - Operating system structures - System Calls – OperatingSystem Design and Implementation - Operating-System Debugging - Operating-System Generation .

L – 45 ; Total Hours – 45

TEXT BOOKS:

1. C.Hamacher Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill, 2002.
2. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002.

REFERENCES:

1. William Stallings, "Computer Organization & Architecture - Designing for Performance", 6th Edition, Pearson Education, 2003 reprint.
2. David A. Patterson and John L.Hennessy, "Computer Organization & Design, the hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002
3. John P.Hayes, "Computer Architecture & Organization", 3rd Edition, McGrawHill, 1998.

COURSE OUTCOMES:

CO1: Apply the basic knowledge of digital concept to the functional components of a Computer System.

CO2: Analyze the addressing mode concepts and design the instruction set Architecture

CO3: Identify the functions of various processing units within the CPU of a Computer System

CO4: Analyze the function of the memory management unit and create suitable memory interface to the CPU.

CO5: Recognize the need for recent Bus standards and I/O devices.

Board of Studies (BoS) :	**Academic Council:**
22nd BOS of ECE held on 14.12.2021	18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	M	M				M		L	L		M	H			H
CO2	M	M				M		L	L		M	H			H
CO3	M	M				M		L	L		M	H			H
CO4	M	M				M		L	L		M	H			H
CO5	M	M				M		L	L		M	H			H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote Lifelong learning opportunities for all.

Statement: This course discusses about the basic electronics of computer system and its structure. This knowledge provides quality education and promotes lifelong learning opportunities for all.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable industrialization and foster innovation.

Statement: It proves the performance improvement in hardware and software of computer architecture.

ECDX 002	CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

SDG: 4,7,9

COURSE OBJECTIVES:

COB1 : To describe the modeling of control systems.

COB2 : To analyze the properties of control system in time domain & frequency domain.

COB3 : To design feedback controllers and compensators

COB4 : To analyze the stability of the control system.

COB5 : To discuss about the state variable representation of physical systems and define the effect of state feedback

MODULE I CONTROL SYSTEM MODELING 8

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph.

MODULE II TIME RESPONSE ANALYSIS 10

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB.

MODULE III FREQUENCY RESPONSE ANALYSIS 10

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol"s Chart - Use of Nichol"s Chart in Control System Analysis.

MODULE IV STABILITY ANALYSIS & DESIGN OF COMPENSATORS 10

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators.

MODULE V STATE VARIABLE ANALYSIS 7

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state

equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems – Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems.

L – 45 ; Total Hours – 45

TEXT BOOKS:

1. FaridGolnaraghi, Benjamin C. Kuo," Automatic Control Systems", McGraw Hill Professional, Tenth Edition, 2017.
2. Katsuhiko Ogata," Modern Control Engineering" Prentice Hall, 5e, 2010.
3. J. Nagrath, M. Gopal Control Systems Engineering, Anshan, 5e, 2008
.

REFERENCES:

1. William S. Levine, "The Control Handbook, Second Edition: Control System Fundamentals" CRC Press, 2010.
2. Jesus C. De Sosa, "Control Systems: Analysis and Realization ", iUniverse, 2010

COURSE OUTCOMES:

At the end of the courses, the students will be able to

CO1 : develop mathematical models of control components and systems

CO2 : design controllers for systems

CO3 : analyze the system in time and frequency domain

CO4 : use the Root Locus method, Routh Hurwitz array and Nyquist stability criterion to find stability of a system

CO5 : obtain and manipulate state space representation of systems

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	M	L	L	L	L	L	L	L	L	L	H	L	M
CO2	H	H	H	L	L	L	M	L	L	L	M	M	H	L	M
CO3	H	H	H	H	L	L	L	M	L	L	L	L	H	H	H
CO4	H	H	H	H	H	L	L	L	L	L	L	L	H	M	H
CO5	H	H	H	H	H	L	L	L	L	H	M	M	M	L	M1

Note: L- Low Correlation M -Medium Correlation H - High Correlation

SDG 4: Quality Education

Statement: A fundamental concept of control system and its characteristic analysis provides a global impact on quality education in the industries.

SDG 7: Affordable and Clean Energy

Statement: Practical applications of control system model offer an impact on affordable and clean energy in overall machine operations.

SDG 9: **Industry, Innovation and Infrastructure**

Statement: Build resilient Infrastructure; promote inclusive and sustainable industrialization through EM wave propagation within the industry.

ECDX 003	DATA STRUCTURE AND ITS	L	T	P	C
SDG: 4,9	ALGORITHMS	2	0	2	3

COURSE OBJECTIVES:

COB1: To describe the fundamental concepts of data structure.
COB2: To analyze the basic operations of stacks and queues for real time scenario.
COB3: To comprehend the significance of sorting algorithms.
COB4: To demonstrate the understanding of various searching algorithms.

MODULE I INTRODUCTION 6

Basic Terminology, Classification, Operations, Abstract Data Type, Algorithms- characteristics and Building blocks of algorithm, Time and Space Complexity, Big O Notation, Omega Notation (Ω), Theta Notation (Q), Array- Declaration of Arrays- Operations on Arrays- Multi-dimensional Arrays

MODULE II LINEAR DATA STRUCTURES 8

Linked Lists- Basic Terminologies- operations- types-Applications of Linked Lists, Introduction to Stacks- Array and Linked List Representation of Stacks- Operations on a Stack- Applications of Stacks- Introduction to Queues- Array and Linked List Representation of Queues - Operations on a Queues -Types- Applications of Queues

MODULE III NON LINEAR DATA STRUCTURES 8

Basic Terminology of trees-Types- Binary Tree, Threaded Binary Trees, AVL Trees- Traversing a Tree-operation-Heap - Graph Terminology-types-Matrix and List representation of Graph- Graph Traversal Algorithms- Shortest Path Algorithms- Hash and Collision

MODULE IV SEARCHING AND SORTING 8

Introduction to Searching- Linear Search, Binary Search- Introduction to Sorting- Bubble Sort- Selection Sort-Insertion Sort- Merge Sort- Quick Sort- Heap Sort.

PRACTICALS

List of Experiments

1. Basics of C Programming language

2.Implementation of Linear Data Structures
3.Implementation of Non Linear Data Structures
4.Implementation of Searching algorithm
5.Implementation of Sorting algorithm
6.Problem solving Application using Data structure algorithms

L –30 ; P – 30 ; Total Hours – 60

TEXT BOOKS:

1. Mark A.Weiss, “Data Structures and Algorithm Analysis in C”, Second Edition, Pearson Education, 2010.
2. Reema Thareja, “Data Structures Using C”, Second Edition , Oxford University Press, 2019

REFERENCES:

1. Salaria R S, “Data Structues and Algorithms using C”, Fifth Edition, Khanna Book Publishing, New Delhi, 2012
2. Venkatesan R and Lovelyn Rose S, “Data Structures”, Wiley India Pvt.Ltd., New Delhi, 2015.
3. Karumanchi Narasimha, ”Data Structures and Algorithms Made Easy”, Fifth Edition, CareerMonk Publication, 2016
4. Seymour Lipschutz,”Data Structures using C”, First Edition, McGraw Hill Education, 2017.

COURSE OUTCOMES:

CO1: Apply linear and non-linear data structures like stacks, queues, linked list etc.
CO2: Compare between different data structures. Pick an appropriate data structure for a design situation.
CO3: Analyze, evaluate and choose appropriate abstract data types and algorithms to solve particular problems.
CO4: Analyze and evaluate the efficiency of searching and sorting algorithms.
CO5: Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures.

Board of Studies (BoS) :
22nd BOS of ECE held on 14.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	M	M				M		L	L		M	H			H
CO2	M	M				M		L	L		M	H			H
CO3	M	M				M		L	L		M	H			H
CO4	M	M				M		L	L		M	H			H
CO5	M	M				M		L	L		M	H			H

Note: L - Low Correlation M -Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote Lifelong learning opportunities for all.

Statement: Data structures is a basic building block for real time Problem solving and Artificial intelligence

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable Industrialization and foster innovation.

Statement : Able to apply the data structure concepts and algorithms for the various applications.

ECDX 004	SENSOR AND ACTUATOR	L	T	P	C
SDG: 4, 9		3	0	0	3

COURSE OBJECTIVES:

COB1: Acquire knowledge on Data Acquisition Systems

COB2: To gain knowledge on characteristics of sensors and measurement errors.

COB3: Get exposed to different types of resistive, inductive and capacitive sensors

COB4: Analyze the static and dynamic characteristics of sensors

COB5: To impart knowledge on programming and interfacing of sensors with microcontroller

MODULE I DATA ACQUISITION AND CHARACTERISTICS OF SENSORS 8

Data Acquisition, Transfer Functions-Mathematical Models, Calibration, Computation of Parameters and Stimulus, Sensor Characteristics-Sensors for Mobile Communication Devices, Full-Scale I/O, Accuracy, Calibration Error, Dynamic Models of Sensor Elements-Reliability.

MODULE II PHYSICAL PRINCIPLES OF SENSING 8

Electric Charges, Fields, and Potentials-Capacitance-Magnetism-Induction-Resistance-Piezoelectric Effect-Pyroelectric Effect-Hall Effect-Thermoelectric Effects-Sound Waves-Temperature and Thermal Properties of Materials-Heat Transfer.

MODULE III OPTICAL AND ELECTRONIC CIRCUITS FOR SENSOR 8

Light-Energy of Light Quanta, Light Polarization and Scattering-Radiometry-Photometry-Mirrors-Lenses-Optical Efficiency-Signal Conditioners-Sensor Connections and excitation circuits -Integrated Interfaces-Data Transmission-Noise in Sensors and Circuits-Batteries for Low-Power Sensors.

MODULE IV TYPES OF SENSORS 8

IR sensor, Proximity sensor, Accelerometer, Temperature sensor, Flow sensor, Ultrasonic sensor, LDR, Gas sensor, piezoelectric sensor, Bio sensors-Pressure sensor.

MODULE V APPLICATION DESIGN USING SENSORS 8

Introduction to Atmega328 microcontroller and on-chip peripherals - Arduino IDE -API programming –Interfacing and calibrating–Digital & Analog sensor – Case Study.

L – 45 ; Total Hours – 45

TEXT BOOKS:

1. Jacob Fraden, “Handbook of Modern Sensors: Physics, Design and Applications”, 5th Edition, Springer, USA,2016,
2. Margolis, Michael, Brian Jepson, and Nicholas Robert Weldin, “Arduino cookbook: recipes to begin, expand, and enhance your projects”, O'Reilly Media, 2020.

REFERENCES:

1. Kevin James, “PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control”, Newnes, 2000
2. Doebelin E.O. and Manik D.N., “Measurement Systems”, 6th Edition, Tata McGraw-Hill Education Pvt. Ltd., 2011
3. John P. Bentley, “Principles of Measurement Systems”, 4th Edition, Pearson Education, 2004.
4. McRoberts, Michael. “Beginning Arduino”, A press, 2011.

COURSE OUTCOMES:

CO1: Describe the mathematical fundamentals of sensors

CO2: Design data acquisition systems for practical applications.

CO3: Examine the measurement metrics of sensors

CO4: Select the suitable sensor for a real time application

CO5: Develop the application using sensors and microcontrollers

Board of Studies (BoS) : 22nd BOS of ECE held on 14.12.2021

Academic Council: 18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
CO1	H	H	M	L	L	-	-	-	-	-	-	-	L	-	-
CO2	H	M	M	L	L	-	-	-	-	-	-	-	L	-	-
CO3	H	M	L	L	L	-	-	-	-	-	-	L	L	-	-
CO4	H	H	M	L	L	L	L	-	-	-	-	L	L	-	-
CO5	H	M	H	L	L	L	L	-	-	-	-	L	L	-	-

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote Life long learning opportunities for all.

Statement: This course enables the student to understand the basic concepts of Data Acquisition, Characteristics of sensors, physical principles of sensing and applications helps for lifelong learning of newer technologies and concepts related to the sensors.

SDG 9: Build resilient Infrastructure, promote inclusive and sustainable Industrialization and foster innovation. .

Statement : Able to apply the theoretical concepts of sensors and designing concepts for the various applications using sensors.

MATHEMATICS ELECTIVE
(SEMESTER III)

		L	T	P	C
MADX 01	**TRANSFORMS AND PARTIAL**				
SDG: 4	**DIFFERENTIAL EQUATIONS**	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

COB1: To formulate and solve partial differential equations of first, second and higher orders

COB2: To introduce basics and engineering applications of Fourier series

COB3: To develop Fourier transform techniques

COB4: To introduce analytic solutions of PDEs by using Fourier series

COB5: To acquaint with Z -Transform techniques for discrete time systems.

MODULE I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

MODULE II FOURIER SERIES 9+3

Fourier Series and Dirichlet's conditions - General Fourier series – Even and Odd functions - Half range Fourier series - Parseval's identity - Harmonic Analysis.

MODULE III FOURIER TRANSFORMS 9+3

Fourier integral theorem (without proof) - Fourier transform pair - Fourier Inverse Transform – Properties - Convolution theorem - Parseval's identity.

MODULE IV APPLICATIONS OF FOURIER SERIES 9+3

Applications of Fourier series to solution of PDEs having constant coefficients with special reference to Heat & Wave equations, Discrete and point Spectrum and Single pulse.

MODULE V Z – TRANSFORM 9+3

Introduction and Definition of Z-transform - Properties of Z- Transform - Convolution Theorem of Z-Transform - Inverse Z–transform - Convolution Theorem of Inverse Z-Transform - Formation of difference equations - Solving Difference Equations using Z-Transform

L –45 ; T-15; TOTAL HOURS – 60

TEXT BOOKS:

1 Kreyszig .E., "Advanced Engineering Mathematics", 10th edition, John Wiley and Sons (Asia) Pvt Ltd., Singapore, 2011.
2. Grewal B.S., "Higher Engineering Mathematics", 44th edition, Khanna Publishers, New Delhi, 2017.
3. Ramana, B.V, "Higher Engineering Mathematics" Tata Mc Graw Hill Publishing Co. New Delhi, 2010.

REFERENCES:

1 Veerarajan.T., "Engineering Mathematics", 5th edition, Tata Mc Graw Hill Publishing Co. New Delhi, 2012.
2 Peter V. O'Neil, "Advanced Engineering Mathematics", 7th edition, Cengage Learning, 2011.
3 Dennis G. Zill, Warren S. Wright, "Advanced Engineering Mathematics", 4th edition, Jones and Bartlett publishers, Sudbury, 2011.
4 Alan Jeffrey, "Advanced Engineering Mathematics", Academic Press, USA, 2002.

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

CO1: form and solve the partial differential equations using different methods

CO2: derive a Fourier series of a given periodic function by evaluating Fourier coefficients

CO3: apply integral expressions for the forward and inverse Fourier transform to a range of non-periodic waveforms

CO4: solve partial differential equations by using Fourier series

CO5: solve difference equations using Z-transform

Board of Studies (BoS) :	**Academic Council:**
12th BOS of Mathematics & AS held on 23.06.2021	17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M														
CO2	M														
CO3	H														
CO4	M														
CO5	M														

SDG 4: Ensure inclusive and equitable quality education and promote lifelong opportunities for all.

Learning of various mathematical techniques like matrices and calculus will lead to knowledge of applications in Computer Science

MADX 02	DISCRETE MATHEMATICS	L	T	P	C
SDG: 4		3	1	0	4

COURSE OBJECTIVES:

COB1: To introduce logical and mathematical ability to deal with abstraction

COB2: To acquaint with the concepts of predicate calculus. **COB3:**To introduce the notations and concepts used in set theory **COB4:** To apply and use the terms function, domain, codomain, range, image, inverse image and composition

COB5: To introduce basic concepts from abstract algebra, especially the essential concepts in group theory.

MODULE I PROPOSITIONAL CALCULUS 9+3

Propositions – Logical connectives – Compound propositions – Conditional and biconditional propositions – Truth tables – Tautologies and contradictions – Contrapositive – Logical equivalences and implications – DeMorgan's Laws – Normal forms – Principal conjunctive and disjunctive normal forms – Rules of inference – Arguments – Validity of arguments.

MODULE II PREDICATE CALCULUS 9+3

Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – The rules of universal specification and generalization – Validity of arguments.

MODULE III SET THEORY 9+3

Basic concepts –Notations-Subset –Algebra of sets –The power set – Ordered pairs and Cartesian product- Relations on sets – Types of relations and their properties – Relational matrix and the graph of a relation – Partitions –Equivalence relations –Partial ordering –Poset – Hasse diagram – Lattices and their properties– Boolean algebra – Homomorphism.

MODULE IV FUNCTIONS 9+3

Functions – Classification of functions –– Composition of functions – Inverse functions – Binary and n–ary operations – Characteristic function of a set – Hashing functions – Recursive functions – Permutation functions.

MODULE V ALGEBRAIC SYSTEMS 9+3

Groups, Cyclic Groups, Subgroups, Cosets, Lagrange's theorem, Normal subgroups – Codes and group codes – Basic notions of error correlation – Error recovery in group codes.

L –45 ; T-15; Total Hours – 60

TEXT BOOKS:

1. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 30th Reprint 2011.
2. Kenneth H.Rosen, "Discrete Mathematics and its Applications:, 7th Edition, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, Special Indian Edition, 2011.

REFERENCES:

1. Ralph.P.Grimaldi, "Discrete and Combinatorial Mathematics: An Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Thomas Koshy, "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. C.L.Liu, D.P.Mohapatra, "Elements of Discrete Mathematics", 4th Edition, Tata McGraw-Hill Pub. Co. Ltd, New Delhi, 2012

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

CO1: form truth tables and write principal normal forms

CO2: write the negation of a quantified statement involving either one or two quantifiers.

CO3: prove that a proposed statement involving sets is true, or give a counterexample to show that it is false.

CO4: compute the connection between bijective functions and inverses. Be able to find the inverse of an invertible function.

CO5: give intrinsic structure of groups both abstract and specific examples illustrating the mathematical concepts involved.

Board of Studies (BoS) :
12th BOS of Mathematics & AS held on 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M														
CO2	M														
CO3	H														
CO4	M														
CO5	M														

SDG 4: Ensure inclusive and equitable quality education and promote lifelong opportunities for all

Learning of various mathematical techniques will lead to knowledge of applications in Communication Engineering

MADX 03	PROBABLITY AND STATISTICS	L	T	P	C
SDG:4		3	1	0	4

COURSE OBJECTIVES:

COB1: To impart knowledge on the basic concepts of probability

COB2: To understand random variables and distribution functions

COB3: To acquaint with joint density function and generating functions

COB4: To introduce sampling techniques and estimation

COB5: To perform hypothesis testing and draw inference

MODULE I PROBABILITY 9+3

Sample space, events- axioms of probability and interpretation – Addition, multiplication rules – conditional probability, Independent events - Total probability – Baye's theorem - Descriptive Statistics.

MODULE II RANDOM VARIABLE AND DISTRIBUTION FUNCTIONS 9+3

Discrete random variable –continuous random variable – Expectation - probability distribution - Moment generating function – Binomial, Poisson, Geometric, Uniform (continuous), Exponential and Normal distributions.

MODULE III TWO DIMENSIONAL RANDOM VARIABLES 9+3

Joint, marginal, conditional probability distributions –covariance, correlation - transformation of random variables- Generating functions.

MODULE IV SAMPLING AND ESTIMATION 9+3

Sampling distributions – basic knowledge on Random, simple random, stratified and cluster samplings – Test of Hypotheses - concepts- Point estimation and Interval estimation.

MODULE V THEORY OF INFERENCE 9+3

Large sample tests – test for single and difference on proportions, single mean, difference of means, difference of variances – confidence intervals. Small sample tests – Student's t test, F test and Chi square test on theory of goodness of fit and analyses of independence of attributes.

L – 45 ; T - 15; Total Hours – 60

TEXT BOOKS:

1. T.Veerarajan, “Probability and Statistics”, Tata McGraw-Hill New Delhi, 2008.
2. Miller, I., Miller, M.,Freund, J. E., “Mathematical statistics”, 7th Edition, Prentice Hall International, New Jersey 1999.
3. S.P.Gupta, “Applied Statistics”, Sultan Chand & Sons 2015

REFERENCES:

1. S.M.Ross, “Introduction to Probability and Statistics for Engineers and Scientists” Fifth Edition, Elesvier 2016
2. S.C.Gupta and V.K.Kapoor, “Fundamentals of Mathematical Statistics”, Sultan Chand and Sons New Delhi 2012
3. Arora and Arora, “Comphrensive Statistical Methods”, S. Chand, New Delhi 2007.

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

CO1: do problems on probability, Baye’s theorem and descriptive statistics.

CO2: evaluate moment generating functions and calculate probabilities using distributions.

CO3: calculate probabilities and derive the marginal and conditional distributions of bivariate random variables

CO4: classify random samplings and calculate point and interval estimates

CO5: : make an informed decision, based on the results of inferential procedures.

Board of Studies (BoS) :
12th BOS of Mathematics & AS held on 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	L													
CO2	M	L													
CO3	M	L													
CO4	M	L		M											
CO5	H	L		M											

SDG 4 : Ensure inclusive and equitable quality education and promote lifelong opportunities for all.

Learning of various statistical methods will lead to knowledge of applications in Electronics and communication Engineering

MADX 04	RANDOM PROCESSES	L	T	P	C
SDG: 9		3	1	0	4

COURSE OBJECTIVES:

COB1: To acquire knowledge of the theory of probability, Baye's theorem and Tchebechev inequality

COB2: To understand random variables and discrete and continuous probability distributions

COB3: To demonstrate the techniques of two dimensional random variables and its distributions

COB4: To introduce the random process, stationary, Markov process and the study of correlation functions

COB5: To study spectral analysis and Weiner-Khinchine theorem

MODULE I PROBABILITY 9+3

Sample space, events- axioms of probability and interpretation – Addition, multiplication rules – conditional probability, Independent events - Total probability – Baye's theorem - Tchebychev's inequality.

MODULE II RANDOM VARIABLES AND ROBABILITY DISTRIBUTIONS 9+3

Discrete random variable –continuous random variable – Expectation - probability distribution - Moment generating function – Binomial, Poisson, Geometric, Uniform (continuous), Exponential and Normal distributions.

MODULE III TWO DIMENSIONAL RANDOM VARIABLES 9+3

Joint, marginal, conditional probability distributions - covariance, correlation and regression lines - transformation of random variables.

MODULE IV RANDOM PROCESSES 9+3

Classification of Random process - Stationary process - WSS and SSS processes - Poisson process – Markov Chain and transition probabilities- Autocorrelation function and its properties - Cross Correlation function and its properties.

MODULE V SPECTRAL DENSITY 9+3

Linear system with random inputs – Ergodicity-Power spectral Density Function - Properties - System in the form of convolution - Unit Impulse

Response of the System – Weiner-Khinchine Theorem - Cross Power Density Spectrum.

L – 45 ; T-15; TOTAL HOURS – 60

TEXT BOOKS:

1. Veerarajan T., “Probability, Statistics and Random Processes”, Tata McGraw Hill,3rd edition, New Delhi, 2008.
2. Papoulis, “Probability, Random Variables and Stochastic Processes”, 4th Edition, Tata McGraw Hill Company, New Delhi,2002.
3. S.M.Ross, “Introduction to Probability and Statistics for Engineers and Scientists” Fifth Edition, John Wiley & Sons, New Jersey 2007.

REFERENCES:

1. Scott L. Miller, Donald G. Childers, Probability and Random Processes, Academic Press,London,2009.
2. Trivedi K S, “Probability and Statistics with reliability, Queueing and Computer Science Applications”, Prentice Hall of India, 2nd edition, New Delhi.

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

CO1: Evaluate probability, apply Baye’s theorem and calculate bounds using Tchebechev inequality

CO2: Calculate probabilities and expected values for distributions

CO3: Calculate probabilities and derive the marginal and conditional distributions of bivariate random variables

CO4: Evaluate stationary process, compute correlation functions and related identities

CO5: compute power spectral density functions and apply Weiner-Khinchine theorem

Board of Studies (BoS) :
12th BOS of Mathematics & AS held on 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	H	L													
CO2	M	L													
CO3	M	L													
CO4	H	M													
CO5	H	M													

SDG 9 : Sustainable Industry, innovation and Infrastructure

Learning of various techniques in Random Processes will lead to knowledge required for applying in many projects.

MADX 05	NUMERICAL METHODS	L	T	P	C
SDG: 4		3	1	0	4

COURSE OBJECTIVES:

COB1: To familiarize with the methods of solving equations numerically

COB2: To introduce interpolation techniques and finite difference concepts

COB3: To acquire knowledge on Numerical differentiation and integration

COB4: To solve ordinary differential equations numerically

COB5: To solve partial differential equations numerically

MODULE I NUMERICAL SOLUTIONS OF EQUATIONS 9+3

Bisection method - Regula Falsi method – Secant method - Fixed point iteration method - Newton's Raphson method –Gauss Elimination method - Gauss-Jordon method – Gauss Jacobi method - Gauss-Seidel method.

MODULE II INTERPOLATION 9+3

Finite difference operators – Gregory Newton's forward and backward interpolations – Cubic spline interpolation - Lagrange interpolation - Newton's divided difference formula.

MODULE III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

Numerical differentiation using Newton's forward and backward formulae – Numerical integration: Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Gaussian Two Point and Three Point Quadrature formulae – Double integrals using Trapezoidal and Simpson's 1/3 rule.

MODULE IV INITIAL VALUE PROBLEMS FOR FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS 9+3

Numerical solutions by Taylor's Series method, Euler's method, Modified Euler's Method - Runge – Kutta Method of fourth order – Milne's and Adam's Bashforth Predictor and Corrector methods.

MODULE V BOUNDARY VALUE PROBLEMS FOR PDE 9+3

Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional

Laplace equation.

L –45 ; T-15; TOTAL HOURS – 60

TEXT BOOKS:

1. Grewal, B.S., “Numerical methods in Engineering and Science”, 7th edition, Khanna Publishers,New Delhi, 2007.
2. Gerald C.F., P.O.Wheatley, “Applied Numerical Analysis” , Pearson Education, New Delhi, 2002

REFERENCES:

1. Chapra S.C, Canale R.P. “Numerical Methods for Engineers”, 5th Ed., McGraw Hill, New York, 2006.
2. Jain M.K., S.R.K.Iyengar, R.K.Jain, “Numerical methods for Scientific and Engineering Computation”, New Age International Publishers, New Delhi, 2003
3. Sastry.S.S,”Introductory Methods of Numerical Analysis”,Fifth Edition,PHI Learning Private Ltd., New Delhi, 2012

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

CO1: solve algebraic, transcendental and system of equations by numerical methods

CO2: apply various interpolation techniques and finite difference concepts

CO3: carry out numerical differentiation and integration using different methods whenever regular methods are not applicable

CO4: solve first order ODE using single and multi step methods

CO5: solve the boundary value problems in PDE by finite differences

Board of Studies (BoS) :
12th BOS of Mathematics and AS department held 23.06.2021

Academic Council:
17th AC held on 15.07.2021

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	M	L													
CO2	M														
CO3	M	L													
CO4	M	L													
CO5	M	L													

SDG 4 : Ensure inclusive and equitable quality education and promote lifelong opportunities for all.

Learning of various methods in numerical analysis will lead to use of applications in many projects in Engineering.

HUMANITIES ELECTIVE – III SEMESTER

SSDX 01	**ENGINEERING ECONOMICS AND MANAGEMENT**	**L**	**T**	**P**	**C**
SDG: 4, 8, 9,12		**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To present the major concepts and techniques of engineering economic analysis that is needed in the decision making process by providing insights to the basic microeconomic concepts of demand, supply and equilibrium.

COB2: To generate theoretical knowledge and understanding of macroeconomic aggregates such as national income and inflation and the major challenges associated with the measurement of these aggregates.

COB3: To develop analytical and critical thinking skills on money, banking and public finance and use them to judge the appropriateness of economic development and policy options.

COB 4: To introduce the basic concepts of management and planning and highlight the contribution of planning to the attainment of organization's objectives.

COB 5: To apprise the students about important management concepts and create awareness about the corporate social responsibilities and ethical aspects.

MODULE I DEMAND AND SUPPLY ANALYSIS 9

Introduction to Engineering Economics – Engineering efficiency – Economic efficiency - Scope of Engineering Economics, Engineers' contributions to economic growth- Problem solving and decision making - Laws of Demand and Supply - Difference between Microeconomics and Macroeconomics - Equilibrium between Demand and Supply, Elasticity of Demand - Pricing strategies.

MODULE II NATIONAL INCOME AND INFLATION 8

Concepts of National Income and measurement – GDP Growth Rate - Importance and difficulties of estimating National Income in India - Aggregate demand and aggregate supply, Macroeconomic equilibrium – Meaning of Inflation, its types causes and preventive measures.

MODULE III MONEY, BANKING AND PUBLIC FINANCE 10

Money – Meaning, types, functions, importance - Commercial Banks - Central Bank - Monetary Policy – meaning, objectives, Methods of Credit

Control By RBI, Government Budget – Government revenue and expenditures – Fiscal policy - Its objectives, instruments and limitations - Deficit Financing - The Fiscal Responsibility and Budget Management Act, 2003 (FRBMA) – Economic Reforms in India – LPG Policy.

MODULE IV PRINCIPLES OF MANAGEMENT AND PLANNING **8**

Nature of management and its process - Importance of Management- Functions and Principles of Management - Nature, Purpose and Kinds of Planning.

MODULE V ENGINEERING MANAGEMENT **10**

Strategic Management-Manager and Environment - Globalization and Technology Intermediation, Corporate Social Responsibility of business - meaning, importance, arguments for and against Corporate Social Responsibility - Business Ethics- Role of Ethics in Engineering Practice- meaning, importance - State intervention in business - Pros and Cons of intervention.

L – 45 ; Total Hours – 45

TEXT BOOKS:

1. Krugman, P, Wells, R, and Graddy, K., “Essentials of Economics”, Worth Publishers, 4th Edition, New York, 2016.
2. Hussain, Moon Moon, “Economics for Engineers”, Himalaya Publishing House, 1st Edition, New Delhi, India, 2015.

REFERENCES:

1. Andrew Gillespie, “Foundations of Economics”, OUP Oxford, England, 2007.
2. Acemoglu, D., Laibson, D., & List, J., “Microeconomics”, Pearson Education, 2nd Edition, Boston, 2017.
3. Brinkman John , “Unlocking the Business Environment”, Routledge, 1st Edition, London, United Kingdom, 2010.(ISBN 9780340942079)
4. Cleaver Tony, “Economics: The Basics”, Routledge, 3rd Edition, London, United Kingdom, 2014.
5. H. L. Ahuja, “Macroeconomics”, S Chand Publishing; Twenty Edition, New Delhi, India, 2019.
6. Koutsoyiannis A, “Modern Microeconomics”, Palgrave Macmillan, 2nd Edition, U.K, 2003.
7. R.A. Musgrave and P.B. Musgrave, “Public Finance in Theory and Practice”, McGraw Hill Education India, Fifth Edition, India, 2017.

8. Mell Andrew and Walker Oliver, “The Rough Guide to Economics”, Rough Guide Ltd, 1st Edition, London, 2014.
9. R. Paneerselvam, “Engineering Economics”, PHI Publication, 2nd Edition, New Delhi, India, 2014.
10. Robbins S.P. Decenzo David A and Coulter, “Fundamentals of Management: Essential Concepts and Applications”, Pearson Education, 9th Edition, London, England, 2014.

COURSE OUTCOMES:

On successful completion of this course, students will be able to

CO1: interpret the forces driving demand and supply and their impact on market conditions.

CO2: demonstrate various dimensions of macroeconomic variables like national income, money supply, employment, etc. in analyzing the effects on business.

CO3: explicate the different aspect of Governmental activities and their rationality and describe how they can be pursued through fiscal and monetary policy.

CO4: develop skills to plan, organize, direct and control the resources of the organization for obtaining common objectives or goals.

CO5: augment managerial skills and adopt ethical practices in various functional areas and engineering practices.

Board of Studies (BOS) :
5thBoS of SSSH held on 29.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1		H	H	M		H	H				H	H
CO2		H	M			M					H	H
CO3			M	M		H	H		H			H
CO4						M	H	H	M		M	H
CO5						M	H	H	M		M	H

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

SDG 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment, and decent work for all.

SDG 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.
SDG 12: Ensure sustainable consumption and production patterns.

Inclusive and equitable quality education can make a critical difference to production patterns, consumer understanding of more sustainably produced goods, promote inclusive and sustainable economic growth along with productive employment and decent work for all.

SSDX 02	**SOCIOLOGY OF SCIENCE AND**	**L**	**T**	**P**	**C**
SDG: 17	**TECHNOLOGY**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To recognize and define the basic concepts of society and the ways in which sociologists use these concepts in constructing explanations for individual and group problems.

COB2: To illustrate the convergence and divergence of sociology with engineering subjects in terms of the subject matter, nature and scope of the discipline and its approach.

COB3: To demonstrate the relationship between science, technology and society.

COB4: To understand the issues relating to science, technology and change in India both in the historical and globalization contexts.

COB5: To appraise the impact of science and technology on different socio-cultural institutions and processes.

MODULE I INTRODUCTION 8

Sociology - Definition, scope and importance, relationship with other social sciences - Major theoretical perspectives: Functionalism, Conflict Theorizing and Interactionism - Elements of social formation - Society, Community, Groups and Association - Institutions, family and kinship, religion, education, politics - Social process - Associative Social Process - Co-operation, Accommodation and Assimilation - Dissociative Social Process - Competition and Conflict.

MODULE II INDIVIDUAL AND SOCIETY 9

Culture - characteristics, functions, types, cultural lag and civilization - Socialization – process, stages, agencies and anticipatory socialization - Social Control - characteristics, importance, types and agencies - Social stratification. - Meaning, forms - caste and class.

MODULE III SCIENCE, TECHNOLOGY AND SOCIETY 9

Relationship between society and science and vice-versa - Science as a social system - Norms of science - Relationship between science and technology - History of modern science in India – colonial–independence and post-independence science - Science education in contemporary India – primary level to research level - Performance of universities in the development of technology - Interrelationship between industry and

universities.

MODULE IV SCIENCE, TECHNOLOGY AND SOCIAL ISSUES 10

Technology, media, identity and global society - Conformity and deviance and role of science and technology - Technology and development issue - S&T and sustainable development - Role of science and technology in the creation of environmental crisis - Social inequality, social exclusion and digital divide - Science, technology and ethical issues -Gender and technology.

MODULE V GLOBALIZATION, SCIENCE, TECHNOLOGY AND CHANGE 9

Social Change - nature, direction, forms - Technology and rate of social change – Globalization - characteristics, historical and social context- Social consequences of science and technology on civil society - Globalization - Liberalization - Their impact on Indian science and technology - WTO and issues related to intellectual property rights - MNCs and Indian industry.

L – 45; Total Hours – 45

TEXT BOOKS:

1. Giddens A. “Sociology” Wiley India Pvt. Ltd2017
2. Heald Haralambos, R.M “Sociology Themes and Perspectives”, Oxford, New Delhi-92. 2014
3. Sergio Sismondo. An Introduction to Science and Technology Studies Malden: Wiley Blackwell.2010
4. R.K. Merton, Sociology of Science, Theoretical and Empirical Investigations, University of Chicago Press, 1973.

REFERENCES:

1. Atal Yogesh, “Changing Indian Society” Rawat Publications, Jaipur, 2006.
2. Bilton, T. et al “Introductory Sociology”, Palgrave, New York. 2002
3. Das Gupta, Samir and ‘‘An Introduction to Sociology”, Pearson, Delhi. 2012.
4. Francis Abraham M. “Contemporary Sociology: An Introduction to Concepts and Theories”**,** New Delhi, Oxford University Press. 2014
5. Inkless, A, “What is Sociology”, Prentice Hall, New Delhi. 1987
6. Tumin, Melvin M “Social Stratification”, Prentice Hall, New Delhi. 1969.

COURSE OUTCOMES:

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

CO1: recognize the fundamental tenets of Sociology.

CO2: interpret the relationship between individual and society in a sociological perspective.

CO3: categorize and constructively identify their own assumptions about the relationships among society, science and technology

CO4: appraise the dynamics of human society with special reference to the science, technology and contemporary trends of globalization.

CO5: able to link and reflect on current and ongoing sociological debates on development and role of technology.

Board of Studies (BOS) :
5thBoS of SSSH held on 29.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1			H			H	H	M	L	H	L	
CO2			M			H	H	M	H	H	M	L
CO3			H	M	H	H	M		M	H	H	M
CO4			M			H	H	L	L	M	H	H
CO5			M			H				M		L

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 17: Strengthen the means of implementation and revitalize the global partnership for sustainable development.

To inculcate knowledge and socialize youth in building participation, institutions and partnership for inclusive development for the implementation of sustainable development goals.

SSDX 03	**INDUSTRIAL ECONOMICS AND MANAGEMENT**	**L**	**T**	**P**	**C**
SDG: 8 and 9		**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To provide a wholesome idea about the concept of industrial economics and identify the classifications of firms based on ownership and control.

COB2: To impart theoretical and analytical knowledge on the different market structures, pricing practices and government policies.

COB3: To equip the students with the framework that will be useful for applying economic models in business strategy, competition policy and regulations.

COB4: To understand the importance of Industrial Policy in the development of Industries in India.

COB5: To elucidate industrial growth in India by examining its performance and problems in industrial sector.

MODULE I INTRODUCTION TO INDUSTRIAL ECONOMICS 9

Definition and scope of industrial economics - Concept and importance of industry; Concept and organization of a firm - Classification of firms based on ownership - sector (industries, formal vs. Informal) - size and use - based classification - Separation of ownership and control - Localization of industries.

MODULE II MARKET STRUCTURE 9

Perfect Competition – Imperfect Competition: Monopoly – Monopolistic – Oligopolistic Strategy, Cartels, Cournot Kinked Demand and Price Leadership – Measurement of economic concentration – Policy against monopoly and restrictive trade practices – Competition Law – Pricing Practices: Objectives – Determinants – Pricing Methods – Government Policies and Pricing.

MODULE III PRODUCTION ECONOMICS AND THEORY OF FIRM 9

Production and Production function – Types, Factor Inputs – Input-Output Analysis**,** Undifferentiated Products - Cournot, Stackelberg, Dominant firm model, Bertrand-Heterogeneous products - Chamberlin's small and large number case - Kinked demand curve theory - Bain's limit pricing – Production Possibility Frontier.

MODULE IV INDUSTRIAL POLICY 9

Industrial Policy: Industrial Policy in India -1948, 1956, 1977, 1980, 1990, 1991 - Industrial Performance after Independence.

MODULE V INDUSTRIAL GROWTH IN INDIA 9

Trends and prospects - Public enterprises; efficiency - Productivity and performance constrain - Small scale industries: definition, role - Policy issues and performance - Capacity utilization - Industrial sickness and Exit - Technology transfer - Privatization.

L – 45 ; Total Hours – 45

TEXT BOOKS:

1. Barthwal R R “Industrial Economics: An Introductory Textbook”, New Age International Pvt. Ltd Publishers, 2017
2. P.J. Devine, N. Lee, R.M. Jones, W.J. Tyson, “An Introduction to Industrial Economics”, Routledge.2019.

REFERENCES:

1. Ferguson, Paul R. and Glenys J. Ferguson, “Industrial Economics - Issues and Perspectives”, Macmillan, London. 1994
2. Gregory Mankiw “Principles of Microeconomics”, Havcourt Asia Publishers, 2001.
3. Mohanty Binode Ed. “Economic Development Perspectives”, Vol. 3, Public Enterprises and Performance, Common Wealth Publishers, New Delhi, 1991
4. Mote and Paul “Managerial Economics, Tata McGraw Hill, 2001
5. Peterson and Lewis “Managerial Economics”, 4th Ed., Prentice Hall, 2004

COURSE OUTCOMES:

CO1: Develop knowledge on the concept and organization of firms and the implications of the separation of ownership and control.

CO2: Acquire familiarity with various market structures and formulate appropriate pricing strategies.

CO3: Think analytically using various economic models concerning market structures and apply them to the real world of industry.

CO4: To compare the various Industrial Policies introduced in India and recognize the role of these policies in making required industrial development in India.

CO5: Clearly diagnose and illustrate the challenges in industrial economy in India and develop effective and comprehensive solution on them.

Board of Studies (BoS) :
5th BoS of SSSH held on 29.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1			H	M			H		M		M	L
CO2			H		M		H		M		M	L
CO3			H				H		M		M	M
CO4			H				H		M		H	M
CO5			H				H		M		H	M

Note: L - Low Correlation M - Medium Correlation H - High Correlation

SDG 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

SDG 9: Build resilient infrastructure, promote sustainable industrialization and foster innovation.

A comprehensive and holistic approach towards the way for sustainable development and economic growth through the inclusive economic strategy and thereby to reduce the poverty, hunger among people by familiarizing them industry and its importance as survival strategy for earning decent standard of living.

SSDX 04	**DYNAMICS OF INDIAN SOCIAL**	**L**	**T**	**P**	**C**
SDG: 10, 16	**STRUCTURE**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

COB1: To provide knowledge on the components of the Indian social structure.
COB2: To learn the nature and contemporary structure of Indian social institutions.
COB3: To sensitize students about social stratification in Indian Society.
COB4: To create awareness about the social problems occurring in contemporary India.
COB5: To explicate the changing institutions, the processes, the agents and the interventions that brings about change in the Indian society.

MODULE I INDIAN SOCIAL STRUCTURE 9

Demographic composition - Racial, religious, ethnic and linguistic -Types of communities - rural, urban, agrarian and tribal - Social backwardness - OBC, SC, ST and EWS - Indian minorities- religious, ethnic, linguistic and LGBT.

MODULE II INDIAN SOCIAL INSTITUTIONS 9

Family - types, characteristics, functions of family - Joint Family- definition features, functions of joint family, dysfunctions of joint family, disintegration of joint family – Marriage - definition, characteristics, marriage as sacrament or contract.

MODULE III SOCIAL STRATIFICATION IN INDIA 9

Social stratification - Concept of hierarchy - inequality, meaning and characteristics - Social Stratification and Social Mobility - Functions of Social Stratification - Caste, definition, principles, contemporary changes, dominant caste - Caste - class interface - Religious minorities.

MODULE IV SOCIAL PATHOLOGY 9

Social Problem - nature, social disorganization - Population explosion- causes, effects, relationship with development - Child Labour- causes, magnitude and consequences – Unemployment - nature, types, causes and effects - Gender issues - social status of women, violence against women and women in work place - Contemporary issues - communalism, terrorism and corruption.

MODULE V SOCIAL CHANGE IN INDIA 9

Socio-cultural change - Sanskritization – Westernization - Secularization, Modernization - Processes of Social change - Industrialization – Urbanization – Globalization - Social movement - concept, characteristics, functions - New social movement-Women and Environment movement.

L – 45; Total Hours – 45

TEXT BOOKS:

1. Sharma, K.L., “Indian Social Structure and Change”, Jaipur: Rawat Publications, 2008.
2. Ahuja Ram., “Social Problems in India”, Rawat Publication: New Delhi, 2014.
3. Ahuja Ram., “Society in India”, Rawat Publication: New Delhi, 2014.

REFERENCES:

1. Atal Yogesh, “Changing Indian Society” Rawat Publications, Jaipur, 2006.
2. Dube S.C., “India's Changing Villages: Human Factors in Community Development”, London, Routledge and Kegan Paul, 2003.
3. Hasnain N., “Indian Society: Themes and Social Issues”, Mc Graw Hill, 2019.
4. Jayapalan, N., **“**Indian Society and Social Institutions” Atlantic Publishers, 2001.
5. Pandey Vinita., “Indian Society and Culture”, Rawat Publications, New Delhi, 2016
6. Rao Sankar., “Sociology of Indian Society”, S. Chand Publisher, New Delhi, 2004.

COURSE OUTCOMES:

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

CO1: explain about the social structure and social institutions that constitute society in India.

CO2: differentiate the various categories of inequalities and their challenges.

CO3: describe the social stratification and its impact in society.

CO4: analyze the social problems encountered in contemporary India.

CO5: correlate the various forms and trends of the social change in Indian society and realize the relevance of their role in bringing about development.

Board of Studies (BoS) :
5thBoS of SSSH held on 29.12.2021

Academic Council:
18th Academic council held on 24.02.2022

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO11	PO 12
CO1			H			H	M			M		
CO2			M			M	H	L				H
CO3			M			M	H	L				H
CO4			H			H	H		M			M
CO5			H		H	M	H	M		H		H

Note: L- Low Correlation M - Medium Correlation H - High Correlation

SDG 10: Reduce inequality within and among countries.

SDG16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

To sensitize and impart pertinent knowledge to youths to combat the contemporary issues and challenges facing Indian society in order to remedy its social pathos and injustices in the path of achieving sustainable development in India.