Bapatla Engineering College :: Bapatla

(An Autonomous Institution & Affiliated to Acharya Nagarjuna University)

Sponsored by Bapatla Education Society

Bapatla : 522102, Guntur District,
Andhra Pradesh, India.

R 18-Scheme & Syllabus

(w.e.f. A.Y. 2018-2019)

4 Year B.Tech Program
of
Electronics and Communication Engineering

www.becbapatla.ac.in

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

Vision

- To build centers of excellence, impart high quality education and instill high standards of ethics and professionalism through strategic efforts of our dedicated staff, which allows the college to effectively adapt to the ever changing aspects of education.

- To empower the faculty and students with the knowledge, skills and innovative thinking to facilitate discovery in numerous existing and yet to be discovered fields of engineering, technology and interdisciplinary endeavors.

Mission

- Our Mission is to impart the quality education at par with global standards to the students from all over India and in particular those from the local and rural areas.

- We continuously try to maintain high standards so as to make them technologically competent and ethically strong individuals who shall be able to improve the quality of life and economy of our country.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision

- To produce globally competitive and socially responsible Electronics and Communication Engineering graduates to cater the ever changing needs of the society.

Mission

- To provide quality education in the domain of Electronics and Communication Engineering with advanced pedagogical methods.
- To provide self-learning capabilities to enhance employability and entrepreneurial skills and to inculcate human values and ethics to make learners sensitive towards societal issues.
- To excel in the research and development activities related to Electronics and Communication Engineering.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Program Outcomes (PO)

Engineering Graduates will be able to:

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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

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

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

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Program Specific Outcomes (PSO)

A graduate of the Electronics and Communication Engineering Program will be able to:

PSO-1: Develop and implement modern Electronic Technologies using analytical methods to meet current as well as future industrial and societal needs.

PSO-2: Analyze and develop VLSI, IoT and Embedded Systems for desired specifications to solve real world complex problems.

PSO-3: Apply machine learning and deep learning techniques in communication and signal processing

Program Educational Objectives (PEO)

PEO-I: Equip Graduates with a robust foundation in mathematics, science and Engineering Principles, enabling them to excel in research and higher education in Electronics and Communication Engineering and related fields.

PEO-II: Impart analytic and thinking skills in students to develop initiatives and innovative ideas for Start-ups, Industry and societal requirements.

PEO-III: Instill interpersonal skills, teamwork ability, communication skills, leadership, and a sense of social, ethical, and legal duties in order to promote lifelong learning and Professional growth of the students.

Academic Rules & Regulations for B. Tech Program

(Approved by Academic Council & Governing Body of the College held on August 2018)

(Amended in August 2019; Effective for students admitted into First year B.Tech from the academic year 2018-2019 onwards – R18 Regulations).

1.0 EXTENT: All the rules and regulations, specified herein after, shall be read as a whole for the purpose of interpretation and when a doubt arises, the interpretation of the Chairman, Academic Council, Bapatla Engineering College (Autonomous) is final. As per the requirements of the Statutory Bodies, The Principal, Bapatla Engineering College (Autonomous), shall be the Chairman of the College Academic Council.

1.1DURATION OF THE PROGRAMME AND MEDIUM OF INSTRUCTION: The duration of the B.Tech. Programme is for four academic years consisting of two semesters in each academic year. The medium of instruction and examinations is English.

2.0 ADMISSIONS:

2.1 Admission into the First year of any Four Year B.Tech. Programmes of study in Engineering: Admissions into the first year of B.Tech. Programme of Bapatla Engineering College (Autonomous) (***Subsequently referred to as*** **B.E.C**) will be as per the norms stipulated by the Govt. of Andhra Pradesh from time to time.

2.2 Admission into the Second year of any Four year B.Tech. Programmes of study in Engineering as Lateral Entry Student**:** Admissions into the second year of B.Tech. Programme of B.E.C will be as per the norms stipulated by the Govt. of Andhra Pradesh from time to time.

2.3 Admissions with advance standing: These may arise in the following cases:

1) When a student seeks transfer from other colleges to B.E.C and intends to pursue B.Tech at B.E.C in an eligible branch of study.
2) When students of B.E.C get transferred from one regulation to another regulation or from previous curriculum to revised curriculum.
3) When a student, after long discontinuity, rejoins the college to complete his/her Programme of study for the award of the degree.

These admissions may be permitted by the Academic Council of B.E.C as per the norms stipulated by the statutory bodies and the Govt. of Andhra Pradesh from time to time. In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Programme of study at B.E.C will be governed by the transitory regulations stipulated in ***4.3.3 and 4.3.4.***

3.0 Details of the Program:

S.No	Activity	Description
1.	Number of Semesters in an Academic Year	Two
2.	Course Work	15 Weeks. 90 instructional days.
3.	Evaluation	As per the Assessment and Examination Policy.

4.0 Programmes of study in B.Tech:

4.1 The Four year B.TechProgramme is offered in the following branches of study:

S.No.	Title of the UG Programme	Abbreviation
1.	Civil Engineering	CE
2.	Computer Science & Engineering	CS
3.	Electrical & Electronics Engineering	EE
4.	Electronics & Communication Engineering	EC
5.	Electronics & Instrumentation Engineering	EI
6.	Information Technology	IT
7.	Mechanical Engineering	ME

4.2 Structure of the Programme:

As per the Program Review Policy & AICTE model curriculum guidelines.

4.3 **Transitory Regulations**: For students admitted under advance standing (mentioned in 2.3) these transitory regulations will provide the *modus operandi*.

At the time of such admission, based on the Programme pursued (case by case)

1) Equivalent courses completed by the student are established by the BOS concerned.
2) Marks/Credits are transferred for all such equivalent courses and treated as successfully cleared in the Programme of study prescribed by the concerned BOS.
3) A Programme chart of residual courses not cleared will be derived and a Programme of study with duration specified will be prescribed for pursuit at B.E.C.

4) Marks obtained in the previous system, if the case be, are converted to grades and CGPA is calculated accordingly.

All other modalities and regulations governing shall be the same as those applicable to the stream of students with whom such a candidate is included into.

4.4 Curriculum for each Programme of study:

1) The Four year curriculum of any B.TechProgramme of study in any branch of engineering is formulated based on the guidelines mentioned in 4.2 and will be recommended by the Board of Studies concerned and is approved by the Academic council of the college.
2) In the case of students admitted through lateral entry, the respective regular curriculum from the second year onwards is to be pursued by such students. Foundation courses may be added if necessary.
3) In the case of students admitted under advanced standing, the equivalencywill be prepared by the Department Committee and to be approved by the Board of Studies concerned and the Academic Council.
4) After approval from the Academic Council, Department informs the courses to be taken by all the students along with the academic regulations.

Table below shows a typical curriculum frame work for B.Tech Degree program.

S.No.	Subject Area	Average no. of credits
1.	Humanities & Social Sciences courses	12 - 14
2.	Basic Science Courses	21 – 28
3.	Engineering Science	18 - 21
4.	Professional Core courses	65 – 78
5.	Professional Elective Courses	15 - 21
6.	Open Electives	6 – 12
7.	Major Project / Seminar, etc	12
8.	MOOCs	2
9.	Summer Internship	2
10.	Mandatory courses (2 courses)*	0
	TOTAL	165 - 170

The students admitted through the **Lateral Entry scheme** have to complete **125 – 130** credits.

**For mandatory courses as suggested by UGC / AICTE no credits are allocated but obtaining pass grade in these subjects is compulsory to obtain degree.*

4.5 The Maximum duration permitted to pursue the programme and cancellation of admission:

4.5.1 The maximum duration permitted for any student to successfully complete any four year B.Tech. Programme of study shall be:

1) Eight academic years in sequence from the year of admission for a normal student admitted into the first year of any Programme,
2) Six academic years in sequence from the year of admission for a Lateral entry student admitted into the second year of any Programme, and
3) For students admitted with advanced standing, the maximum time for completion of Programme study shall be twice the period in terms of academic years in sequence, stipulated in the Programme curriculum defined at the time of admission.

4.5.2 In case, any student fails to meet the applicable conditions for the eligibility of degree in the maximum stipulated period as mentioned in ***4.5.1***, his/her admission stands cancelled and no degree will be awarded.

5.0 EXAMINATION& EVALUATION:

The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded as per section ***9.1.***

EVALUATION:

The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded. The performance of a student in each course is assessed with alternate assessment methods, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.

The distribution of marks between Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to be conducted at the end of the semester will be as follows:

Nature of the Course	CIE	SEE
Theory subjects	50	50
Drawing	50	50
Practical	50	50
Term Paper	50	50
Project work	75	75

5.1 Continuous Internal Evaluation (CIE) in Theory and Drawing subjects:

In each Semester there shall be two Term examinations and some ***Alternate Assessment Tools (AAT)*** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The Alternate Assessment Tools with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course. It will be reviewed and approved by the Department Committee.

The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular year of study. The maximum weightage for Term Examinations, AATs and the calculation of marks for CIE in a theory course is given in the following table.

Particulars	Term Exams (Max. 20 marks)	AAT (Max. 30 marks)
Better Performed ex	75% of marks obtained	Continuous assessment by teacher as per the predetermined course delivery & assessment plan. (Min. two assessments)
Other exam	25% of marks obtained	

A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in that course and eligible to write the SEE of that course.

Semester End Examination (SEE) in Theory, Design and/or Drawing course:

a) For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester for 50 marks, except where stated otherwise in the detailed Scheme of Instruction. Question paper setting shall be set by the teacher or teachers together in a multi section courses and to be verified as described in policy document.

b) A minimum of 20 (40%) marks are to be secured exclusively in the Semester End Examination (SEE) of theory, design and/or drawing course in order to be declared as passed in that course and for the award of the grade in the course.

5.3 Continuous Internal Evaluation (CIE) in laboratory courses:

The evaluation for Laboratory course is based on CIE and SEE. The CIE for 50 marks comprises of 20 marks for day to day laboratory work, 15 marks for record submission and 15 marks for a laboratory examination at the end of the semester.

In any semester, a minimum of 90 percent of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be taken up by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department concerned to be eligible to appear for the Final Examination in that laboratory course.

A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in that lab course and eligible to write the SEE of that lab course.

5.4 Semester End Examination (SEE) in laboratory courses:

a) For each laboratory course, the Semester End Examination (SEE) shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 50 marks which include 10 marks for write up, 20 marks for lab experiment/exercise, 15 marks for Viva-voce and 5 marks for general impression.

b) A minimum of 20 (40%) marks shall be obtained in SEE of a laboratory course in order to be declared as passed and for the award of the grade in that laboratory course.

5.5 Evaluation of Term Paper:

a) A term paper is to be submitted by each student in the 7^{th} semester which would be a precursor to the project work to be done in the 8^{th} semester. The evaluation is based on CIE for 50 marks, which includes a minimum of two seminars/presentations for 20 marks and the report submitted at the end of the semester which is evaluated for 30 marks.

b) A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in the Term Paper and eligible to write the SEE in the Term Paper.

c) The Semester End Examination (SEE) shall be conducted for 50 marks by one internal and one external examiner appointed by the Principal. The SEE contains Viva-voce and the demonstration of the model developed or work performed as a part of the term paper.

d) A minimum of 20 (40%) marks shall be obtained in SEE of the term paper in order to be declared as passed and for the award of the grade in the term paper.

5.6 Evaluation of the Project

a) In case of the Project work, the evaluation shall be based on CIE and SEE. The CIE for 50 marks consists of a minimum of two Seminars / presentations for 20 marks and the Project Report submitted at the end of the semester which is evaluated for 30 marks.

b) A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in the Project Work and eligible to write the SEE in the Project Work.

c) SEE shall be evaluated in the form of a Viva- voce and the demonstration of the thesis work for 100 marks. Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner to be appointed by the Principal.

d) A minimum of 40 marks shall be obtained in SEE exclusively in order to be declared as passed in the Project and for the award of the grade.

NOTE : A student who is absent for any Test / Exam / Seminar / Presentation as a part of Continuous Internal Evaluation (CIE), for any reason whatsoever, shall be deemed to have scored zero marks in the respective component and no provision for make-up shall be provided.

5.7 Course Repetition (Repeater course)

The students not qualified to write SEE in a course may register for the repeater courses through course repetition and summer semester. The students have to apply to the Principal through the respective HOD by paying prescribed fees.

Course repetition: A student can take up a maximum of two theory courses in a semester immediately after the semester end examinations of that particular semester in accordance with the guidelines recommended by the Academic Council. The students who are not taking regular semester courses may additionally register for one more theory course.

Summer semester: Further the students can register maximum three (theory + lab courses together) courses in the summer semester. Summer semester courses shall be of both even & odd semesters. Summer semester shall be conducted immediately after completion of even semester end examinations.

The HODs concerned have to allot a teacher related to that course to conduct class work. The minimum number of periods to be conducted should not be less than 75% of the total prescribed periods for that course. The classes will be conducted in the vacation period or in the weekends or in the afternoons as decided by the HOD concerned. Teacher has to evaluate the student for his performance in CIE as per the autonomous norms and the qualified students should appear for a semester end examination. The pass criteria in both CIE & SEE should be as per autonomous norms.

The documents for monitoring the candidates registered for course repetition are available with the Heads of the Departments and Exam Section.

6.0 ATTENDANCE REGULATIONS:

All students shall maintain a minimum overall attendance of 75% in the registered semester. The attendance percentage is computed by considering total number of periods conducted in a semester as the denominator and the total number of periods actually attended by the student in that semester, as the numerator.

In case of shortfall in this, the Principal of the College shall consider and may condone deficiency up to a limit of 10% in special cases for reasons such as medical emergencies, participation in sport, cultural activities, seminars, workshops and paper presentation etc. at the level of University, State, and National after due recommendation by the concerned Head of the Department.

For the above cases student must take prior permission from the head of the department to participate in such events and in case of medical emergencies intimation should be given immediately and submit the medical certificate to the concerned Head of the Department. The student seeking condonence of attendance on the above grounds has to pay the condonence fee as specified by the college.

Further a student, who could not satisfy the minimum attendance of average 75% in the semester (or 65% in special cases as mentioned above) in any semester, is not eligible to appear for the Semester End examinations and shall have to repeat that semester in the subsequent year.

6.1 Attendance at CIE and SEE: Attendance at all examinations, both CIE and SEE of each course registered shall be compulsory for the students and there shall not be any provision for re-examinations/consideration.

6.2 Any student against whom any disciplinary action by the College is imposed shall not be permitted to attend any SEE in that Semester.

6.3 The basis for the calculation of the attendance shall be the period prescribed by the College by its calendar of events. For the first semester students, the same is reckoned from the date of admission to the course.

6.4 The students shall be informed about their attendance position periodically by the College so that the students can strive to make up the shortage. However, non-receipt of such information from the college will not be considered as valid reason for exemption from the attendance requirements.

7.0 DETENTION: A student is said to have been detained and not allowed to appear for Semester End Examination (SEE) at the end of the semester when

7.1 The student does not have a minimum average 75% attendance or 65% attendance with condonation in all subjects put together in that semester.

7.2 Such a student shall have to repeat the same semester subsequently and satisfy the above requirements afresh to become eligible to appear for the Semester End Examination (SEE), conducted at the end of the semester.

8.0 CONDITIONS FOR PROMOTION:

8.1 A student not detained in the first semester of a year of study shall be promoted to second semester of that year of study.

8.2 A student shall be eligible for promotion to III semester of B.Tech. Programme, if he/she is not detained in the second semester (of first year B.Tech. Programme) irrespective of the number of backlog courses (in terms of credits not earned) in I year B.Tech. (i.e. I & II semesters together).

8.3 A student shall be eligible for promotion to V semster of B.Tech. Programme, if he/she is not detained in the IV semester and also must secure 50% of the credits of the subjects (including laboratory courses, MOOC courses etc as per curriculum) that have been studied in I & II semesters irrespective of whether the candidate takes the end examination or not as per the normal course of study. At the time of commencement of class work for the V semester, student must secure the required credits.

8.4 A student shall be eligible for promotion to VII semester of B.Tech. Programme, if he/she is not detained in the VI semester of B.Tech. Programme and also must secure 50% of the credits of the subjects (including laboratory courses, MOOC courses etc as per curriculum) that have been studied upto IV semester. At the time of commencement of class work for the VII semester, student must secure the required credits.

And in case of getting detained for shortage of earned credits as per above, the student may make up the credits through supplementary exams for the failed courses before the date of commencement of class work for V or VII semester respectively.

7.0 Reregistration of not qualified courses in CIE for lack of attendance or lack of marks:

Students who failed to secure minimum percentage of marks (50%) in CIE specified in any course, he / she will not be allowed to write SEE of that course. Such students have to register and qualify in CIE for those courses through course repetition and summer semester.

Students, who failed after final regular examination (SEE), must appear for the supplementary examinations to be conducted as per the college examination schedule.

Registration: Every eligible student has to register himself / herself at the beginning of every semester indicating all the Courses taken up for pursuit by him / her during that Semester and mentor's signature is mandatory.

8.1 When a student is debarred for one or more semesters, his / her registration in the present semester is cancelled and the student is debarred from registering in future during the debarred period.

8.2 In any case, while re-registering in any semester, he or she will have to pay the requisite fee once again.

For extended years of study, students must pay the tuition fees as per the college regulations.

9.0 GRADING SYSTEM

Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each course.

Letter Grades: A letter grade is basically a qualitative measure (an alphabet/letter) giving the performance of a student, such as,

Performance	Grade
Extraordinary	A+
Excellent	A
Very Good	B+
Good	B
Average	C
Pass	P
Unsatisfactory/Fail	F

The above grades are based on the marks obtained by the student in both CIE and SEE.

9.1 Grade Points

Depending on the letter grades assigned, a student earns certain grade points. The Colleges follow the 10-point grading system, as given below for absolute grading system.

The letter grades and the corresponding grade points are as given in the Table.

Table: Grades & Grade Points

Grade	Grade Points	% of Marks
Ex	10	≥90% – 100%
A+	9	≥80% –< 90%
A	8	≥70% – <80%
B	7	≥60% – <70%
C	6	≥50% –< 60%
P	5	≥45% – <50%
F(Fail)	0	< 45%

9.1.1 The grade points given in above tables help in the evaluation of credit points earned by the student in a Course as the credit points are equal to the number of credits assigned to the Course multiplied by the grade points awarded to the student in that Course. This shall be used in arriving at the Semester Grade Point Average (SGPA) of the student for that semester, as it is the sum of all the credit points earned by the student for all the Courses registered in that semester.

9.1.2 Earning of Credit: A student shall be considered to have completed a Course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to P. Letter grade 'F' in any Course implies failure of the student in that Course and no credits earned.

9.2 A student who earns a minimum of 5 grade points (P grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course.

However it should be noted that a pass in any course/term paper/Project shall be governed by the rules mentioned Assessment and Examination Policy.

10.0 GRADE POINT AVERAGE

10.1 The Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the course *i*,

G_i = grade points obtained by the student in the course.

10.2 Semester Grade Point Average (SGPA) is awarded to candidates considering all the courses of the semester. Zero grade points are also included in this computation.

10.3 To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to that particular point of time.

10.4 Example

Semester	Course Code.	Credits	Grade	Grade Point	Credit Points	SGPA	CGPA
III	18EC301	3	C	6	18		
III	18EC302	3	B	7	21		
III	18EC303	3	A+	9	27		
III	18EC304	4	P	5	20		
III	18EC305	4	C	6	24		
III	18EC306	2	A	8	16	**6.72 (148/22)**	**6.72 (148/22)**
III	18ECL301	1	P	5	5		
III	18ECL302	1	B	7	7		
III	18ECL303	1	Ex	10	10		
Total		**22**			**148**		
IV	18EC401	3	P	5	15		
IV	18EC402	3	B	7	21		
IV	18EC403	4	Ex	10	40		
IV	18EC404	4	C	6	24		
IV	18EC405	2	A+	9	18	**7.40 (163/22)**	**7.06 (311/44)**
IV	18EC406	3	A	8	24		
IV	18ECL401	1	P	5	5		
IV	18ECL402	1	C	6	6		
IV	18ECL403	1	Ex	10	10		
Total		**22**			**163**		

11.0 ELIGIBILITY FOR AWARD OF B.TECH. DEGREE: A student shall be eligible for award of the B.Tech degree if he/she fulfils all the following conditions:

1) Registered and successfully completed all the components prescribed in the Programme of study to which he/she is admitted
2) Obtained CGPA greater than or equal to 5.0 (Minimum requirements for Pass)
3) Has no dues to the Institute, hostels, Libraries, NCC/NSS etc., and
4) No disciplinary action is pending against him/her

12.0 AWARD OF CLASS: A candidate who becomes eligible for the award of B.Tech. Degree shall be placed in one of the following Classes based on CGPA.

Table: CGPA required for award of Degree

Distinction	**≥ 8.0***
First Class	**≥ 6.5 < 8.0**
Second Class	**≥ 5.5 < 6.5**
Pass Class	**< 5.5**

* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester **in the minimum stipulated period for the Programme**.

If the student did not obtain a CGPA of 5.0 after completing all courses of study, he/she should repeat some courses and obtain higher grade till his/her CGPA is 5.0. Unless he/she obtains a CGPA of 5.0, degree will not be awarded.

12.1 **Grade Sheet:** A grade sheet (Memorandum) will be issued to each student indicating his performance in all courses taken in that semester and also indicating the Grades and SGPA.

12.2 **Transcripts**: After successful completion of the total Programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee. Partial transcript will also be issued up to any point of study to any student on request and by paying the stipulated fee in force.

12.3 The Academic council of the College approves and recommends the same to Acharya Nagarjuna University for the award of a degree to any student.

13.0 IMPROVEMENT OF CLASS:

13.1 A candidate, after becoming eligible for the award of the Degree, may reappear for the Final Examination in any of the theory courses as and when conducted, for the purpose of improving the class. But this reappearance shall be only once and within a period of two academic years after becoming eligible for the award of the Degree.

However, this facility shall not be availed by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for CIE in any course or for Semester End Examination (SEE) in laboratory courses (including Project Viva-voce) for the purpose of improvement.

14.0 SUPPLEMENTARY EXAMINATIONS: In addition to the Regular Final Examinations held at the end of each semester, Supplementary Final Examinations will be conducted during the academic year. Candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one Final Examination per day.

15.0 INSTANT SUPPLEMENTARY EXAMINATIONS: Candidates who fail in one theory course of VIII semester can appear for Instant Supplementary Examination conducted after declaration of the revaluation results of the said exam.

16.0 MALPRACTICES:

The Principal shall refer the cases of malpractices in Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to an Enquiry Committee constituted by him / her. The Committee will submit a report on the malpractice allegedly committed by the student to the Principal. The Principal along with the members of the Committee is authorized to award a punishment as per the norms, if the student is found guilty.

16.1 To prevent the students indulging in Malpractices through latest electronic gadgets such as Cell-phones, Pagers, Organizer PDAs and Palmtops in addition to chits, printed material etc. in the examination halls, students shall be thoroughly checked at the main entrance as well as in the examination halls by the invigilators. The senior staff members appointed as internal flying squad has greater and decisive role to play in this regard.

16.2 A notice displaying the 'SCALE OF PUNISHMENT' shall prominently be displayed at the Main Entrance to the Examination Halls, preferably near the 'Seating Plan Display'.

16.3 If any student is found resorting to malpractice, the matter shall immediately be brought to the notice of Chief/Additional chief superintendent, Flying squad by the invigilator concerned.

16.4 The above staff members will then prepare a detailed report on the spot in proforma-I (copy enclosed) of the case. The full details of the offence and the details of supporting material must be written in establishing the case. The residential addresses of the students involved in malpractice shall be noted with contact telephone numbers in the malpractice report.

16.5 A written statement is to be obtained from the candidate. If any candidate refuses to give the written statement, the same shall be recorded by the invigilator with the signature of another invigilator as witness.

16.6 Whatever be the supporting material for establishing the case of malpractice, the same are to be confiscated immediately for sending the same to the Malpractices prosecuting committee as a proof.

16.7 The supporting materials so confiscated shall be signed by the chief superintendent and flying squad/invigilator and shall be attached and tagged properly to the scripts of the malpractice cases and are to be sent to Malpractices prosecuting committeea long with the report (proforma enclosed).

16.8 Any representation to relax the punishment will not be entertained by Malpractices prosecuting committee.

16.9 The answer scripts of the candidates who resorted to mal-practice shall be packed in a separate sealed cover duly subscribing on the cover as “MAL-PRACTICE” and send the same to Malpractices prosecuting committee.

16.10 Any student who is arrogant and does not follow the examination rules shall be sent out of the examination hall after collecting his question paper and answer book. Complaints on such cases shall be lodged to the Principal irrespective of imposter is an examinee or an outsider.

SCALE OF PUNISHMENT FOR MAL-PRACTICE CASES

Rule No.	Nature of Offence	Scale of Punishment
01	Writing unparliamentary / vulgar / obscene / words or Language in the answer book. OR Refusing to obey instructions of Chief Superintendent / Invigilator.	The performance of the candidates in that subject shall be cancelled. Further the case should be referred to the disciplinary committee by Chief Superintendent / Malpractices prosecuting committee. If the student repeat the same offence, the performance of the candidate in the semester examination in ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) shall be cancelled
02	A candidate found in possession of any relevant material pertaining to the day of examination such as Papers, Books, Notes OR Notes written on any part of the clothes dressed by the candidate or any part of his/her body or any part of Table or Desk; OR Foot rule, instruments like setsquare, protractor, calculator, mobile phones, etc., with notes written on them. OR Mass copying at the examination centre detected during the conduct of examination or during valuation.	The candidate is to be sent out of the examination hall immediately after obtaining his/her written explanation and duly confiscating his/her Hall-ticket. He/she shall be allowed to appear for the remaining subjects in that examination by obtaining duplicate hall ticket. The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination.
03	A candidate found having copied or indulging in copying from any paper, book or notes or any other source or allowed or is found allowing any other candidate to copy any matter from his/her answer book or to have in any manner rendered any assistance to another candidate, or if he/she is found to have been receiving assistance from another candidate. OR Destruction or suppression of the evidence of the forbidden material in any way like swallowing, tearing or throwing outside etc.	The candidate is to be sent out of the examination hall immediately after obtaining his/her written explanation and duly confiscating his/her Hall-ticket. He/she shall be allowed to appear for the remaining subjects in that examination by obtaining duplicate hall ticket. The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination.

04	Copying detected on the basis of internal evidence such as during valuation/special scrutiny	The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination. Note for MPC: "The Malpractice Prosecuting Committee which awards the punishment to the candidates involved in the malpractice has to make sure of the involvement of the Candidate/s in the offence before any punishment is awarded to the candidate/s."
05	Throwing of Question paper after writing the answers on it to the other candidate(s) with the intention to help the other candidate(s). OR Throwing / Sending the Question paper/ questions contained in the question paper on any sheet/article out during the period of examination with an intention to receive assistance and caught by the Invigilator or by an Officer involved in the conduct of examinations	The candidate is to be sent out of the examination hall immediately after obtaining his/her written explanation and duly confiscating his/her Hall-ticket. He/she shall be allowed to appear for the remaining subjects in that examination by obtaining duplicate hall ticket. The performance of the candidates in that subject shall be cancelled. Further depending on severity of offence or reoccurrence of the offence by the student, the Malpractices prosecuting committee may impose the cancellation of performance of the candidate in two or more or ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) in that semester examination.
06	Exchanging intentionally the answer scripts with a view to give or take help from another examinee.	The candidates (both who helps and who takes help) are to be sent out of the examination hall immediately after obtaining his/her written explanation and duly confiscating his/her Hall-ticket. The performance of all the candidates involved in the act in all subjects in that particular year/semester examination (whole/ part examination, as the case may be, including Practicals) shall be cancelled.
07	Taking away the answer book or leaving the examination hall without handing over the answer book to the Invigilating Staff whether returned Subsequently or tearing the answer Book.	The performance of the candidate in all subjects in that semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled and shall not be permitted to appear for whole/part examination, as the case may be, for next subsequent semester examinations.
08	Writing of answers in the answer	The performance of all the candidates involved in

	book by his/her associates in the examination hall or at any other level.	the act in all subjects in that particular year/semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled and the candidates shall not be permitted to appear for TWO subsequent semesters examinations and they shall not be permitted to study the next higher class (debarred for one semester).
09	Obstructing the Chief Superintendent from performing his/her duties, abusing, threatening and showing disrespect towards Invigilator/ Chief Superintendent/ any other official connected with the conduct of examination within the institution premises.	The culprits are to be handed over to the Police immediately and a Criminal case is to be booked against them. The performance of the candidate in the particular year/ semester examination in ALL SUBJECTS (whole/part examination, as the case may be, including Practicals) shall be cancelled and the candidates shall not be permitted to appear for TWO subsequent semesters examinations and they shall not be permitted to study the next higher class (debarred for one semester).
10	Substitution of answer book. OR Insertion of drawing sheets or replacement of main answer book written outside with one written inside the examination hall.	The performance of the candidate in all subjects in that semester examination (whole/ part examination, as the case may be, including Practicals) shall be cancelled and the candidate shall not be permitted to appear for TWO subsequent examinations and he/she is not permitted to study next higher class (debarred for one semester).
11	Impersonation.	The performance of both the candidates, i.e., the impostor and the candidate, who is being impersonated, in all subjects in that semester examination (whole/ part examination, as the case may be, including Practicals) shall be cancelled and they are not permitted to study and appear for any examination for the next THREE semesters (including academic year in which the impersonation has taken place) in respect of either or both the candidates. A Criminal case may be lodged in the Police Station if the impostor is an outsider
12	Physical assault within the institution premises on personnel connected with the conduct of examinations.	The performance of the candidate in all the subjects in that semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled and the candidate shall not be permitted to appear for THREE subsequent examinations and he/she is not permitted to study next higher class (debarred for two semester), if any, till he/she completes the punishment period. A Criminal / Disciplinary

		case is to be booked against the culprits involved in the act.
13	Possession of blank main answer book/ additional answer book/ drawing sheet/ graph sheet which have not been issued in the Examination hall on the day of exam.	A Criminal / Disciplinary case is to be booked against the candidate. The matter should be brought to the notice of the authorities for initiation of appropriate action against all the guilty. The performance of the candidate in all subjects in that semester examination (whole/part examination, as the case may be, including Practicals) shall be cancelled.
14	Other offences, if any, not covered under the above provisions.	The Malpractice Prosecuting Committee shall make specific recommendations on the punishment to be awarded keeping in view the gravity of offence and also the scale of punishment, as above.

N O T E:

1. No re-examination shall be conducted, where candidates resort to boycott of examinations on any pretext.
2. In case a candidate resorting to malpractice by copying from any material in his/her possession and/or by any means is caught by the Flying Squad or Observers or any other Officer posted for duty for the examination, the explanation of the Invigilator in that particular hall of examination shall be called for, for not detecting the same and appropriate disciplinary action be initiated against him/her, after examining his/her explanation in the matter.
3. In all the malpractice cases the report made by the Invigilators should be thoroughly enquired into by the Chief Superintendent concerned and he/she should satisfy himself/herself with all the details in the Invigilators report and record the same in his/her report.
4. In cases where there is a laxity on the part of invigilators and chief superintendents and other officials connected with the conduct of examinations in the discharge of their duties properly, such as in cases where mass copying is reported in an examination hall or where the candidate involved in malpractice in an examination hall is booked by flying squad or others but not the invigilator, then appropriate disciplinary action should be taken against all the staff members involved, after giving them notice and considering their explanations, if any, offered.
5. Punishment for different offences committed in all cases and its duration is mentioned above. It is quite possible that in few cases, the punishment recommended to the candidates, may exceed, the validity of the Curriculum in existence. In such cases, the punishment period should be limited to that extent within which the candidate has to obtain his/her B.Tech. In certain cases, the candidate may not get any more chances to appear for examination and qualify for the award of B.Tech. The candidate will have to suffer the consequence for his/her misdemeanor.
6. In all cases of Malpractice, the hall ticket of the candidate is to be confiscated and shall be sent to the Malpractices prosecuting committee along with the answer script in separate cover. The candidate shall not be permitted to appear for the remaining subjects if any, in that examination.

PROFORMA - I

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

MAL-PRACTICE CASE REPORT

1. Examination Hall : _____

2. Date of Examination : _____

3. Time of Examination : _____

4.a) Course : _____

b) Year/Semester : _____

c) Scheme : _____

5. Subject in which candidate is booked:
   a) Subject Code : _____
   b) Subject : _____

6. Particulars of the candidate booked:
   a) Regd. No. : _____
   b) Name : _____
   c) Residential address : _____
   : _____
   : _____

7. (a) Case booked by : Invigilator / Squad Members / Surprise Check Squad / Other Invigilator / Chief superintendent / Examination officers (Strike out whichever is not applicable)
   (b) Name & Designation of the Staff who booked the case : _____
   (c) Name & Designation of the Other invigilators in the Hall : _____
   as witness. : _____

8. Give Full Details of the Offence : _____
   _____
   _____
   _____

_____

_____

9. Give full details of Supporting material like Written Chits, Printed material, Mobile Phones, Books, Matter written on Scale, Calculator case etc., (matter should be related to the subject of examination on that day). If copied, the copied matter is to be marked in the supporting material and write Regd. No. of the candidate on the supporting material and should be sent to this office along with the answer booklet.

11. Signature of the Invigilator : _____
(whether the case is booked by him or by other officials)

12. Whether the student has given : YES / NO
the statement or not ?

13. Signature of the candidate : _____

14. Remarks of the : _____

Chief Superintendent _____

_____

_____

SIGNATURE OF THE CHIEF SUPERINTENDENT

Encl: 1) Answer-script
2) Forbidden confiscated material
3) Statement of Student.

17.0 AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/ or Syllabi or any other matter pertained that meets to the needs of the students, society and industry without any notice and the decision is final.

COURSE STRUCTURE SUMMARY

S. No	R18 Course Component	Curriculum Content (% Total Number of Credits Offered)	Total number of Contact Hours	Total number of credits
1	Basic Sciences	11.97	30	20
2	Engineering Sciences	11.97	33	20
3	Humanities and Social Sciences	4.19	13	7
4	Program Core	45.5	119	76
5	Program Electives	8.98	20	15
6	Open Electives	3.59	8	6
7	Project(s)	7.18	15	12
8	Internship/Seminars	1.19	---	2
9	(Any Other) I. Mandatory Courses	4.19	14	7
	II. MOOCS	1.19	---	2
	Total number of Credits			**167**

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Effective from the Academic Year 2018-2019 (R18 Regulations)
First Year B.Tech (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA001	Linear Algebra and ODE	4	0	0	4	50	50	100	3
18PH001	Waves and Modern Physics	4	0	0	4	50	50	100	3
18CY001	Engineering Chemistry	4	0	0	4	50	50	100	3
18CE001	Environmental Studies	3	0	0	3	50	50	100	2
18CS001	Problem Solving with Programming	4	0	0	4	50	50	100	3
18CYL01	Engineering Chemistry Lab	0	0	3	3	50	50	100	1
18ECL12	Hardware Lab	0	0	3	3	50	50	100	1
18CSL01	Problem Solving with Programming Lab	0	0	3	3	50	50	100	1
	TOTAL	19	0	9	28	400	400	800	17

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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First Year B.Tech (SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA002	Numerical Methods and Advanced Calculus	4	0	0	4	50	50	100	3
18EC202	Basic Instrumentation	4	0	0	4	50	50	100	3
18EC203	Programming with C ++	4	0	0	4	50	50	100	3
18EL001	Communicative English	3	0	0	3	50	50	100	2
18EC205	Circuit Theory	4	1	0	5	50	50	100	4
18PHL01	Physics lab	0	0	3	3	50	50	100	1
18ECL22	Programming with C ++ Lab	0	0	3	3	50	50	100	1
18ELL01	English Communication and Skills Lab	0	0	3	3	50	50	100	1
	TOTAL	19	1	9	29	400	400	800	18

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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Effective from the Academic Year2018-2019 (R18 Regulations)
Second Year B.Tech (SEMESTER – III)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA003	Probability and Statistics	4	0	0	4	50	50	100	3
18EC302	Data Structures using Python	4	0	0	4	50	50	100	3
18EC303	Electronic Devices and Circuits	4	0	0	4	50	50	100	3
18EC304	Electromagnetic Field Theory	4	1	0	5	50	50	100	4
18EC305	Digital Electronics	4	1	0	5	50	50	100	4
18EL002	Technical English	3	0	0	3	50	50	100	2
18ECL31	Data Structures using Python Lab			3	3	50	50	100	1
18ECL32	Electronic Devices & Digital Electronics Lab			3	3	50	50	100	1
18ECL33	PSPICE Lab			3	3	50	50	100	1
	TOTAL	23	2	9	34	450	450	900	22

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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Second Year B.Tech (SEMESTER – IV)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA004	Complex Variables and Special Functions	4	0	0	4	50	50	100	3
18EC402	Electronic Circuit Analysis	4	0	0	4	50	50	100	3
18EC403	EM Waves and Transmission Lines	4	1	0	5	50	50	100	4
18EC404	Signals & Systems	4	1	0	5	50	50	100	4
18EC405	Digital Design Using HDL	4	1	0	5	50	50	100	4
18EC406	Professional Ethics and Human Values	4	0	0	4	50	50	100	3
18ECL41	Electronic Circuits Lab			3	3	50	50	100	1
18ECL42	HDL Lab			3	3	50	50	100	1
18ECL43	Signals and Systems lab			3	3	50	50	100	1
	TOTAL	24	3	9	36	450	450	900	24

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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Effective from the Academic Year2018-2019 (R18 Regulations)
Third Year B. Tech (SEMESTER – V)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EC501	Linear Integrated Circuits	4	0	0	4	50	50	100	3
18EC502	Linear Control Systems	4	1	0	5	50	50	100	4
18EC503	Microprocessors and Microcontrollers	4	0	0	4	50	50	100	3
18EC504	Digital Signal Processing	4	0	0	4	50	50	100	3
18EC505	Analog and Digital Communications	4	0	0	4	50	50	100	3
18ECD11,..,14	Elective-1	4	0	0	4	50	50	100	3
18ECL51	Microprocessors and Microcontrollers programming lab			3	3	50	50	100	1
18ECL52	Linear Integrated Circuits Lab			3	3	50	50	100	1
18ECL53	Analog and Digital Communications Lab			3	3	50	50	100	1
18ECMOOC1	MOOCs								2*
	TOTAL	24	1	9	34	450	450	900	**24**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical
* Means No Classwork / Exam.

Elective-I

18ECD11: Computer Organization & Architecture
18ECD12: Data Communication and Computer Networks
18ECD13: Programming with JAVA
18ECD14: Pulse and Switching Circuits

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Third Year B. Tech (SEMESTER – VI)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EC601	Constitution of India	4	0	0	4	50	50	100	0
18EC602	Internet of Things	4	1	0	5	50	50	100	4
18EC603	Digital Image Processing	4	0	0	4	50	50	100	3
18EC604	Antenna and Wave Propagation	4	0	0	4	50	50	100	3
18EC605	VLSI Design	4	0	0	4	50	50	100	3
18ECD21,…,24	Elective – II	4	0	0	4	50	50	100	3
18ECL61	Signal and Image Processing using SCI Lab			3	3	50	50	100	1
18ECL62	Internet of Things Lab			3	3	50	50	100	1
18ELL02	Soft Skills Lab			3	3	50	50	100	1
	TOTAL	24	1	9	34	450	450	900	**19**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Elective – II

18ECD21: Artificial Intelligence
18ECD22: Information Theory and Coding
18ECD23: Embedded System Design
18ECD24: Telecommunication Switching Systems and Networks

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Effective from the Academic Year2018-2019 (R18 Regulations)
Fourth Year B. Tech (SEMESTER – VII)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18ME002	Industrial Management and Entrepreneurship Development	4	0	0	4	50	50	100	3
18EC701	Microwave and Radar Engineering	4	0	0	4	50	50	100	3
18EC702	Wireless &Mobile Communications	4	0	0	4	50	50	100	3
18EC703	Fiber Optics Communications	4	0	0	4	50	50	100	3
18ECD31,…,34	Elective - III	4	0	0	4	50	50	100	3
18—I--	Institutional Elective – I	4	0	0	4	50	50	100	3
18ECL71	Fiber Optic and Microwave Engineering Lab			3	3	50	50	100	1
18ECL72	Wireless & Mobile Communications Lab			3	3	50	50	100	1
18ECP01	Term Paper			3	3	50	50	100	2
18ECII1	Internship					100		100	2*
	TOTAL	20	0	9	29	550	450	1000	**24**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Elective – III

18ECD31: Introduction to Nano-Science and Nanotechnology
18ECD32: Machine Learning
18ECD33: Bio-Medical Instrumentation
18ECD34: Pattern Recognition and Application

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Effective from the Academic Year2018-2019 (R18 Regulations)
Fourth Year B. Tech (SEMESTER – VIII)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18ECD41,…,44	Elective –IV	4	0	0	4	50	50	100	3
18—I--	Institutional Elective – II	4	0	0	4	50	50	100	3
18ECD51,…,54	Elective – V	4	0	0	4	50	50	100	3
18ECP02	Project Work - II			12	12	75	75	150	10
	TOTAL	12	0	12	24	225	225	450	**19**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Elective –IV

18ECD41: Wireless Adhoc and Sensor Networks
18ECD42: Robotics
18ECD43: MEMS
18ECD44: Satellite Communications

Elective – V

18ECD51: Advanced DSP
18ECD52: Artificial Neural Networks
18ECD53: Software Defined Radio
18ECD54: FPGA Design for Embedded Systems

Institutional Elective – 1

1. 18CE101 AIR POLLUTION & CONTROL
2. 18CE102 RURAL WATER SUPPLY AND ENVIRONMENT SANITATION
3. 18CS101 JAVA PROGRAMMING
4. 18CS102 DATABASE MANAGEMENT SYSTEM
5. 18ECI01 DIGITAL IMAGE PROCESSING
6. 18ECI02 EMBEDDED SYSTEMS
7. 18EEI01 APPLICATIONS OF WAVELETS TO ENGINEERING PROBLEMS
8. 18EEI02 INDUSTRIAL ELECTRICAL SYSTEMS
9. 18EII01 PRINCIPLES & APPLICATIONS OF MEMS
10. 18EII02 POWER PLANT INSTRUMENTATION
11. 18ITI01 INTRODUCTION TO DATA ANALYTICS

12. 18ITI02 CYBER SECURITY
13. 18ME101 FLUID POWER & CONTROL SYSTEMS
14. 18ME102 PROJECT MANAGEMENT
15. 18MA006 GRAPH THEORY
16. 18PH101 NANO MATERIALS AND TECHNOLOGY
17. 18PH102 FIBER OPTICS COMMUNICATIONS
18. 18EL003 PROFESSIONAL COMMUNICATION
19. 18NC001 NCC (NATIONAL CADET CORPS)

Institutional Elective – II

1. 18CE103 DISASTER MANAGEMENT
2. 18CE104 REMOTE SENSING &GIS
3. 18CS103 PYTHON PROGRAMMING
4. 18CS104 COMPUTER NETWORKS
5. 18ECI03 WIRELESS COMMUNICATIONS
6. 18ECI04 ARTIFICIAL NEURAL NETWORKS
7. 18EEI03 HIGH VOLTAGE ENGINEERING
8. 18EEI04 ELECTRICAL ENERGY CONSERVATION & AUDITING
9. 18EII03 ROBOTICS AND AUTOMATION
10. 18EII04 SENSORS AND SIGNAL CONDITIONING
11. 18ITI03 MOBILE APPLICATION DEVELOPMENT
12. 18ITI04 WEB TECHNOLOGIES
13. 18ME103 NON-CONVENTIONAL ENERGY SOURCES
14. 18ME104 AUTOMOBILE ENGINEERING
15. 18PH103 ADVANCED MATERIALS
16. 18PH104 OPTO ELECTRONIC DEVICES AND APPLICATIONS
17. 18EL004 ENGLISH FOR COMPETITIVE EXAMINATIONS
18. 18NC001 NCC (NATIONAL CADET CORPS)

Linear Algebra and ODE

I B. Tech –I Semester **(Code: 18MA001)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
- Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.
- Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
- Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms.

Course Outcomes: After studying this course, the students will be able to

CO1	Find the eigen values and eigen vectors of a given matrix and its inverse.
CO2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.
CO3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.
CO4	Apply Laplace transforms to solve differential equations arising in engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2									2			
CO2	3	3	3									2			
CO3	3	3	3									2			
CO4	3	3	3									2			
AVG	3	3	2.75									2			

SYLLABUS

UNIT – I

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.] [12 Hours]

UNIT - II

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy=0.

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8] [12 Hours]

UNIT – III

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation;

Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5][12 Hours]

UNIT – IV

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.

[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1] [12 Hours]

TEXT BOOK:

1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.
2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

Waves and Modern Physics
(Engineering Physics - 1)
I B.TECH – I SEMESTER **(CODE-18PH001)**
(Common for ECE, EEE, EIE)

Lectures	**4**	Tutorial	**0**	Practical	**0**	Credits	**3**
Continuous Internal Assessment			**50**	Semester End Examination (3hours)			**50**

Course Objectives Students will

- Familiarize the students in getting knowledge about modern optics and their Engineering applications
- Make aware of the students to obtain circuit knowledge regarding electrical, Electronics and Magnetism
- Understand the quantum theory and solving the various Physical problems using quantum mechanics.
- Gain the knowledge of various methods of analytical techniques for material testing

Course Outcomes: After studying this course, the students will be able to

CO1	Learn about principle and working of different types of lasers and their applications. Know about principle, types of optical fibers and their effective utilization in optical communications.
CO2	Analyze the electromagnetic principles in electrical and electronic circuits and Maxwell's equations.
CO3	Study about quantum mechanics and its applications.
CO4	Read about properties and applications of ultrasonics in various fields. Know about radio isotopes and their applications

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3			2		2									
CO2	3			3		3	2					2			
CO3	2	3		2											
CO4	2	3		2											
AVG	2.5	3		2.25		2.5	2					2			

SYLLABUS

UNIT-I
(ADVANCED OPTICS)

Lasers: Interaction of radiation with matter. Einstein co-efficients, Properties of laser,Population inversion, LASER principle, pumping schemes-Three level and four level laser, ypes of lasers: solid-state lasers (Ruby), gas lasers (He-Ne), Semiconductor lasers; applications of lasers in industry and medicine.

Fibre Optics: Importance of optical fibre, Structure and principle of optical fibre, acceptance angle and numerical aperture, Types of optical fibres based on modes and refractive index, V-number, losses associated with optical fibres, , fibre optical communication, advantages of optical fibres

UNIT-II
(ELECTRO-MAGNETIC INDUCTION AND MAXWELL'S EQUATIONS)

Maxwell's equations in vacuum and conducting medium. Velocity of electromagnetic wave in vacuum. Electromagnetic oscillations in LC circuit, LCR series resonance in A.C circuit and resonant frequency, Quality factor. Concept of skin effect, Energy in an electromagnetic field; Flow of energy and Poynting vector. Principle of circulating charge and cyclotron, Hall Effect.

UNIT-III
(MODERN PHYSICS)

Dual nature of light, Debroglie concept of matter waves, Davission-Germer experiment, Heisenberg uncertainty principle and applications (non existence of electron in nucleus and finite width of spectral lines), one dimensional time independent and dependent Schrodinger wave equation, physical significance of wave function, application of Schrödinger wave equation to particle in a one dimensional potential box, concept of quantum tunnelling and construction and working of Scanning Tunnelling Electron Microscope.

UNIT-IV
(ANALYTICAL TECHNIQUES)

Ultrosonics: Properties of ultrasonics, Production of ultrasonic waves by magnetostriction and piezo-electric method, Determination of velocity of ultrasonic wave in liquids by Ultrasonic interferometer. Medical applications, Ultrasonic Imaging technique(Doppler Ultrasound Imaging advantages and limitations), industrial applications, NDT : Pulse echo technique, Time of flight diffraction technique.

Nuclear Techniques: Radio isotopes and its applications (medical and Industrial), GM counter, Scintillation counter.

Text Books:

1. Engineering physics M.V. Avadhanulu, P.G.Kshirsagar S.Chand & Company Pvt. Ltd.
2. Engineering physics, Palani Swamy, Scitech publication
3. Reference books: 1. Basic engineering physics – Dr. P.srinivasa Rao, Dr.K.Muralidhar, Himalaya Publication
4. Applied physics - Dr. P. Srinivasa Rao, Dr. K. Muralidhar, Himalaya publication

Engineering Chemistry

I B.TECH – I SEMESTER **(Code: 18CY001**)

Lectures	**4**	Tutorial	**0**	Practical	**0**	Credits	**3**
Continuous Internal Assessment			**50**	Semester End Examination (3hours)			**50**

Prerequisites: None

Course Objectives: Students will

- Learn The principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.
- Understand the thermodynamic concepts, energy changes, concept of corrosion & its control.
- Know the conventional energy sources, solid, liquid and gaseous Fuels & Knowledge of knocking and anti-knocking characteristics
- Gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

Course Outcomes: After studying this course, students will be able to:

CO1	Develop and innovative methods to produces of water for industrial use and potable water at cheaper cost.
CO2	Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion.
CO3	Have the capacity of applying energy sources efficiently and economically for Various needs.
CO4	Design economically and new methods of organic synthesis and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3	2	3		2	3					3			
CO2	2	3	2	3		2	3					3			
CO3	2	3	2	3		2	3					3			
CO4	2	3	3	3		2	3					3			
AVG	2	3	2.25	3		2	3					3			

SYLLABUS

UNIT I: Water Chemistry

Introduction: water quality parameters
Characteristics: Alkalinity, Hardness - Estimation & simple numerical problems,
Boiler Troubles - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;
Internal conditioning - phosphate, calgon and carbonate methods.
External conditioning - Ion exchange process & Zeolite proess
WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection

methods: Chlorination, ozonization and UV treatment.
Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.

UNIT II

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.
Corrosion: Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion, **Corrosion control** – Cathodic protection, and electro plating (Au) & electoless Ni plating.

UNIT III: Fuels

Classification of fuels; Calorific value of fuels (lower, higher)
Solid fuels: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking,
Liquid Fuels: Petroleum refining and fractions, composition and uses. Knocking and anti-knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods of preparation and advantages **Gaseous fuels:** CNG and LPG, Flue gas analysis – Orsat apparatus.

UNIT IV

Organic reactions and synthesis of a drug molecule
Introduction to reactions involving substitution (SN^1, SN^2), addition (Markownikoff's and anti-Markwnikoff's rules) , elimination (E1 & E2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol)
Polymers: Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermoplasts and thermosetting plastics, Bskelite and PVC.
Bio degradable polymers: types, examples-Polyhydroxy buterate (PHB), Polyhydroxy buterate-co-β-hydroxy valerate (PHBV), applications.

TEXT BOOKS:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi 17th edition (2017).
2. Seshi Chawla, "Engineering Chemistry" Dhanpat Rai Pub, Co LTD, New Delhi 13 th edition, 2013.

REFERENCES:

1 Essential Of Physical Chemistry by Arun Bahl, B.S. Bahl, G.D.Tuli, by Arun Bahl, B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012.
2 Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).
3 Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015

Environmental Studies

I B.Tech – I Semester **(Code: 14CE001)**

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives: Students will

- Develop an awareness, knowledge, and appreciation for the natural environment
- Understand different types of ecosystems exist in nature.
- Understand different types of pollutants present in Environment.
- Gain awareness among the youth on environmental concerns important in the long-term interest of the society

Course Outcomes: After studying this course, the students will be able to

CO1	Develop an appreciation for the local and natural history of the area.
CO2	Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people's movements focusing on environment.
CO3	Know how to manage the harmful pollutants. Gain the knowledge of Environment.
CO4	Create awareness among the youth on environmental concerns important in the long- term interest of the society

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1						3	3					2			
CO2						3	3					2			
CO3						3	3					2			
CO4						3	3					2			
AVG						3	3					2			

SYLLABUS

UNIT – I

Introduction: Definition, Scope and Importance, Need for public awareness. Ecosystems: Definition, Structure and Functions of Ecosystems, types - Forest, Grassland, Desert, Aquatic (Marine, pond and estuaries).

Biodiversity: Definition and levels of Biodiversity; Values of Biodiversity - Consumptive, Productive, Social, Aesthetic, Ethical and Optional; Threats and Conservation of Biodiversity; Hot Spots of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation. Chipko movement case study

UNIT – II

Natural resources: Land: Land as a resource, Causes and effects of land degradation - Soil erosion, Desertification. **Forest**: Use of forests, Causes and effects of deforestation, Afforestation, Mining - benefits and problems. **Water**: Uses, floods and drought, Dams - benefits and problems.

Energy: Importance of energy, Environmental Impacts of Renewable and Non-renewable energy resources. Silent Valley Project and Narmada Bachao Andolan case studies 8 periods

Sustainability: Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water harvesting and Watershed management.6 periods + 6 hours field work/Demonstration

UNIT – III

Pollution: Definition; Causes, effects and control of air, water and nuclear pollution; Chernobyl Nuclear Disaster case study; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermicomposting. 12 periods

Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act. 6 periods

UNIT – IV

Environmental issues: Green house effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment. Environmental Standards (ISO 14000, etc.)12 periods

Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare).6 periods

Field work: Visit to a local area to document environmental assets – Pond/Forest/Grassland. Visit to a local polluted site- Urban and industry/ Rural and Agriculture.6 hrs.

TEXT BOOKS:

1. Environmental Studies‖ by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Comprehensive environmental studies‖- JP Sharma, Laxmi Publications.
3. Text Book of environmental Studies – Erach Bharucha

REFERENCE BOOKS:

1. Environmental studies‖, R.Rajagopalan, Oxford University Press.
2. Introduction to Environmental Science‖, Anjaneyulu Y, B S Publications
3. Environmental Science‖, 11th Edition – Thomson Series – By Jr. G. Tyler Miller.

Problem Solving using Programming
(Common for all branches except Civil Engineering)
I B.Tech – I Semester **(Code: 18CS001)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Understand basic concepts of C-Programming such as: C-tokens, Operators, Input/ output, and Arithmetic rules.
- Develop problem solving skills to translate "English" described problems into Programs written using C language
- Apply pointers for parameter passing, referencing and differencing and linking data structures
- Know how to Manipulate variables and types to change the problem state, including numeric, character, array & pointer types, as well as the use of structures and unions, File

Course Outcomes: After the course, the students are expected to be able to

CO1	Formulate simple algorithms for arithmetic and logical problems and remember the basics of computer fundamentals of computer history.
CO2	Translate the algorithms to programs also to test and execute the programs and correct syntax and logical errors and implementing conditional branching, iteration and recursion.
CO3	Analyze the problem for its decomposition into functions.
CO4	Understand the file handling and dynamic memory allocation using c programming language.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3			3							1		2	2
CO2	3	3			3							1		2	2
CO3	3	3			3							1		2	2
CO4	3	3			3							1		2	2
AVG	3	3			3							1		2	2

SYLLABUS

UNIT I (17 Periods)

Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing I/O Operations. Decision Making and Branching.

Programming Exercises for Unit I: C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic and logical errors in a given program, output of a given program, values of variables at the end of execution of a program fragment,Programs using Scientific and Engineering formulae. Finding the largest of the

three given numbers. Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, finding given year is leap year or not, and conversion of lower case character to its upper case.

UNIT II **(17 Periods)**

Decision Making and Looping, Arrays, Character Arrays and Strings.

Programming Exercises for Unit II: To print the sum of the digits of a given number and to display the image of a given number. To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number.To print graphic patterns of symbols and numbers.To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not with and without using String Handling Functions. Transpose of a matrix and sorting of names using arrays.

UNIT III **(18 Periods)**

User-defined Functions,Structures and Unions,Pointers

Programming Exercises for Unit - III: Functions - Recursive functions to find factorial & GCD (Greatest Common Divisor), string operations using pointers and pointer arithmetic. Swapping two variable values. Sorting a list of student records on register number using array of pointers

UNIT IV **(18 Periods)**

File Management in C,Dynamic Memory Allocation,Preprocessor

Programming Exercises for Unit - IV: Operations on complex numbers, and to read an input file of marks and generate a result file, sorting a list of names using command line arguments. Copy the contents of one file to another file. Allocating memory to variables dynamically.

Text Book:

1. Programming in ANSI C by E.Balaguruswamy,Fifth Edition.

References:

1. Kernighan BW and Dennis Ritchie M, ―C programming language‖, 2nded, Prentice Hall.
2. Yashavant P. Kanetkar, ―Let us C‖, BPB Publications.
3. Herbert Schildt, ―C: The Complete Reference‖, 4th edition, Tata Mcgraw-Hill.
4. Ashok N.Kamthane, ―Programming in C‖, PEARSON 2nd Edition

Engineering Chemistry Laboratory

(Common to all branches)

I B.Tech – I Semester **(Code: 18CYL01)**

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: Students will be able

- Learn basics of chemistry lab to carry out the qualitative and quantitative analysis of any given sample.
- To determine the percentage purity of washing soda bleaching powder and given salt. The measurement of quality parameters of water to check its suitability for domestic and industrial purpose
- To estimate the characteristic properties of oil for its use at various level
- To synthesize the Soap, Resin and Aromatic Ester followed by their applications. The use and utility of some instruments like PH meter, Conductometer and Potentiometer for various applications

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

CO1	Familiar with fundamental basics of Chemistry lab
CO2	Estimate purity of washing soda, bleaching powder and quantity of Iron and other salts.
CO3	Gain the knowledge regarding the quality parameters of water& oil like salinity, hardness, alkalinity saponification and iodine value.etc.
CO4	Prepare high polymers and soap & Instrumentation techniques

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2								2						
CO2	2	2	2	2		2			2			2			
CO3	2	2	2	2		2			2			2			
CO4	2	2	2	2					2			2			
AVG	2	2	2	2		2			2			2			

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).

2. **Volumetric Analysis:**
   a. Estimation of Washing Soda.
   b. Estimation of Active Chlorine Content in Bleaching Powder
   c. Estimation of Mohr's salt by permanganometry.
   d. Estimation of given salt by using Ion-exchange resin using Dowex-50.

3. **Analysis of Water:**
   a. Determination of Alkalinity of Tap water.

b. Determination of Total Hardness of ground water sample by EDTA method
c. Determination of Salinity of water sample

4. **Estimation of properties of oil:**
   a. Estimation of Acid Value
   b. Estimation of Saponification value
5. **Preparations:**
   a. Preparation of Soap
   b. Preparation of Urea-formaldehyde resin
   c. Preparation of Phenyl benzoate
6. **Demonstration Experiments (Any two of the following):**

   a. Determination of p^H of given sample.
   b. Determination of conductivity of given sample by conductometer.
   c. Potentiometric Determination of Iron.

TEXT BOOKS (for Chemistry 1 and 2):

1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons, Hyderabad, 2009.
2. Inorganic quantitative analysis, Vogel, 5^{th} edition, Longman group Ltd. London, 1979.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R.n. Goyal and HarrmendraGoel.
2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

Hardware Lab

I B.Tech – I Semester **(Code: 18ECL12)**

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: Students will be able to

- Learn How Identification and Testing of Various Circuit Elements.
- Show How to Measure Voltage, Frequency and Phase of Any Waveform Using CRO
- Learn How to Calculate Voltage & Current using Circuit Theorems.
- Observe Characteristics of Electronic Devices.

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

CO1	Identify and Test Various Electronic Circuit Components.
CO2	Measure Voltage, Frequency and Phase of Different Waveforms Using CRO
CO3	Plot the characteristics of P-N Junction and Zener Diode and Measure the performance characteristics.
CO4	Calculate the Currents and Voltages of a circuit using Thevenin‘s & Norton’s Theorems

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO’s												**PSO’s**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2			3					3				3	1	
CO2		2		3					3				3	1	
CO3	2			3					3				3	1	
CO4		3		3					3				3	1	
AVG	2	2.5		3					3				3	1	

List of Lab Experiments

1. Identification and testing of various circuit elements
2. Study of CRO and Function Generator.
3. Study of RPS Multimeter.
4. Verification of KCL and KVL.
5. Testing of basic gates.
6. Realization of basic gates using discrete components.
7. V-I characteristics of Diode.
8. V-I characteristics of Zener Diode.
9. Verification of Thevenin‘s Theorem.
10. Component testing using CR

Problem Solving using Programming Lab

I B.Tech – I Semester **(Code: 18CSL01)**

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: Students will

- Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, Arithmetic rules.
- Develop problem solving skills to translate "English" described problems into Programs written using C language
- Apply pointers for parameter passing, referencing and differencing and linking data structures.
- Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

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

CO1	Learn the challenge, pick and analyze the appropriate data representation formats and algorithms.
CO2	Choose the best programming construct for the job at hand by comparing it to other structures and considering their constraints.
CO3	Develop the program on a computer, edit, compile, debug, correct, recompile and run it.
CO4	Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3			3				3						
CO2		2	3		3				3						
CO3		2	3		3				3						
CO4		3	2		3				3						
AVG	3	2.5	2.67		3				3						

List of Lab Programs

1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if else statement).

Domestic Customer		
Consumption Units	**Consumption Units**	
0 – 200	0.50 per unit	
201 – 400	100 plus	0.65 per unit
401 – 600	230 plus	0.80 per unit
601 and above	390 plus	1.00 per unit

Domestic Customer		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 50	0.50 per unit	
100 – 200	50 plus	0.60 per unit
201 – 300	100 plus	0.70 per unit
301 and above	200 plus	1.0 per unit

2. Write a C program to evaluate the following (usingloops):
   a) $1 + x^2/2! + x^4 / 4!+ \ldots$upto tenterms
   b) $x + x^3/3! + x^5/5!+ \ldots$ upto ten terms
3. Write a C program to check whether the given numberis
   a) Prime or not.
   b) Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
   a) Mean
   b) Mode
   c) Median
   d) Variance.
5. WriteaCprogramtoreadalistofnumbersandperformthefollowingoperations
   a) Print the list.
   b) Delete duplicates from the list.
   c) Reverse the list.
6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message "Element not found in the List".
7. Write a C program to read two matrices and compute their sum and product.
8. Write a C program to read list of student names and perform the following operations
   a) To print the list of names.
   b) To sort them in ascending order.
   c) To print the list after sorting.
9. Write a C program that consists of recursive functions to
   a) Find factorial of a given number
   b) Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.
10. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message "required copies not in stock" is displayed. Write a program for the above in structures with suitable functions.
11. Write a C program to read a data file of students' records with fields(Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40%) to adata file.
12. Write a C program to read a file as command line argument and count the given word frequency in a file.

Numerical Methods and Advanced Calculus

I B.Tech –II Semester **(Code: 18MA002)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
- Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
- Evaluate double and triple integrals and apply them to find areas and volumes.
- Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

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

CO1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO3	Find the area and volume of plane and three dimensional figures using multiple integrals.
CO4	Apply vector integral theorems to obtain the solutions of engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2									2			
CO2	3	3	2									2			
CO3	3	3	2									2			
CO4	3	3	2									2			
AVG	3	3	2									2			

SYLLABUS

UNIT - I

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.

[Sections: 28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2] [12 Hours]

UNIT - II

Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals;

Lagrange‘s interpolation formula; Divided differences; Newton‘s divided difference formula; Numerical integration; Trapezoidal rule; Simpson‘s one-third rule; Simpson‘s three-eighth rule; Numerical solution of ODE‘s: Introduction; Picard‘s method; Euler‘s method; Runge-Kutta method.
[Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1;32.2; 32.4; 32.7] [12 Hours]

UNIT – III

Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integrals, Change of variables.
[Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2] [12 Hours]

UNIT – IV

Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green‘s theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof).
[Sections: 8.4; 8.5.1; 8.5.3; 8.6; 8.11; 8.12; 8.13; 8.14; 8.16] [12 Hours]

TEXT BOOK:

1. B.S.Grewal, ―Higher Engineering Mathematics‖, 44thedition, Khanna publishers, 2017

REFERENCE BOOKS:

1. [1] ErwinKreyszig, ―Advanced Engineering Mathematics‖, 9th edition, John Wiley & Sons.
2. [2] N.P.Bali and M.Goyal, ―A Text book of Engineering Mathematics‖ Laxmi Publications, 2010

Basic Instrumentation

I B.Tech – II Semester (Code: 18EC202)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Learn basic concepts of measurements and Instrumentation.
- Outline working of various bridges and their applications
- Summarize the uses of CRO in measurements
- Describe the different types of transducers and data acquisition systems

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

CO1	Analyze the basic Measurement standards and the concepts of Electro mechanical
CO2	Summarize the concepts of Bridge Circuits for measuring the instrumental parameters.
CO3	Demonstrate the working of various Oscilloscopes.
CO4	Illustrate the functionality of several transducers and Data Acquisition Systems.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3											2	2	
CO2	3	2											2	2	
CO3	3	2											2	2	
CO4	3	3											2	2	
AVG	3	2.5											2	2	

SYLLABUS

UNIT-I

Measurement and Error

Definitions: Measurement, Standard, Instrument, Calibration, Instrumentation Accuracy, Precision, Significant figures, Sensitivity, Resolution, Threshold, and Linearity. Types of error,

Limiting Errors: Definition, Combination of Limiting errors, Statistical analysis, Probability of errors.

Electromechanical Indicating Instruments

Permanent Magnet Moving Coil Mechanism, DC Ammeters, DC Voltmeters, Voltmeter Sensitivity, Series type Ohmmeter, Shunt type Ohmmeter, **Alternating Current indicating Instruments:** Principle and working of Electro dynamo meter

UNIT-II

Bridge Measurements

Introduction, Wheatstone Bridge, Kelvin Bridge, Kelvin's Double Bridge, **AC Bridges:** Maxwell Bridge, Hay Bridge, Schering Bridge, Wein Bridge.

Electronic Instruments for measuring Basic Parameters

AC voltmeter using rectifiers, True RMS-Responding voltmeter, **Q Meter:** Basic Q-meter circuit, Measurement methods, Sources of error**.**

UNIT-III

Oscilloscopes

Introduction, Block diagram and working of CRO and Cathode Ray Tube (CRT), **Oscilloscope Techniques:** Frequency determination, Phase angle and Time delay measurement, **Special Oscilloscopes**: Working of Storage Oscilloscope, Sampling Oscilloscope, and Digital Storage Oscilloscope.

Frequency Counter

Working of Simple frequency counter

UNIT-IV

Transducers as Input Elements to Instrumentation Systems

Classification of Transducers, Selection criteria of Transducer, **Strain gauges:** Principle of Strain gauge, Derivation for gauge factor of a strain gauge, **Displacement Transducers:** Resistive potentiometers, LVDT, Capacitive transducers (i) Variable gap type (ii) Variable area type (iii) Variable dielectric type. **Temperature Measurements:** Principle and operation of RTD, Thermistor, Thermocouples

Analog and Digital Data Acquisition Systems

Introduction to Instrumentation systems, Block diagram and working of Digital data acquisition system

TEXT BOOK:

1. Modern Electronic Instrumentation and Measurement Techniques by W.D Cooper & A.D Helfrick PHI, 2008.

REFERENCE BOOKS:

1. A Course in Electrical and Electronics Measurements and Instrumentation by Sawhney. A.K**,** 18th Edition, DhanpatRai& Company Private Limited, 2007.
2. Electronic Instrumentation by H S Kalsi, Tata McGraw-Hill Education, 1995.

Programming with C++

I B.Tech – II Semester (Code: 18EC203)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: C Language

Course Objectives: Students will

- Develop a greater understanding of the issues involved in programming language design and implementation
- Develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.
- Implement several programs in languages other than the one emphasized in the core curriculum (C++).
- Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, parameter passing.

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

CO1	Learn the features of C++ supporting object oriented programming.
CO2	Understand the relative merits of C++ as an object oriented programming
CO3	Apply the major object-oriented concepts to implement object oriented programs in C++, encapsulation, inheritance and polymorphism.
CO4	Analyze advanced features of C++ specifically stream I/O, templates and operator over loading.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3				3							1			2
CO2	3	2			3							1			2
CO3	3	2			3							1			2
CO4	2	3			3							1			2
AVG	2.67	2.33			3							1			2

SYLLABUS

UNIT I

Introduction: Basic concepts of OOP, benefits and applications of OOP, what is C++, applications of C++, C++ statements, structure of a C++ program, creating the source file, compiling and linking. C++ tokens, keywords, identifiers and constants, data types in C++, operators in C++,symbolic constants, type compatibility, declaration of variables, dynamic initialization of variables, reference variables, scope resolution operator, member dereferencing operator, memory management operator, type cast operator, expressions and their types, special assignment expressions, implicit conversions, operator overloading, operator precedence, control structures. C++ streams and stream classes, unformatted I/O operations, formatted I/O operations, managing output with manipulators

UNIT II

Functions in C++: main function, function prototyping, call by reference, return by reference, inline functions, default arguments, const arguments, function overloading, friend and virtual functions. **Classes and objects**: specifying a class, defining member functions, nesting member functions, private member functions, static data members and member functions, arrays of objects, objects as function arguments, returning objects, local classes.

UNIT III

Constructors and Destructors: constructors, parameterized constructors, multiple constructors in a class, constructors with default arguments, dynamic initialization of objects, copy constructor, dynamic constructor, const objects, destructors. Defining Operator overloading, overloading unary and binary operators, overloading binary operators using friends, rules for operator overloading, manipulation of strings using operators.

UNIT IV

Pointers, pointers to objects, this pointer, pointers to derived classes, pure virtual functions. Inheritance: single inheritance, making a private member inheritance, multilevel inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, abstract classes.

TEXT BOOK

1. Object oriented programming with C++, Balagurusamy, 4th edition, Tata McGraw-Hill publications, 2008.

REFERENCE BOOKS

1. Object oriented programming with ANSI and turbo C++, Ashok N.Kamthane, Pearson Education, 2005.
2. C++ programming language by Bjarne Stroustup,3rd edition, Pearson education,2009.

Communicative English

I B.Tech – II Semester (Code: 18EL001)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: Students will learn how

- To comprehend the importance, barriers and strategies of listening skills in English.
- To illustrate and impart practice Phonemic symbols, stress and intonation.
- To practice oral skills and receive feedback on learners' performance.
- To practice language in various contexts through pair work, role plays, group work and dialogue conversations.

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

CO1	Understand how to build academic vocabulary to enrich their writing skills
CO2	Produce accurate grammatical sentences
CO3	Analyse the content of the text in writing
CO4	Produce coherent and unified paragraphs with adequate support and detail

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1								2	2	3		2			
CO2								2	2	3		2			
CO3								2	2	3		2			
CO4								2	2	3		2			
AVG								2	2	3		2			

SYLLABUS

UNIT-I

1.1 **Vocabulary Development:** Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes
1.2 **Essential Grammar:** Prepositions, Conjunctions, Articles
1.3 **Basic Writing Skills:** Punctuation in writing
1.4 **Writing Practices:** Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive)

UNIT-II

2.1 **Vocabulary Development:** Synonyms and Antonyms
2.2 **Essential Grammar:** Concord, Modal Verbs, Common Errors
2.3 **Basic Writing Skills:** Using Phrases and clauses
2.4 **Writing Practices:** Hint Development, Essay Writing

Unit III

3.1 **Vocabulary Development:** One word Substitutes
3.2 **Essential Grammar:** Tenses, Voices
3.3 **Basic Writing Skills:** Sentence structures (Simple, Complex, Compound)
3.4 **Writing Practices:** Note Making

Unit IV

4.1 **Vocabulary Development:** Words often confused
4.2 **Essential Grammar:** Reported speech, Common Errors
4.3 **Basic Writing Skills:** Coherence in Writing: Jumbled Sentences
4.4 **Writing Practices:** Paraphrasing & Summarising

Reference Books

1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press: 2011.
2. Practical English Usage, Michael Swan. Oxford University Press: 1995.
3. Remedial English Grammar, F.T.Wood. Macmillan: 2007.
4. Study Writing, Liz Hamp lyons & Ben Heasley. Cambridge University Press

Circuit Theory

I B.Tech – II Semester (Code: 18EC205)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Engineering Physics

Course Objectives: Students will learn

- Basics of circuit analysis-KVL, KCL, Mesh analysis and Nodal Analysis
- Basics of circuit analysis using star and delta models
- Analysis of dc/ac electric circuits and important theorems of circuit analysis
- Illustrate the transient response of source free and driven RL, RC circuits

Course Outcomes: After studying this course, the students will be able to

CO1	Solve various DC circuits using reduction techniques.
CO2	Apply Nodal and Mesh techniques to analyze electrical circuits.
CO3	Analyze the circuits using network theorems.
CO4	Analyze basic RL and RC circuits, including the transient response, to understand their time-dependent behavior and responses under different driving conditions.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											2		
CO2	3	3											2		
CO3	3	3											2		
CO4	3	3											2		
AVG	3	2.75											2		

SYLLABUS

UNIT – I

Voltage and current Laws: Introduction, nodes, paths, loops and branches, Kirchhoff's current and voltage laws, series and parallel connected sources, resistors in series and parallel, voltage and current division.**[CHAPTER-3]**

Basic Nodal and Mesh Analysis: Nodal analysis, the super node, Mesh analysis, and The super mesh, Nodal vs. Mesh analysis: A comparison **[CHAPTER-4]**

UNIT II

Useful circuit analysis techniques: Linearity and superposition, source transformations, Thevenin and Norton equivalent circuits, maximum power transfer Theorem, Reciprocity Theorem, and delta-wye conversion. **[CHAPTER-5]**

UNIT III

Basic RL and RC Circuits: The source free RL circuit, properties of the exponential response, the source free RC circuit, driven RL circuits, natural and forced response, driven RC circuits. **[CHAPTER-8]**

UNIT IV

Frequency Response: Parallel Resonance, quality factor, Damping factor, Bandwidth and High Q circuits, Series resonance, other resonant forms, scaling. **[CHAPTER-16]**

TEXT BOOK:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, Engineering Circuit Analysis, 8th Edition, Tata McGraw Hill, 2016.

REFERENCE BOOKS:

1. Circuits & Networks: Analysis and Synthesis, A.Sudhakar and ShyammohanS.Pilli, Tata McGraw Hill, 2007.
2. Network Analysis, M. E. Vanvalkenburg, 3rd Edition, PHI, 2003.

Physics Laboratory

I B.Tech – II Semester (Code: 18PHL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre-Requisite: None.

Course Objectives: Students will learn

- Basic experiments such as Magnetic Field Measurements, Hall Effect and LCR resonance give the knowledge to apply them in magnetic applications
- The experiments CRO, Solar Cell, LASER diode provides the thorough understanding of OPTO Electronic devices useful in Engineering and Industrial applications
- The measurements relating to various physical parameters of materials make the student to understand their utility, design and fabrication of several devices.

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

CO1	Acknowledge the important aspects of earth magnetic field, realize the use of Maxwell's equations in various magnetic applications
CO2	Realization of material properties and parameters.
CO3	Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications.
CO4	Study The All Electronic Components like Diode, CRO

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2		3					2						
CO2	3	2		3					2						
CO3	3	2		3					2						
CO4	3	2		3					2						
AVG	3	2		3					2						

List of Experiments

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. Study the variation of intensity of magnetic field along the axis of a circular coil using Stewart-Gee's apparatus.
3. Determination of thickness of thin wire using air wedge interference bands.
4. Determination of wavelengths of mercury spectrum using grating normal incidence method.
5. Determination of dispersive power of a given material of prism using prism minimum deviation method.
6. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the

resonant frequency.

7. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
8. Verify the laws of transverse vibration of stretched string using sonometer.
9. Determine the rigidity modulus of the given material of the wire using Torsional pendulum.
10. Draw the load characteristic curves of a solar cell.
11. Determination of Hall coefficient of a semiconductor.
12. Determination of voltage and frequency of an A.C. signal using C.R.O.
13. Determination of Forbidden energy gap of Si &Ge.
14. Determination of wavelength of laser source using Diode laser.

Any three experiments are virtual

TEXT BOOK:

1. Engineering physics laboratory manual P.Srinivasarao & K.Muralidhar, Himalaya publications.

Programming with C++ Lab

I B.Tech – II Semester (Code: 18ECL22)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre-Requisite: C Language.

Course Objectives: Students will be able to

- Understand advantages of C++ programming over procedural oriented programming learn the basics of variables, operators, control statements, arrays, classes and objects.
- Understand, write and implement the following concepts: Inheritance, Interfaces, Packages, Strings and Collections
- Understand and write programs on Exception Handling, I/O, and Multithreading
- Understand and implement applications using Applets, AWT, Swings and Events

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

CO1	Understand basics of variables and operators such as variables, conditional and iterative execution methods etc.
CO2	Identify classes, objects, members of a class and relationships among them needed for a specific problem and Write C++ principles and proper program
CO3	Demonstrate the concepts of polymorphism, inheritance, packages and interfaces.
CO4	Write C++ to implement error-handling techniques using exception handling

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3				3										
CO2	3				3										
CO3	3				3										
CO4		2	2		3										
AVG	3	2	2		3										

List of Lab Programs

Write C++ programs to illustrate the concept of the following:

1. Arrays
2. Structures
3. Pointers
4. Objects and Classes
5. Console I/O operations
6. Scope resolution and memory management operators
7. Inheritance
8. Polymorphism
9. Virtual Functions

10. Friend Functions
11. Operator overloading
12. Function overloading
13. Constructors and Destructors
14. Pointers
15. File I/O operations

Note: A minimum of ten programs are to be executed and recorded to attain eligibility for University Practical examination.

English Communication Skills Laboratory

I B.Tech – II Semester (Code: 18ELL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: Students will be able

- To comprehend the importance, barriers and strategies of listening skills in English
- To illustrate and impart practice Phonemic symbols, stress and intonation.
- To practice oral skills and receive feedback on learners' performance.
- To practice language in various contexts through pair work, role plays, group work and dialogue conversations

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

CO1	Better understand the nuances of English language through audio- visual experience and group activities
CO2	Develop neutralization of accent for intelligibility
CO3	Build confidence to enhance their speaking skills
CO4	Use effective vocabulary both in formal and informal situations

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1									3	2		2			
CO2									3	2		2			
CO3									3	2		2			
CO4									3	2		2			
AVG									3	2		2			

Syllabus

UNIT-I

- Listening Skills; Importance – Purpose- Process- Types
- Barriers to Listening
- Strategies for Effective Listening

UNIT-II

- Phonetics; Introduction to Consonant, Vowel and Diphthong sounds
- Stress
- Rhythm
- Intonation

UNIT-III

- Formal and Informal Situations
- Expressions used in different situations

Introducing Yourself & Others-Greeting & Parting-Congratulating- Giving Suggestions & Advices-Expressing Opinions-Inviting People- Requesting-Seeking Permission-Giving

Information- Giving Directions- Sympathizing- Convincing People- Complaining & Apologizing-Thanking Others- Shopping- Travelling- Conversational Gambits

UNIT-IV

- JAM Session
- Debates
- Extempore

Reference Books:

1. Communication Skills, Sanjay Kumar and PushpaLata. Oxford University Press. 2011
2. Better English Pronunciation, J.D. O' Connor. Cambridge University Press:1984
3. New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:2015
4. English Conversation Practice, Grant Taylor. McGraw Hill:2001

Software:

1. Buzzers for conversations, New Interchange series
2. English in Mind series, telephoning in English
3. Speech Solutions, A Course in Listening and Speaking

Probability and Statistics

II B.Tech – I Semester **(**CODE: 18MA003**)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Outcomes: Students will be able to

- Apply the continuous probability densities to various problems in science and engineering.
- Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, T-test to various real-life problems
- Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the Population based on sample data.
- Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

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

CO 1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO 2	Perform Test of Hypothesis for a population parameter for single sample.
CO 3	Perform Test of Hypothesis for population parameters for multiple samples.
CO 4	Interpret the results of correlation, regression and one way ANOVA for the given data.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3										2			3
CO2	3	3	2									2			3
CO3	3	3	2									2			3
CO4	3	3	3									2			3
AVG	3	3	2.33									2			3

SYLLABUS

UNIT – I

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Joint Distributions (Discrete), Joint Distributions (Continuous). Populations and Samples, Law of large numbers, Central limit theorem and its applications, The sampling distribution of the mean (σ unknown), The sampling distribution of the variance.

(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.10, 6.1, 6.2, 6.3, 6.4 of Text Book [1])

UNIT – II

Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean, Comparisons-Two independent Large samples, Comparisons-Two independent small samples, Paired sample t test.
(Sections 7.1,7.2, 7.4, 7.5, 7.6, 8.2, 8.3, 8.4 of Text Book [1])

UNIT-III

The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances, Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions, Procedure for Analysis of Variance (ANOVA) for comparing the means of k (>2) groups- one way classification (Completely randomized designs), Procedure for Analysis of Variance (ANOVA) for comparing the means of k (>2) groups- two-way classification (Randomized block designs).
(Sections 9.1, 9.2, 9.3, 10.1, 10.2, 10.3, 12.2, 12.3 of Text Book [1])

UNIT -IV

MULTIVARIATE ANALYSIS: The concept of bivariate relationship, scatter diagram, Pearson's correlation and correlation matrix. Simple linear regression model and assumptions, Least Squares Estimation of the parameters of the model, Testing the significance of the model. Regression versus Correlation, Multiple linear regression model with k explanatory variables and assumptions of the model. Least Square Estimation of regression coefficients. Concept of the coefficient of determination R^2 .Test for significance of the regression model and individual regression coefficients. Applications of multiple regression analysis.

TEXT BOOKS:

1. Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.
2. Introduction to Linear Regression Analysis, Douglas C. Montgomery, E.A. Peck and G.G. Vining, 3rdedition, Wiley.

REFERENCE BOOKS:

1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI.
2. Fundamentals of Mathematical Statistics, S.C.Gupta and V.K.Kapoor,11th Edition, Sultan Chand & Sons.
3. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics',Schaum's outline series.
4. K.V.S.Sarma,'Statistics Made Simple – Do it yourself on PC',Prentice Hall India, Second Edition, 2015.

Data Structures using 'Python'

II B.Tech – I Semester (CODE: 18EC302)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Learn the features of python and fundamentals of python programming.
- Implement the linear data structures like linked list, stacks, queues and double ended queues using python.
- Understand the concept of trees, tree traversal techniques and its implementations using python
- Understand the Concept of graph representations and searching techniques implementations using python

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

CO1	Demonstrate the Python programming skills to solve engineering problems.
CO2	Apply python programming to linear and non-linear data structures for efficient memory management.
CO3	Analyze various trees and demonstrate tree traversal techniques.
CO4	Interpret graphs and evaluate various traversal algorithms.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3			2									2	2
CO2	2	3			2									2	2
CO3	2	3			2									2	2
CO4	2	3			2									2	2
AVG	2	3			2									2	2

SYLLABUS

UNIT – I

PYTHON PRIMER: Python overview, objects in Python, Expressions, operators and precedence, Control flow, functions, simple Input and Output, Iterators and generators, additional python conveniences, Scopes and namespaces, Modules and the import statement.

ARRAY-BASED SEQUENCES: python's sequence types, low- level arrays, dynamic arrays and amortization, efficiency of python's sequence types: python's list and tuple classes, python's string class.

UNIT – II

LINKED LISTS: Singly linked list, circularly linked list, doubly linked list

STACKS: The stack abstract data type, Simple array-based stack implementation, reversing data using a stack, implementing stack with a linked list

QUEUES: the queue abstract data type, Array based queue implementation, implementing queue with a linked list.

DOUBLE-ENDED QUEUES: the DE queue abstract data type, implementing a de queue with a circular array, implementing de queue with a linked list, de queues in the python collections module

UNIT – III

TREES: tree definitions and properties, tree abstract data type, computing depth and height, binary trees, linked structure for binary tree, Array-based representation of a binary tree, tree traversal algorithms, binary search trees, AVL trees.

UNIT – IV

GRAPH: The graph ADT, Edge list structure, Adjacency list structure, Adjacency map structure, Adjacency matrix structure, Graph traversal algorithms: depth first search, breadth first search, minimum spanning trees.

TEXT BOOKS

1. "Data Structures & Algorithms", Michael T. GoodRich, Roberto Tamassia, Michael H. Goldwasser.John Wiley & sons ,2013

REFERENCES

1. " Introduction to programming using python", Y.Daniel Liang, Pearson, 2013.
2. "Introducing Python- Modern Computing in Simple Packages", Bill Lubanovic ,O_Reilly Publication, 1st Edition, 2015.
3. "Core python programming",R. NageswaraRao, Dreamtech, 2017.
4. "Programming in Python 3", Mark Summerfield, Pearson Education, 2nd Edition
5. "Beginning Python –From Novice to Professional", Magnus Lie Hetland, APress Publication, 3rdEdition, 2017

Electronic Devices and Circuits

II B.Tech – I Semester (CODE: 18EC303)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Outcomes: Students will

- Describe the characteristics of the p-n junction diode and some special function diodes.
- Obtain knowledge about the operation of different types of Rectifiers.
- Understand the operation and characteristics of B.J.T and the concepts of Transistor biasing and thermal stabilization.
- Understand the operation and characteristics of FET, MOSFET and the Operation Characteristics of PNPN and other electronic devices.

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

CO 1	Describe the characteristics of various semiconductor diodes.
CO 2	Analyze and Design of various rectifier circuits with and without filters.
CO 3	Analyze the BJT characteristics the biasing techniques.
CO 4	Describe the characteristics of FET and PNPN devices.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											2		
CO2	3	3	2										2		
CO3	3	3											2		
CO4	3	2											2		
AVG	3	2.5	2										2		

SYLLABUS

UNIT – I

THE P-N DIODE: Volt-Ampere equation, The Temperature Dependence of P-N characteristics, Diode Resistance (Static and Dynamic), Space Charge Capacitance, Diffusion Capacitance.

Special Diodes: Varactor Diode, Break Down diodes, Tunnel Diode, V-I characteristics of Tunnel Diode with the help of Energy Band Diagrams, Photo Diode, Light emitting diode.

UNIT II

RECTIFIERS: Half wave, Full wave and Bridge Rectifiers without filter and with inductor filter, Capacitor filter, L section and π- section filters.

UNIT III

TRANSISTORS CHARACTERISTICS: The Junction transistor, Transistor current

components, Transistor as an amplifier, Common Base Configuration, Common Emitter Configuration, CE cutoff region, CE Saturation region, CE current gain, Common Collector Configuration, Photo Transistor.

TRANSISTOR BIASING AND THERMAL STABILIZATION: Operating point, Bias Stability, Self-Bias, Stabilization against variations in ICO, VBE, and β, Bias Compensation, Thermistor and Sensistor compensation, Thermal runaway, Thermal stability.

UNIT IV

FIELD EFFECT TRANSISTORS: The Junction Field Effect Transistor, Pinch-Off voltage, JFET V-I Characteristics, FET Small signal model, Metal-Oxide-Semiconductor FET.

PNPN and Other Devices: SCR, DIAC, TRIAC, UJT and The Phototransistor (their characteristics only).

TEXT BOOK:

1. Integrated Electronics-Jacob Millman, Chritos C. Halkies,TataMc-Graw Hill, 2009.
2. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, Tata McGraw Hill, Second Edition.

REFERENCE BOOKS:

1. Electronic Devices and Circuits – J. Millman, C. C. Halkias, Tata Mc-Graw Hill.
2. Robert L Boylested and Louis Nashelsky, Electronic Devices and Circuit Theory, 8th Edition, PHI, 2003.

Electromagnetic Field Theory

II B.Tech – I Semester (CODE: 18EC304)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Understand basic laws of electrostatics to determine electric field intensities and other parameters for various charge distributions.
- Learn the Maxwell's equations for static electric fields and apply the boundary conditions.
- Use the basic laws of magnetostatics for computing magnetic field intensities and understand the use of defining flux densities, magnetic potential and the energy density.
- Study the EM wave propagation in free space and various material media and use the Poynting vector for power calculations.

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

CO 1	Determine electric field intensities and flux densities, electric potential and the energy density using the basic laws of electrostatics
CO 2	Apply the Maxwell's equations on static electric fields to determine boundary conditions across different media and analyze the different capacitor problems.
CO 3	Apply the basic laws of magnetostatics to determine magnetic field intensities and flux densities, magnetic potential and the energy density.
CO 4	Analyze the EM wave propagation in free space, dielectric and conducting media and derive the expression for Poynting vector.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													2
CO2	3	2													2
CO3	3	2													2
CO4	2	3													2
AVG	2.75	2.25													2

SYLLABUS

UNIT – I

ELECTROSTATICS –I: The experimental law of coulomb, Electric field intensity, Field due to a continuous volume charge distribution, Field of a line charge, sheet of charge. Electric Flux Density, Gauss's law, Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, The line integral, Definition of potential and potential difference. The potential field of a point charge, system of charges, potential gradient, the dipole and Energy density in

electrostatic field.

UNIT - II

ELECTROSTATICS – II: The nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance. Several capacitance examples. Capacitance of a two-wire line. Derivations of Poisson's and Laplace's equations, Examples of the solution of Laplace's equation. Current and current density, continuity of current, conductor properties and boundary conditions.

UNIT - III

THE STEADY MAGNETIC FIELD: Biot-Savart Law, Ampere's Circuital Law, Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials. Magnetic Forces and Materials: Force on a moving charge, Force on a differential current element, Force between differential current elements, Force and torque on a closed circuit, the nature of magnetic materials, Magnetization and Permeability. Magnetic boundary conditions. Potential energy in magnetic fields.

UNIT - IV

TIME VARYING FIELDS AND MAXWELL'S EQUATIONS: Faraday's law, Displacement current, Maxwell's equations in point form, integral form.

THE UNIFORM PLANE WAVE: Wave propagation in free space, dielectrics. Poynting theorem and wave power. Propagation in good conductors: skin effect. Wave polarization.

TEXT BOOK:

1. W H Hayt, J A Buck, J Akhtar Engineering Electromagnetics, 8th Edition McGraw Hill Education, 2014.

REFERENCE BOOKS:

1. Mathew NO Sadiku, Elements of Electromagnetics, Oxford University Press, 2003.
2. Joseph A Edminister, Theory and Problems of Electromagnetics, 2nd Edition, Schaum's Outline Series, Mc-Graw Hill International, 1993
3. EC Jordan and KG Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, Prentice Hall of India.

Digital Electronics

II B.Tech – I Semester (CODE: 18EC305)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Outcomes: Students will

- Learn the basic principles of digital circuits and different number system with its representations.
- Understand Boolean expression minimizing methods for simplification, implement them using logic gates and construct combinational logic circuits.
- Analyze combinational circuits like multiplexers, Encoders and sequential circuits.
- Design various sequential circuits like counters, shift registers.

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

CO 1	Demonstrate proficient use of decimal, binary, octal, and hexadecimal number systems execute arithmetic operations in various bases.
CO 2	Develop simplified Boolean expressions using Boolean laws and implement them using logic gates.
CO 3	Construct various combinational and sequential logic circuits.
CO 4	Design MSI circuits with the help of sequential deign procedure,

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2												2	
CO2	2	3	2											2	
CO3	2	3	2											2	
CO4	2	3	3											3	
AVG	2.33	2.75	2.33											2.25	

SYLLABUS

UNIT – I

BINARY SYSTEMS: Complements: The r's complement, the (r-1)'s complement, subtraction using method of complements. Binary codes: Decimal codes, Reflected code, Error detecting codes, alphanumeric codes.

SIGN MAGNITUDE REPRESENTATION: Signed Magnitude form, signed 1's complement form, Signed 2's complement form.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic definitions, Axiomatic definitions of Boolean algebra, Basic Theorems and properties of Boolean algebra, Boolean functions. Canonical and standard forms, Digital Logic gates.

UNIT - II

SIMPLIFICATION OF BOOLEAN FUNCTIONS: The map method, Two-and Three-variable Maps, Four variable Maps, Five variable Maps, POS simplification, NAND and NOR implementation, Other Two-level implementations, Don't care conditions, The Tabulation Method, Determination of prime - implicants, Selection of prime – implicants.
COMBINATIONAL LOGIC: Introduction, Design procedure, Adders, Subtractors, Code conversion, Multilevel NAND circuits, Multilevel NOR circuits, EX-OR and EX-NOR circuits.

UNIT - III

COMBINATIONAL LOGIC WITH MSI AND LSI: Binary parallel adder, Carry propagation, Decimal adder, Magnitude comparator, Decoders, Demultiplexers, Encoders, Multiplexers.
SEQUENTIAL LOGIC: Flip-flops, Triggering of Flip-Flops, Analysis of clocked Sequential Circuits, state reduction and assignment, Flip-Flop excitation tables, Conversions of Flip-Flops, Design of Sequential circuits.

UNIT - IV

REGISTERS, COUNTERS AND MEMORY UNIT: Registers, shift registers, Ripple counters, Synchronous counters.
DIGITAL INTEGRATED CIRCUITS: Introduction, Characteristics of logic families, RTL and DTL circuits, I2 L, TTL, MOS, CMOS Logic families. Programmable Logic Devices: PLA, PAL, ROM.

TEXT BOOK:

1. Digital Logic and Computer Design, **M Morris Mano**, PHI/Pearson Education.

REFERENCE BOOKS:

1. Digital Integrated Electronics, Taub and Schilling, Mc-Graw Hill.
2. Fundamental of Digital Circuits, A.Anand Kumar, Pearson Education, 4th Edition.

Technical English

II B.Tech – I Semester (CODE: 18EL002)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Outcomes: Students will be able

- To enhancing the vocabulary competency of the students
- To enhance the understanding of the elements of grammar
- To enable the students to use proper spelling, grammar in constructing the
- To enhance the learner's ability to communicate accurately

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

CO 1	Make use of contextual clues to infer meanings of unfamiliar words from context
CO 2	Understand how to apply technical information and knowledge in practical documents for a variety of purposes
CO 3	Analyses the content of the text in writing use grammatical, stylistic, and mechanical formats and conventions appropriate to various audiences and disciplines
CO 4	Build confidence to participate actively in writing activities (individually and in collaboration) that model effective technical communication in the workplace

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1								2	2	3		2			
CO2								2	2	3		2			
CO3								2	2	3		2			
CO4								2	2	3		2			
AVG								2	2	3		2			

SYLLABUS

UNIT-I

1.1 Vocabulary Development: Familiarizing Idioms & Phrases
1.2 Grammar for Academic Writing: Making Requests
1.3 Language Development: Using Transition & Link words
1.4 Technical Writing: Letter Writing & Email Writing

UNIT-II

2.1 Vocabulary Development: Analogous words, Gender Sensitive language
2.2 Grammar for Academic Writing: Tenses: Simple Past /Present Perfect, The Future: Predicting & Proposing
2.3 Language Development: Cloze tests

2.4 Technical Writing: Technical Reports

UNIT-III

3.1 Vocabulary Development: Abbreviations& Acronyms

3.2 Grammar for Academic Writing: Describing(People/Things/Circumstances) : Adjectival & Adverbial groups

3.3 Language Development: Transcoding (Channel conversion from chart to text)

3.4 Technical Writing: Circular, Memos, Minutes of Meeting

UNIT-IV

4.1 Vocabulary Development: Corporate vocabulary

4.2 Grammar for Academic Writing: Inversions & Emphasis

4.3 Language Development: Reading Comprehension

4.4 Technical Writing: Resume Preparation

Reference Books

1. Communication Skills, Sanjay Kumar &PushpaLatha. Oxford University Press: 2011.
2. Technical Communication Principles and Practice. Oxford University Press: 2014.
3. Advanced Language Practice, Michael Vince. MacMilan Publishers: 2003.
4. Objective English (Third Edition), Edgar Thorpe &Showick. Pearson Education: 2009
5. English Grammar: A University Course (Second Edition), Angela Downing & Philip Locke, Routledge Taylor & Francis Group: 2016

Data Structures Using Python Lab

II B.Tech – I Semester (CODE: 18ECL31)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre-Requisite: Data Structures

Course Objectives: Students will

- Implement various Searching and Sorting Techniques.
- Create different linear data structures like linked lists, stacks, and queues.
- Create non-linear data structures like trees and graphs.
- Understand the searching mechanism like depth first search and breadth first search.

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

CO 1	Compose different sorting and searching algorithms
CO 2	Implement linear data structures like linked list, stacks, and queues.
CO 3	Develop non-linear data structures like trees and graphs.
CO 4	Demonstrate traversal techniques on non-linear data structures.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3			2				3					2	2
CO2	2	3			2				3					2	2
CO3	2	3			2				3					2	2
CO4	2	3			2				3					2	2
AVG	2	3			2				3					2	2

List of Lab Programs

1. Python program to implement bubble sort, selection sort, insertion sort.
2. Python program to implement merge sort, quick sort
3. Python program on linear search and binary search.
4. Python program to implement Singly Linked List
5. Python program to implement Doubly Linked List
6. Python program to implement Circular Linked List
7. Python programs to implement stacks using arrays and linked lists.
8. Python programs to implement queues using arrays and linked lists.
9. Python program to perform Binary Tree traversal operations.
10. Python programs to perform Binary search tree operations.
11. Python program to Travers in a graph using Depth first search.
12. Python program to Travers in a graph using breadth first search.

Electronic Devices and Digital Electronics Lab

II B.Tech – I Semester (CODE: 18ECL32)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will learn how

- To study basic electronic components
- To observe characteristics of electronic devices
- To know the concepts of Combinational Logic circuits.
- To understand the concepts of Sequential Logic circuits

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

CO1	Plot the V-I characteristics of various semi-conductor devices
CO2	Simulate the characteristics of various semiconductor devices using software.
CO3	Design of fixed, collector to base and self-bias circuits for BJT.
CO4	Simulate fixed, collector to base and self-bias circuits for B.J.T using Software.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2			3									2		
CO2					3								2		
CO3	2			3									2		
CO4					3								2		
AVG	2			3	3								2		

List of Lab Experiments:

Cycle 1:

1. Show that how Zener diode acts as voltage regulator
2. Characteristics of Common Emitter Configuration
3. Characteristics of JFET
4. Design and verification of self-bias circuit
5. Characteristics of Silicon Controlled Rectifier
6. Characteristics of UJT
7. Design and Verification of Collector to Base bias circuit Characteristics of BJT

Cycle 2 :

8. Design of Combinational Logic Circuits like Half-Adder, Full-Adder, Half-Subtractor and Full-Subtractor
9. Design Gray to Binary and Binary to Gray code converter.
10. Design 4-bit Magnitude comparator

11. Design of Multiplexers/De Multiplexer
12. Observe the functionality of various flipflops
13. Design of Shift register (To verify Serial to Parallel, Parallel to Serial ,Serial to Serial and Parallel to Parallel Converters) using Flip-Flops
14. Design of Binary/Decade Counter.
15. Design Asynchronous Counter, Mod Counter, Up Counter, Down Counter and Up/Down Counter.

PSPICE Lab

II B.Tech – I Semester (Code: 18ECL33)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Understand the netlist from the given circuit, simulate and observe the DC operating point and DC analysis.
- Analyze the frequency response of various amplifier circuits with ac analysis.
- Obtain the transient response of nonlinear wave shaping circuits.
- Verify the truth tables of different logic gates

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

CO 1	Understand the netlist from the given circuit, simulate and observe the DC operating point and DC analysis.
CO 2	Analyze the frequency response of various amplifier circuits with ac analysis.
CO 3	Design of various rectifier circuits with and without filters
CO 4	Verify the truth tables of different logic gates

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2		2	2								1	1	3
CO2	2	3		2	2								2	2	2
CO3	3	2			2								2	2	3
CO4	3	1			2								2	2	3
AVG	3	2		2	2								1	1	3

List of Lab Programs:

1. PSPICE Simulation of Nodal Analysis for DC Circuits.
2. PSPICE Simulation for finding DC voltages and currents.
3. PSPICE Simulation for finding resonant frequency of series RLC circuit.
4. Verification of Low pass and High pass Filters using PSPICE
5. Verification of Half–Wave and Full-Wave Rectifier
6. VI Characteristics of PN Diode
7. Frequency Response of CE Amplifier
8. Verification of Clippers
9. Verification of Clampers
10. Design and Verification of Logic Gates

Complex Analysis and Special functions

II B.Tech II Semester (Code: 18MA004)

Lectures	3	Tutorial	1	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: Students will

- Perceive the importance of acquiring sufficient knowledge on underlying principles of complex analysis and their prominent roles in various applications of numerous concepts.
- Determine Taylor and Laurent series expansions of the given functions and utilize residue concept to evaluate many difficult real integrals.
- Apply the ideas of Fourier Integrals, Fourier Transforms and their Inverses for addressing the real world problems in an effective manner.
- Analyze the properties of Special Functions for the empirical principles of effect hierarchy in recurrence relations and obtain the relevant Series Solutions for differential equations in different cases to overcome the challenging circumstances.

Course Outcomes: After studying this course, the students will be able to

CO1	Make use of fundamentals of Complex Analysis like n roots of Complex number, Analytic Function, Continuity, Harmonic Conjugates and their important role of applicability in various concepts.
CO2	Evaluate certain complicated real integrals under Contour integration using residue calculus and also derive the series expansions of given functions by Taylor series and Laurent Series.
CO3	Utilize various properties and applications of Fourier transforms, their inverses including Convolution Theorem in handling scientific and technical applications.
CO4	Identify the meaningful Series Solutions for Differential Equations and analyze the Properties of Special Functions in solving specific engineering

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3	2									3			
CO2	3	3	2									2			
CO3	3	3	2									3			
CO4	3	3	2									2			
AVG	3	3	2									2.5			

SYLLABUS

UNIT – I

Complex Numbers and functions: Complex Numbers; Geometric Representation of Imaginary numbers; Roots of a complex number; Complex function; Real and imaginary parts of circular and hyperbolic functions; **Calculus of complex functions:** Introduction; Limit of a complex function; Derivative of f(z); Analytic functions; Harmonic functions; Complex integration; Cauchy's theorem; Cauchy's integral formula.
[Sections: 19.1; 19.2; 19.5; 19.7; 19.12; 20.1; 20.2; 20.3; 20.4; 20.5;20.12; 20.13; 20.14]
[12 Hours]

UNIT – II

Calculus of complex functions: Series of complex terms; Taylor series; Laurent's series; Zeros of an analytic function; Singularities of an analytic function; Residues; Residue theorem; Calculation of residues; Evaluation of real definite integrals: Evaluation around the unit circle, Evaluation around a small semi-circle.
[Sections: 20.16.1; 20.16.2; 20.16.3; 20.17.1; 20.17.2; 20.18.1; 20.18.2; 20.19; 20.20] [12 Hours]

UNIT – III

Fourier transforms: Introduction; Definition; Fourier integral theorem (without proof); Fourier sine and cosine integrals; Complex form of Fourier integrals; Fourier integral representation of a function; Fourier transforms ; Properties of Fourier transforms; Convolution theorem(without proof); Fourier transforms of the derivative of a function.[Sections: 22.1; 22.2; 22.3.1; 22.3.3; 22.3.4; 22.4; 22.5; 22.6.2; 22.9] [12 Hours]

UNIT – IV

Series Solution of Differential Equations and Special Functions: Introduction; Validity of series solution; Series solution when x = 0 is ordinary point of the equation; Frobenius method; Bessel's function; recurrence formula for $J_n(x)$; expansions for J_0 and J_1; value of $J_{1/2}$; generating function for $J_n(x)$; orthogonality of Bessel functions.[Sections: 16.1;16.2;16.3;16.4;16.;,16.6;16.7;16.8;16.9;16.11] [12 Hours]

TEXT BOOK:

1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.
2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics", Laxmi publications,2010.

Electronic Circuit Analysis

II B.Tech.–II Semester (Code: 18EC402)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electronic Devices and circuits

Course Objectives: Students will

- Design and analyze transistor circuits at low frequencies using the hybrid model..
- Analyze distortion in multistage amplifiers, and also skills in identifying and mitigating performance limitations.
- Evaluate the impact of feedback on amplifier circuit parameters gain, resistance, and distortion factors.
- Understand the principle of oscillation and design different types of oscillators.

Course Outcomes: After studying this course, the students will be able to

CO1	Apply h-parameter methods to design and analyze transistor circuits at low frequencies.
CO2	Identify and address distortion and frequency response issues in transistor power amplifiers..
CO3	Evaluate feedback impact on amplifier circuits, optimizing performance by considering gain, resistance, and distortion factors.
CO4	Select appropriate oscillator configurations for targeted applications.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											3		
CO2	3	2											3		
CO3	3	3											3		
CO4	3	3	2										3		
AVG	3	2.5	2										3		

SYLLABUS

UNIT – I

BJT at low frequency: Transistor Hybrid model, determination of h parameters from characteristics, analysis of transistor amplifier using h-parameter model, emitter follower, Millers theorem and its dual, cascading transistor amplifiers, simplified CE & CC Hybrid models, high input resistance circuits – Darlington pair, boot strapped Darlington pair.

FET at low frequency: FET small signal model, CS/CD/CG configurations at low frequencies.

UNIT-II

Multistage amplifiers: Classification of amplifiers, distortion in amplifiers, frequency response of an amplifier, bode plots, band pass of cascaded stages, RC-coupled amplifier, low frequency response of an RC-coupled stage, effect of emitter bypass capacitor on low-frequency response.

Power amplifiers: Class-A large-signal amplifier, second-harmonic distortion, higher-order harmonic distortion, transformer coupled audio power amplifier, efficiency, push-

pull amplifiers, class-B amplifier, class-AB operation.

UNIT – III

Feedback amplifiers: Classification of amplifiers, feedback concept, transfer gain with feedback, negative feedback amplifiers and their characteristics, input & output resistance, method of analysis of a feedback amplifier, voltage-series feedback,, current- series feedback, current- shunt feedback, voltage-shunt feedback.

UNIT – IV

Oscillators: Barkhausen criterion for sinusoidal oscillators, RC-phase shift oscillator using FET and BJT, resonant circuit oscillators, general form of oscillator, Wien bridge, Hartley, Colpitts oscillators using BJT, crystal oscillators, frequency stability criterion for oscillators.

TEXT BOOKS:

1. Integrated Electronics: Analog and Digital Circuits and Systems, Jacob Millman and Christos C Halkias, Tata McGraw-Hill Education, 2003.

REFERENCE BOOKS:

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshrestha and S.C. Gupta, TTTI Series, Tata McGraw-Hill Education, 2003.
2. Electronic Devices and Circuits by S. Salivahanan and N. Suresh Kumar, 3rd Edition, Tata McGraw-Hill Education, 2012.

EM Waves and Transmission Lines

II B.Tech – II Semester (18EC403)

Lectures	3	Tutorial	1	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electromagnetic field theory

Course Objectives: Students will

- Understand concepts related to reflections and transmission of plane wave at different interfaces.
- Study the characteristics of various transmission lines and use the Smith chart to solve various parameters
- Analyze the different modes of propagation in rectangular waveguides
- Deduce the wave equations for different modes of propagation in circular waveguides.

Course Outcomes: After studying this course, the students will be able to

CO1	Analyze the reflection and refraction mechanisms of plane waves in different media.
CO2	Analyze the characteristics the lossy, lossless and distortion less microwave transmission lines and apply the Smith chart to solve various transmission line parameters.
CO3	Solve the wave equations for different modes of propagation in rectangular waveguides and analyze its characteristics.
CO4	Derive the wave equations for different modes of propagation in circular waveguides and analyze its characteristics.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3													2
CO2	2	3													2
CO3	2	3													2
CO4	2	3													2
AVG	2	3													2

SYLLABUS

UNIT – I

Reflection and Refraction of Plane Waves: Reflection by a perfect conductor-Normal incidence, Reflection by a perfect conductor-oblique incidence, Reflection by a perfect dielectric-Normal incidence, Reflection by a perfect insulator-oblique incidence, Reflection at the surface of a conductive medium, surface impedance.

UNIT II

Microwave Transmission Lines: Introduction, transmission line equations and solutions, reflection coefficient and transmission coefficient, standing wave and standing wave ratio, line impedance and admittance, smith chart, impedance matching-single stub matching.

UNIT III

Rectangular Waveguides: Solutions of wave equations in rectangular coordinates, TE modes in rectangular waveguides, TM modes in rectangular waveguides, power transmission in rectangular waveguides, power losses in rectangular waveguides, excitations of modes in rectangular waveguides, characteristics of standard rectangular waveguides.

UNIT IV

Circular Waveguides: Solutions of wave equations in cylindrical coordinates, TE modes in circular waveguides, TM modes in circular waveguides, TEM modes in circular waveguides, power transmission in circular waveguides or coaxial lines, power losses in circular waveguides, excitations of modes in circular waveguides, characteristics of standard circular waveguides.

Text Books:

1. Electromagnetic Waves and Radiating Systems, Edward C. Jordan, Keith G. Balmain,2nd edition, PHI India.(Unit I)
2. Microwave Devices &Circuits, Samuel Y Liao,, 3rd edition, PHI India (Unit II,III,IV)

Reference Books:

1. Electromagnetic waves by R.K.Shevgaonkar , Tata McGraw Hill.
2. P A Rizzi, Micro Wave Engineering: Passive Circuits, PHI, 2002

Signals & Systems

II B.Tech – II Semester (Code: 18EC404)

Lectures	4	Tutorial	1	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Linear Algebra and ODE

Course Objectives: Students will

- Perform basic mathematical operations on basic signals and classifying the systems
- Analyze the LTI system, Can evaluate systems response and Represent a continuous time periodic signal as a Fourier series and determine response of the LTI system to any input signal
- Use the Fourier transform to analyze continuous time signals and systems.
- Perform sampling of low pass signals; verify correlation and computation of spectral densities.

Course Outcomes: After studying this course, the students will be able to

CO1	Describe the mathematical operations on standard signals and classification of system
CO2	Apply Fourier series for periodic continuous time signals to the frequency
CO3	Apply the Fourier transform to continuous time signals and systems.
CO4	Convert the continuous time signals into their discrete version and to perform correlation of signals.

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3		2											3
CO2	3	3		2											3
CO3	3	3		2											3
CO4	3	3		2											3
AVG	3	3		2											3

SYLLABUS

UNIT-I

Introduction: Signals and systems defined types of signals, systems.

Mathematical description of Continuous–Time Signals: Functions and functional notation, signal functions, scaling and shifting, differentiation and integration, even and odd functions, periodic functions, signal energy and power.

Properties of Continuous –Time systems: Block diagram and system terminology, system modeling, system properties.

UNIT-II

Time-Domain Analysis of Continuous-Time Systems: The convolution integral, block diagram realization of differential equations.

The Continuous-Time Fourier Systems: Periodic excitation and response of LTI systems, Basic concepts and development of the Fourier series, Numerical computation of the Fourier series, convergence of the Fourier series, properties of the Fourier series, band

limited signals, responses of LTI systems with periodic excitation.

UNIT-III

The Continuous-Time Fourier Transform: Aperiodic excitation and response of LTI systems, Basic concepts and development of the Fourier transform, Convergence and the generalized Fourier transform, Numerical computation of the Fourier transform, Properties of the continuous time Fourier transform.

Continuous-Time Fourier Transform analysis of signals and systems: Frequency response, Ideal filters, Practical passive filters.

UNIT-IV

Sampling: Representing a continuous time signal by samples, Impulse sampling.

Correlation, Energy Spectral Density and Power Spectral Density: correlation and the correlogram, autocorrelation, cross correlation, correlations and the Fourier series, energy spectral density, power spectral density.

TEXT BOOK:

1. Fundamentals of Signals and Systems, 2nd Edition, Michael J Roberts, Govind Sharma, Tata McGraw Hill, 2010.

REFERENCE BOOKS:

1. Signals and Systems, Simon Haykin, John Wiley, 2004.
2. Signals and Systems, A V Oppenheim, A S Wilsky& IT Young, PHI/ Pearson, 2003.
3. Signals, Systems and Communications, B P Lathi, BSP, 2003.

Digital Design using HDL

II B.Tech – II Semester (Code: 18EC405)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Digital Electronics

Course Objectives: Students will

- Understand the basics of Hardware Description Languages, Program structure and basic language elements of Verilog.
- Gain experience by designing, modeling, implementing, and verifying several digital circuits using Verilog HDL.
- Know the gate-level modeling and dataflow modeling of combinational and simple sequential circuits.
- Learn the behavioral modeling of combinational and sequential circuits , tasks and functions.

Course Outcomes: After studying this course, the students will be able to

CO1	Illustrate the design flow and design methodologies for a digital design.
CO2	Describe the basic conventions and interfaces for modules and ports.
CO3	Implement digital circuits using gate primitives and dataflow constructs.
CO4	Simulate digital circuits using behavioral description and with task and functions.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2												2	
CO2	3													2	
CO3	2	3												2	
CO4		2			2									2	
AVG	2.67	2.33			2									2	

SYLLABUS

UNIT – I

Overview of Digital Design with Verilog HDL: Evolution of CAD, emergence of HDLs, typical HDL-based design flow, importance of HDL.

Hierarchical Modelling Concepts: Top-down and bottom-up design methodology, differences between modules and module instances, components of a simulation, design block, stimulus block.

Basic Concepts: Lexical conventions, data types, system tasks, compiler directives

Modules and Ports: Module definition, port declaration, connecting ports, hierarchical name referencing.

UNIT II

Gate-Level Modelling: Modelling using basic Verilog gate primitives, description of and/or and buf/not type gates, rise, fall and turn-off delays, min, max, and typical delays, Examples

Dataflow Modelling: Continuous assignments, delay specification, expressions, operators, operands, operator types, Examples.

UNIT III

Behavioural Modeling: Structured procedures, initial and always, Procedural Assignments, timing controls, conditional statements, multiway branching, loops, sequential and parallel blocks, Examples.

Tasks and Functions: Differences between tasks and functions, declaration, invocation, automatic tasks and functions.

UNIT IV

Useful Modelling Techniques: Procedural continuous assignments, overriding parameters, conditional compilation and execution, useful system tasks.

Timing and delays: delay models, path delay modelling, inside specify blocks, time in checks.

User defined primitives: basics, combinational UDPs and examples, sequential UDPs and examples.

TEXT BOOK:

1. Samir Palnitkar, Verilog HDL: A Guide to Digital Design and Synthesis, Second Edition, Prentice Hall PTR, 2003

REFERENCE BOOKS:

1. T.R. Padmanabhan, B. Bala Tripura Sundari , Design through Verilog HDL –, Wiley, 2009.
2. Zainalabdien Navabi, Verilog Digital System Design, TMH, 2nd Edition

Professional Ethics and Human Values

II B.Tech – II Semester (Code: 18EC406)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Know the importance of Values and Ethics in Personal lives and professional careers.
- Compare about various social issues, code of ethics and uses of ethical theories
- Extend the concept of safety & risk assessment, responsibilities and engineering rights
- Classify different global issues and ethical principles of professional societies

Course Outcomes: After studying this course, the students will be able to

CO1	Identify different human values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values
CO2	Illustrate professional roles played by an engineer in the society& apply the concepts of engineering ethics to various theories
CO3	Distinguish the concepts of safety and risk and understand the responsibilities of engineers towards the same
CO4	Apply ethical principles to resolve situations that arise in their professional lives and global issues

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1						2		3				2			
CO2						2		3				2			
CO3						2		3				2			
CO4						2		3				2			
AVG						2		3				2			

SYLLABUS

UNIT – I

HUMAN VALUES: Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully, caring, Sharing, honesty, Courage, Valuing Time, Co-operation, Commitment, Empathy, Self Confidence, Character, Spirituality.

UNIT – II

ENGINEERING ETHICS: Senses of 'Engineering Ethics', Variety of model issues, Types of inquiry, Moral dilemmas, Moral Autonomy, Kohlberg's theory, Gilligan's theory, Consensus and Controversy, Professions and Professionalism, Professional Ideals and Virtues, Theories about right action, Self-interest, customs and Religion, Uses of Ethical Theories.

UNIT – III

ENGINEERING AS SOCIAL EXPERIMENTATION: Engineering as Experimentation, Engineers as responsible Experimenters, Codes of Ethics, A Balanced Outlook on Law. Safety, Responsibility and Rights: Safety and Risk-Assessment of Safety and Risk, risk Benefit analysis and reducing risk. Collegiality and Loyalty , Respect for Authority , Collective Bargaining, Confidentiality , Conflicts of Interest , Occupational Crime , Professional Rights ,employee Rights , Intellectual Property Rights (IIPR) , Discrimination.

UNIT – IV

GLOBAL ISSUES: Multinational Corporations , Environmental Ethics, Computer Ethics, Weapons Development , Engineers as Managers , consulting Engineering, Engineers as Expert Witnesses and Advisors, Moral Leadership, Sample Code of Ethics like ASME, ASCE, IEEE, Institution of engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.

TEXT BOOKS:

1. R. Subramanian, Professional ethics, Oxford higher Education, 2013.
2. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, NewYork 1996.

REFERENCE BOOK:

1. Govindarajan. M, Natarajan. S, Senthilkumar. V.S, Engineering Ethics, PHI, 2004.

Electronic Circuits Lab

II B.Tech – II Semester (Code: 18ECL41)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electronic Devices and Circuits lab

Course Objectives: Students will

- Acquire a basic knowledge in solid state electronics including diodes, BJT,FET and their applications
- Develop the ability to analyze and design analog electronic circuits using discrete Components.
- Generate simulations for the desired circuits using OrCAD PSpice circuit design software.

Course Outcomes: After studying this course, the students will be able to

CO 1	Illustrate the characteristics of the diodes and its diverse applications including rectifiers and clippers and compare with the simulated outputs.
CO 2	Design small signal amplifiers for given specifications using discrete components and verify using PSpice circuit design software
CO 3	Distinguish the working of small signal amplifiers and power amplifiers.
CO 4	Design the different types of oscillator circuits using BJT.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3		3	3				3				3		
CO2	3	3		3	3				3				3		
CO3	3	3		3					3				3		
CO4	3	3		3					3				3		
AVG	3	3		3	3				3				3		

LIST OF EXPERIMENTS:

1. Full Wave Rectifier with Centre tapped Transformer.

2. Full Wave Rectifier Bridge Circuit

3. Frequency Response of Common Emitter Amplifier.

4. Frequency Response of Common Source Amplifier.

5. Obtain the bandwidth of Two Stage RC-Coupled Amplifier.

6. Design of Voltage Shunt Feedback Amplifier.

7. Class-A Power Amplifier.

8. Complementary Symmetry Push-pull amplifier.

9. RC Phase Shift Oscillator.

10. Colpitt's Oscillator.

11. BJT Darlington Emitter Follower

12. BJT Boot Strapped Darlington Pair

13. Hartley / Crystal Oscillator.

14. Voltage Series Feedback Amplifier.

15. BJT Voltage Series Regulator/ Voltage Shunt Regulator

NOTE: A minimum of 10 (Ten) programs are to be executed and recorded to attain eligibility for Semester End Examination.

TEXT BOOK:

1. Electronic devices and circuit theory", Robert L. Boylestad and Louis Nashelsky.

REFERENCE BOOKS:

1. Microelectronic Circuits, 7th Edition, Sedra/Smith, Oxford University Press, 2010
2. "Integrated electronics", Jacob Millman and Christos C Halkias.

HDL Lab

II B.Tech – II Semester (Code: 18ECL42)

Lectures	4	Tutorial	1	Practical	0	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Digital Electronics

Course objectives: Students will

- Describe the importance of modern programmable logic devices
- Demonstrate different styles of writing HDL code
- Use vivado tools in digital circuits modeling, simulation, functional verification in Verilog
- Validate and synthesize a digital circuit to FPGA board using Verilog HDL

Course outcomes: After studying this course, the students will be able to

CO 1	Apply EDA tools for simulation, verification and synthesis of digital design
CO 2	Develop Verilog RTL code for combinational digital circuits.
CO 3	Develop Verilog RTL code for sequential digital circuits.
CO 4	Implement digital systems by programmable devices, such as FPGA

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	2	3				2				3	3	3
CO2	3	2	2	2					2				3	3	3
CO3	3	2	2	2					2				3	3	3
CO4	3	2	3	2	3				3				3	3	3
AVG	3	2	2.25	2	3				2.25				3	3	3

List of Programs: Implement the following in Verilog HDL

1. Logic Gates.
2. Multiplexers/ De-Multiplexers.
3. Encoders/ Decoders.
4. Comparators.
5. Adders/ Subtractors.
6. Multipliers.
7. Parity Generators.
8. Design of ALU.
9. Latches.
10. Flip-Flops.
11. Synchronous Counters.

12. Asynchronous Counters.

13. Shift Registers.
14. Memories.
15. CMOS Circuits.

NOTE: A minimum of 10 (Ten) programs are to be executed and recorded to attain eligibility for Semester End Examination.

SIGNALS & SYSTEMS LAB

II B.Tech – II Semester (Code: 18ECL43)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Describe the MATLAB syntax, functions and programming
- Simulate various continuous and discrete time signals using MATLAB
- Perform basic operations on signals and sequences by using MATLAB
- Compute convolution, correlation between signals and sequences

Course Outcomes: After studying this course, the students will be able to

CO1	Demonstrate the MATLAB syntax, functions and programming.
CO2	Generate and characterize various continuous and discrete time signals by using MATLAB
CO3	Examine basic operations on signals and sequences by using MATLAB
CO4	Analyze LTI systems by using convolution and correlation

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2				3					2					3
CO2	2				3					2					3
CO3	2				3					2					3
CO4	2				3					2					3
AVG	2				3					2					3

LIST OF LAB PROGRAMS

1. Basic Operations on Matrices.
2. Generation of basic continuous time signals namely unit impulse, step, ramp, exponentialand Sinusoidal signals.
3. Generation of basic discrete time signals namely unit impulse, step, ramp, exponentialand Sinusoidal signals.
4. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting,Folding, Computation of Energy and Average Power.
5. Finding the Even and Odd Parts of Signal or Sequence and Real and Imaginary Parts ofSignal.
6. Verification of linearity and time invariance properties of a given continuous /discrete system.
7. Convolution between Signals and Sequences.
8. Autocorrelation and Cross correlation between Signals and Sequences.
9. Verification of Linearity and Time Invariance Properties of a Given Continuous/Discretesystem.
10. Computation of Unit Sample, Unit Step and Sinusoidal Responses of the Given LTI Systemand Verifying its Physical Realizability and Stability Properties.

11. Finding the Trigonometric Fourier Series of a given Signal.
12. Finding the Fourier Transform of a given Signal and plotting its Magnitude and Phasespectrum.
13. Sampling Theorem Verification.
14. Program to find frequency response of analog LP/HP/BP/BS filters.
15. Program to find the impulse response of a system defined by a difference equation.

NOTE: A minimum of 10 (Ten) Programs have to be performed and recorded by the candidateto attain eligibility for Semester End Examination.

Linear Integrated Circuits

III B.Tech – I Semester (Code: 18EC501)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electronic Circuit Analysis

Course Objectives: Students will,

- Understand the basic fundamentals of operational amplifier and its linear and non- Linear applications.
- Design and working principles of oscillators, wave form generators and comparators.
- Analyze Nonlinear Wave shaping circuits and different data convertors.
- Examine the functioning of special ICs-555timer, IC723, PLL, VCO and design of active filters.

Course Outcomes: After studying this course, the students will be able to

CO1	Describe the basic operations of an op-amp to perform linear and non-linear applications
CO2	Design different types of oscillators, waveform generators and comparators and their basic working
CO3	Analyze the concepts of Clippers and Clampers and Data Converters
CO4	Illustrate the functioning of special IC's and able to design different types of Active Filters.

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											2		
CO2	2	3	3										2		
CO3	2	3											2		
CO4	3	3	3										2		
AVG	2.5	2.75	3										2		

SYLLABUS

UNIT – I

OPERATIONAL AMPLIFIERS: Operational amplifier and block diagram representation, op-amp with negative feedback. Block diagram representation of feedback configurations, voltage series feedback amplifier, voltage shunt feedback amplifier, differential amplifier with one op-amp, input offset voltage, input bias current, input offset current, total output offset voltage, frequency response of op-amp, stability, slew rate.

OP-AMP APPLICATIONS: The summing amplifier, Differential and instrumentation amplifiers, Voltage to current and current to voltage conversion, The Op-amp with complex impedances, Differentiators and integrators, Non Linear Op Amp circuits, Precision rectifiers.

UNIT – II

OSCILLATORS& COMPARATORS: Oscillator principles, Oscillator types, Frequency stability, Phase shift oscillator, Wein bridge oscillator, Quadrature oscillator, Square-wave generator, Triangular wave generator, Saw tooth wave generator, and Voltage controlled oscillator. Introduction to comparator, Basic comparator, Zero-crossing detector, Schmitt Trigger, Comparator characteristics, Limitations of Op-Amps as comparators, Voltage limiters.

UNIT – III

CLIPPERS, CLAMPERS & CONVERTERS: Positive and negative clippers, Positive & negative clampers, Absolute value output circuit, Peak detector, S/H circuit. D/A conversion fundamentals, weighted resistor summing, R-2R Ladder D/A converters, A/D conversion: Ramp type, Successive Approximation, Dual slope converters, Parallel & Tracking A/D converters.

UNIT – IV

APPLICATIONS OF SPECIAL ICS & ACTIVE FILTERS: The 555 timer, 555 as Monostable and Astable Multivibrator and applications. Phase Locked Loops, Operating principles, Monolithic PLLs, 565 PLL applications, A 723 Voltage Regulator and its design. Active LP and HP filters, Band pass filters: Wideband, Narrow Band pass filters, Band stop filters, State variable filters, and All pass filters.

TEXT BOOKS:

1. Rama Kant A. Gayakwad, Op-Amps& Linear Integrated Circuits, 4th Edition, PHI/ PearsonEducation, 2003.
2. D.Roy and Choudhury, ShailB.Jain, Linear Integrated Circuits, 2nd Edition, New Age International, 2003.

REFERENCE BOOKS:

1. Microelectronics: Circuit Analysis and Design, Donald A. Neamen, 4th Edition,McGrawHill, 2010.
2. Microelectronic Circuits, 7th Edition, Sedra Smith, Oxford University Press, 2010.

Linear Control System

III B.Tech – I **Semester** (Code: 18EC502)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Linear Algebra and Ordinary Differential Equations.

Course Objectives: Students will,

- Understand different types of control systems and obtain its transfer function.
- Study the Behavior of control systems for standard test signals
- Determine the stability of the system from its analysis in the time and frequency domain using graphical method.
- Illustrate the concept of state space model for different control systems.

Course Outcomes: After studying this course, the students will be able to

CO1	Analyze transfer function for different control systems and effect of feedback.
CO2	Analyze the effect of controls system for various test signals and also able to find the time domain parameters and Error constants.
CO3	Examine frequency characteristics, analyze stability, and interpret system responses using graphical methods.
CO4	Plot root locus and analyze control systems by using state space analysis.

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3											2		
CO2	2	3											2		
CO3	3	3											2		
CO4	3	3	2										3		
AVG	2.5	3	2										2.25		

SYLLABUS

UNIT – I

INTRODUCTION: Basic concept of simple control system, open loop – closed loop control systems. Effect of feedback on overall gain – stability sensitivity and external noise. Types of feedback control systems – Linear time invariant, time variant systems.

MATHEMATICAL MODELS AND TRANSFER FUNCTIONS OF PHYSICAL SYSTEMS: Differential equations – impulse response and transfer functions – translational and rotational mechanical systems. Transfer functions and open-loop and closed-loop systems.

Block diagram representation of control systems – block diagram algebra – signal flow graph –Mason's gain formula

UNIT – II

TIME DOMAIN ANALYSIS: Standard test signals – step, ramp, parabolic and impulse

response function – characteristic polynomial and characteristic equations of feedback systems – transient response of first order and second order systems to standard test signals.

Time domain specifications – steady state response – steady state error and error constants. Effect of adding poles and zeros on over shoot, rise time, band width – dominant poles of transfer functions.

STABILITY ANALYSIS IN THE COMPLEX PLANE: Absolute, relative, conditional, bounded input – bounded output, zero input stability, conditions for stability, Routh – Hurwitz criterion.

UNIT – III

FREQUENCY DOMAIN ANALYSIS: Introduction – frequency domain specifications – correlation between time and frequency responses.

Polar plots – Bode plots – Nyquist stability criterion – Nyquist plots. Assessment of relative stability using Nyquist criterion – closed loop frequency response.

UNIT – IV

ROOT LOCUS TECHNIQUE: Introduction – stability from root locus – construction of root loci.

STATE SPACE ANALYSIS: Concepts of stat, state variables and state models – digitalization – solution of state equations – state models for LTI systems. Concepts of controllability and Observability.

TEXT BOOKS:

1. B.C. Kuo, Automatic control systems, 9th edition, PHI.
2. I. J. Nagrath& M Gopal, Control Systems Engineering, 3rd edition, New Age International.

REFERENCE BOOKS:

1. Schaum Series, Feedback and Control Systems, TMH.
2. M. Gopal, Control Systems Principles and Design, TMH.
3. John Van de Vegta, Feedback Control Systems, 3rd edition, Prentice Hall, 1993.
4. K. Ogata, Modern Control Engineering, 3rd edition, PHI.
5. Control Systems Engineering, Norman S. Nise, 6th edition, Wiley, 2011.
6. Modern Control Systems,Richard C. Dorf and Robert H. Bishop,12th Edition, Prentice Hall,2011.

Micro Processors and Micro Controllers

III B.Tech – I Semester (Code: 18EC503)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Digital Electronics

Course Objectives: Students will

- Illustrate the architecture of 8086 microprocessor.
- Introduce the programming and interfacing techniques of 8086 microprocessor.
- Understand the interfacing circuits for various applications of 8051 microcontroller.
- Analyze the basic concepts and programming of 8051 microcontroller.

Course Outcomes: After studying this course, the students will be able to

CO1	Analyze Architecture, Instruction set, addressing modes and assembler directives of Intel 8086 to design microcomputer-based applications.
CO2	Interpret IDE usage for developing efficient assembly language programs for 8086..
CO3	Interface various programmable peripherals with 8086 to realize a desired application.
CO4	Analyze Architectural features, Instruction Set, and on-chip peripherals of 8051 for control applications.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3		2									2	3	
CO2	2	3	2		2									3	
CO3	2	3	2											3	
CO4	2	3											2	3	
AVG	2	3	2	2	2								2	3	

SYLLABUS

UNIT – I

MICROPROCESSOR: introduction to microcomputers and microprocessors, introduction and architecture of 8086 family, addressing modes, instruction description and assembler directives of 8086 microprocessors.

UNIT – II

8086 PROGRAMMING AND SYSTEM CONNECTIONS: Program development steps, writing programs for use with an assembler, assembly language program development tools, writing and using procedures and assembler macros. 8086 interrupts and interrupt responses.

UNIT – III

DIGITAL INTERFACING: Programmable parallel ports, handshake IO, 8255 programmable peripheral interfaces. Interfacing microprocessor to keyboards.
ANALOG INTERFACING: DAC principle of operation and interfacing.

PROGRAMMABLE DEVICES: Introduction to Programmable peripheral devices 8254, 8259, 8251, DMA data transfer, 8237 DMA controller, RS232 communication standard and maximum mode of 8086 operation.

UNIT – IV

INTRODUCTION TO MICROCONTROLLERS: comparing microprocessors and microcontrollers, Architecture of 8051, pin configuration of 8051microcontroller, hardware input pins, output pins ports and external memory, counters and timers, serial data input and output and interrupts. Programming & interfacing 8051: - Addressing modes of 8051 microcontroller, Instruction set of 8051 microcontroller, simple programs using 8051 microcontrollers. Interfacing a stepper motor, ADC.

TEXT BOOKS:

1. Duglus V. Hall, Microprocessor and Interfacing, Revised 2nd Edition, TMH, 2006.
2. Mohammed Ari Mazidi and JanciGillispie, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi.

REFERENCE BOOKS:

1. Advanced Microprocessors and Peripherals AK Ray and KM Bhurchandi 2nd Edition, TMH.
2. The 8051 Microcontroller, 3rd Edition, Kenneth Ayala, Cengage Learning

Digital Signal Processing

III B.Tech – I Semester (Code: 18EC504)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Signals and Systems

Course Objectives: Students will

- Study the various types of Digital signals and systems and their frequency domain representation.
- Learn and solve the concepts of DFT and FFT and their importance in signal processing applications.
- Design IIR Digital filters through Approximation Procedures and their realizations.
- Design FIR Digital filters through windowing Techniques and study the basic concepts of Decimation and interpolation operations.

Course Outcomes: After studying this course, the students will be able to

CO1	Analyze various types of Digital signals and systems.
CO2	Determine and demonstrate the DFT and FFT of a given signal.
CO3	Design an IIR Digital Filter for given specifications.
CO4	Develop a FIR Digital Filter for given specifications and Realization of digital filters

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3													3
CO2	3	2													3
CO3	2	3	3												3
CO4	2	3	3												3
AVG	2.5	2.75	3												3

SYLLABUS

UNIT – I

INTRODUCTION: Signals, Systems and Signal Processing, classification of signals, the concept of frequency in Continuous - Time and Discrete – Time signals.

DISCRETE-TIME SIGNALS AND SYSTEMS: Discrete-Time Signals, Discrete-Time Systems, Analysis of Discrete-Time Linear Time-Invariant Systems, Discrete-Time Systems Described by Difference Equations, Recursive and Non-recursive Discrete-Time Systems.

THE Z-TRANSFORM AND ITS APPLICATION TO THE ANALYSS OF LTI SYSTEMS: The Z Transform, Properties of the Z Transform, Rational Z Transforms, Inversion of the Z Transform, Analysis of Linear Time-Invariant Systems in the Z Domain, the One-sided Z Transform.

UNIT – II

THE DISCRETE FOURIER TRANSFORM: ITS PROPERTIES AND

APPLICATIONS: Frequency Domain Sampling: The Discrete Fourier Transform, Properties of the DFT.

EFFICIENT COMPUTATION OF THE DFT: FAST FOURIER TRANSFORM ALGORITHMS: Efficient Computation of the DFT FFT Algorithms, Applications of FFT Algorithms.

UNIT – III

DESIGN OF DIGITAL FILTERS: General Considerations, Design of IIR Filters from Analog Filters, Frequency Transformations.

IMPLEMENTATION OF DISCRETE- TIME SYSTEMS: Structures for the Realization of Discrete-Time Systems, Structures for IIR Systems.

UNIT – IV

DESIGN OF DIGITAL FILTERS: Design of FIR Filters, Symmetric and Antisymmetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Design of Linear-Phase FIR Filters by the Frequency-Sampling Method.

IMPLEMENTATION OF DISCRETE- TIME SYSTEMS: Structures for FIR Systems.

TEXT BOOK:

1. John G. Proakis, Dimitris G Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications," 4th Edition, Pearson Education, 2007.

REFERENCE BOOKS:

1. Sanjit K Mitra, "Digital Signal Processing: A Computer Based Approach," 3rdEdition, TMH, SIE, 2008.
2. Lonnie C Ludeman, "Fundamentals of Digital Signal Processing," John Wiley & Sons, 2009. Alan V Oppenheim and Ronald W Schafer, Discrete Time Signal Processing, Pearson Education, 2007.
3. Andreas Antoniou, "Digital Signal Processing", Tata Mc Graw Hill, 2006.

Analog and Digital Communications

III B.Tech – I Semester (Code: 18EC505)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Study of amplitude modulation and demodulation techniques.
- Understand the basic principles of angle modulation and demodulation techniques.
- Explore the various pulse analog and pulse digital modulation and demodulation techniques.
- Describe some important digital band-pass modulation techniques used in practice.

Course Outcomes: After studying this course, the students will be able to

CO1	Analyze Amplitude Modulation in time and frequency domains.
CO2	Analyze transmission of signals using frequency modulation techniques
CO3	Apply pulse modulation principles for signal encoding and transmission.
CO4	Analyze the baseband modulation and pass band modulation techniques using correlative level coding and orthogonalization.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3													2
CO2	2	3													2
CO3	3	2													2
CO4	2	3													2
AVG	2.5	2.75													2

SYLLABUS

UNIT – I

AMPLITUDE MODULATION: Introduction to Continuous-wave Modulation, Need for Modulation. Amplitude Modulation, Virtues, Limitations, and Modifications of Amplitude Modulation, Double Sideband- Suppressed Carrier Modulation, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing, Single-Sideband Modulation, Vestigial Sideband Modulation, AM Transmitters and Receivers.

UNIT – II

ANGLE MODULATION: Basic Definitions, Properties of Angle Modulated Waves, Relationship between PM and FM waves, Narrow-Band Frequency Modulation, Wide-Band Frequency Modulation, Transmission Bandwidth of FM waves, Generation of FM waves, Demodulation of FM signals. Pre-emphasis and De-emphasis in FM, FM Transmitters and Receivers. Noise in Analog Communication (SNR calculations)

UNIT – III

PULSE MODULATION: Sampling Process (ideal and flat-top), Pulse-Amplitude Modulation, Pulse-Position Modulation, Quantization Process, Quantization Noise, Pulse Code Modulation: Encoding, Regeneration, Decoding, Delta Modulation, Differential Pulse Code Modulation, Line Codes.

UNIT – IV

DIGITAL BAND-PASS MODULATION TECHNIQUES: Introduction, Pass band transmission model, Matched filter Receiver, Binary Amplitude-Shift Keying (BASK), Phase-Shift Keying (BPSK, QPSK), Frequency-Shift Keying (BFSK, MSK), Noncoherent Digital Modulation Schemes (BASK, BFSK, DPSK),M-ary Digital Modulation Schemes (M-ary PSK, M-ary QAM, M-ary FSK), SNR calculations with Matched filter, BER calculations for Digital Modulations.

TEXT BOOK:

1. Simon Haykin and Michael Moher, "An Introduction to Analog & Digital Communications",2nd Ed., Wiley, 2007.

REFERENCE BOOKS:

1. H Taub& D. Schilling, GautamSahe, "Principles of Communication Systems", TMH, 3rdEdition, 2007.
2. Sam Shanmugam, "Analog and Digital Communication Systems", John Wiley and Sons, 1992.

COMPUTER ORGANIZATION & ARCHITECTURE

III B.Tech – I Semester (Code: 18ECD11)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Digital Electronics, Basic Programming

Course Objectives: Students will able

- To understand the basic structure and operation of a digital computer.
- To understand the operation of the arithmetic unit including the algorithms and implementation of fixed point and floating-point addition, subtraction, multiplication and division.
- To know the concept of pipelining and memory system including cache memories and virtual memory.
- To study the different ways of communicating with I/O devices and standard I/O Interfaces.

Course Outcomes: After studying this course, the students will be able to

CO1	Interpret efficient commercial digital computers constituents.
CO2	Analyze functionality of sub-systems for realizing computing applications
CO3	Implement concepts of pipelining & different arithmetic units for improved execution Speeds.
CO4	Compare and evaluate trends in memory & I/O Interfaces systems for modern Architectures.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3			3									2	
CO2	3	3	2		3									2	
CO3	3	3	3		3									2	
CO4	2	3	3		3									2	
AVG	2.5	3	2.67		3									2	

SYLLABUS

UNIT – I

BASIC STRUCTURE OF COMPUTERS: Computer types, Functional Unit, Basic operational concepts, Bus structures, Performance, multiprocessors and multicomputer.

MACHINE INSTRUCTIONS AND PROGRAMS: Numbers, Arithmetic operations and characters, Memory location and addresses, Memory operations, Instructions and instruction sequencing, Addressing modes, Basic Input and Output operations, Stacks and Queues, Subroutines, Additional instructions.

UNIT – II

BASIC PROCESSING UNIT: Some fundamental concepts, Execution of a complete

Instruction, Multiple-Bus organization, Hardwired control, Micro programmed control, Microinstructions.

Arithmetic: Addition and subtraction of signed numbers, Design of fast adders, Multiplication of positive numbers, signed operand multiplication, Fast multiplication, Integer division.

UNIT – III

PIPELINING: Basic concepts, Data hazards, Instruction hazards, Influence of instruction sets, Data path and control considerations, Superscalar operation.

THE MEMORY SYSTEM: Some basic concepts, Semiconductor RAM memories-Internal Organization of memory chips, read only memories, Speed, size and cost, Cache memories, Performance considerations, Virtual memories.

UNIT – IV

INPUT/OUTPUT ORGANIZATION: Accessing I/O devices, Interrupts, Direct memory access, Standard I/O interfaces: PCI, SCSI, and USB.

TEXT BOOK:

1. Computer Organization Carl Hamacher, ZvonkoVranesic, SafwatZaky, Fifth Edition, McGraw Hill.

REFERENCE BOOKS:

1. Computer Architecture and Organization-John P. Hayes, Third Edition, McGraw Hill.
2. Computer Organization and Architecture William Stallings, Sixth Edition, Pearson/PHI.
3. Computer Systems Architecture M. Moris Mano, Third Edition, Pearson/PHI.

DATA COMMUNICATION AND COMPUTER NETWORKS

III B.Tech – I Semester (Code: 18ECD12)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will,

- Learn various protocols, Network hardware, and Network software.
- Gain knowledge about functionality of each layer in OSI, TCP/IP protocols.
- Study about the different types of LANS
- Interpret the operation of the protocols that are used in Internet.

Course Outcomes: After studying this course, the students will be able to

CO1	Classify the fundamental underlying principles of computer networking
CO2	Illustrate the details and functionality of layered network architecture.
CO3	Explain the different types of network topologies and routing algorithms
CO4	Analyze performance of various communication internet protocols.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													2
CO2	2	2													2
CO3	2	3													2
CO4	2	3													2
AVG	2.25	2.5													2

SYLLABUS

UNIT – I

Introduction to Data Communication and Networking: Uses of Computer Networks, Network Hardware, Network Software Internet Reference Models (OSI and TCP/IP).
Physical Layer: Basis for Data Communication, Guided Transmission Media, Wireless Transmission Medium, Circuit Switching and Telephone Network, High Speed Digital Access.

UNIT – II

Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction, Data Link Control and Protocols, Example Data Link Protocol.
Medium Access Layer: Channel Allocation Problem, Multiple Access, CSMA, CSMA/CD, CSMA/CA.

UNIT – III

Local Area Network: Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, Blue tooth, Connecting devices: -Repeaters, Hub, Bridges, Switch, Router, Gateways, Virtual LAN,
Network Layer: Network Layer Design Issues, Routing Algorithms Congestion control Algorithms,

UNIT – IV

Transport layer: Transport Layer Service, Elements of Transport protocols, Internet protocols (UDP and TCP)

Application Layer: DNS- Domain Name System, Electronic Mail, World Wide Web, Multimedia (Audio Compression, Streaming Audio, Voice over IP, Video Compression, Video on Demand).

TEXT BOOKS:

1. Andrew S. Tanenbaum, David.J.Wetherall, "ComputerNetworks", Prentice-Hall, 5th Edition, 2010.
2. Behrouz A. Foruzan, Data communication andNetworking, 4th Edition,TMH, 2004.

REFERENCE BOOKS:

1. W.Tomasi,"Introduction to Data Communications and Networking" Pearson education.
2. G.S.Hura and M.Singhal,"Data and Computer Communications",CRCPress,Taylor and Francis Group.
3. S.Keshav,"An Engineering Approach to CoputerNetworks",Pearson Eduction,2nd Edition.

PROGRAMMING WITH JAVA

III B.Tech – I Semester (Code: 18ECD13)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Programming with C++

Course Objectives: Students will learn

- Basics of Object Oriented Programming concepts used in JAVA
- Usage of classes and objects in developing JAVA programs.
- Various inheritance concepts in implementing JAVA programs.
- Error handling mechanisms and Multithreading concepts in JAVA

Course Outcomes: After studying this course, the students will be able to

CO1	Write and implement simple JAVA programs using Object Oriented
CO2	Understand the concepts of classes and objects to develop JAVA programs
CO3	Develop reusable programs using the concepts of inheritance, interfaces and packages.
CO4	Apply the concepts of Exception handling and Multithreading while implementing JAVA programs.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3			3										2
CO2	3	3	2		3										2
CO3	3	3	2		3										2
CO4	3	3			3										2
AVG	3	3	2		3										2

SYLLABUS

UNIT-I

INTRODUCTION: Creation of Java, importance of Java to internet, byte code, Java buzzwords, OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, dynamic initialization, scope and life time of variables, arrays, operators, control statements, type conversion and casting, compiling and running of simple Java program.

UNIT-II

CLASSES AND OBJECTS: Concepts of classes and objects, class fundamentals, declaring objects, assigning object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this key word, garbage collection, overloading methods and constructors, parameter passing - call by value, recursion, nested classes and inner classes, exploring the String class.

UNIT-III

INHERITANCE: Basic concepts, member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

PACKAGES AND INTERFACES: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT-IV

EXCEPTION HANDLING AND MULTITHREADING: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups.

TEXT BOOKS:

1. The Complete Reference Java J2SE 7th Edition by Herbert Schildt, McGraw-Hill Companies.
2. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons.

REFERENCE BOOKS:

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.

Pulse and Switching Circuits

III B.Tech – I Semester (Code: 18ECD14)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electronic Devices

Course Objectives: Students will be able to
CO1: Analyze RC circuits for low pass and high pass filtering.
CO2: Design different clipper and clamper circuits.
CO3: Design Bistable, Monostable and AstableMultivibrators using discrete components.
CO4: Analyze voltage and current sweep circuits and identify methods to mitigate sweep errors.

Course Outcomes: After studying this course, the students will be able to

CO1	Calculate the response of low-pass and high-pass RC circuits
CO2	Explain the concept of nonlinear wave shaping.
CO3	Acquire knowledge in multivibrators and their applications.
CO4	Familiar with the working of voltage time base and current time base generator.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3											3		
CO2	3	3	2										3		
CO3	3	3	2										3		
CO4	3	2											3		
AVG	3	2.75	2										3		

SYLLABUS

UNIT – I

LINEAR WAVE SHAPING: The high- pass RC circuit, Response of RC high- pass circuit to sinusoidal, step, pulse, square wave, exponential and ramp input, The high-pass RC circuit as a differentiator, Double differentiation, low-pass RC circuit, Response of RC low-pass circuit to sinusoidal, step, pulse, square-wave, exponential and Ramp inputs, The low-pass RC circuit as an integrator, Attenuators.

UNIT – II

NON-LINEAR WAVE SHAPING:
Clipping (Limiting) circuits, Diode clippers, Clipping at two independent levels, Comparators, Diode-differentiator comparator, Applications of voltage comparators, the clamping operation, Positive clamper, Negative clamper, a clamping circuit theorem, Transistor as a switch.

UNIT – III

BISTABLE MULTIVIBRATORS: The stable states of a binary, A fixed bias transistor binary, A self-biased transistor binary, Commutating capacitors, Methods of improving

resolution, Unsymmetrical triggering of the binary, Triggering Unsymmetrically through a unilateral device, Symmetrical triggering, Direct –connected binary circuit, Schmitt Trigger circuit, Emitter- coupled binary.

MONOSTABLE AND ASTABLE MULTIVIBRATORS: The Monostable Multivibrator, Gate width of a collector-coupled Monostable Multivibrator, Waveforms of the collector-coupled Monostable Multivibrator, Triggering of the Monostable Multivibrator, Astable collector- coupled Multivibrator.

UNIT – IV

VOLTAGE TIME BASE GENERATORS: General features of a time- base signal, Exponential sweep circuit, Miller and Bootstrap Sweep circuits.

CURRENT TIME-BASE GENERATORS: A simple current sweep, Linearity correction through adjustment of driving waveform, a transistor current time -base generator.

TEXT BOOK:

1. J Millman and H Taub, Pulse, Digital and Switching Circuits, TMH, 2003.

REFERENCE BOOKS:

1. J Millman and H Taub, Mothiki S. Prakash Rao, Pulse Digital & Switching Waveforms, 2nd Edition, TMH.
2. David A Bell, Solid State Pulse Circuits, 4th Edition, PHI 2003.

Micro Processors and Micro Controllers Programming Lab

III B.Tech – I Semester (Code: 18ECL51)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will be able to

- Understand the basic programming of 8086 Microprocessor.
- Interface the 8086 microprocessors with various peripherals for various applications.
- Understand the basic programming of 8051 microcontroller.
- Interface the 8051 microcontroller with various peripherals for various applications

Course Outcomes: After studying this course, the students will be able to

CO1	Demonstrate skill on usage of modern tools such as TASM for 8086 microprocessor and KEIL for 8051 microcontroller.
CO2	Develop assembly language programs for various applications using 8086 Microprocessor.
CO3	Develop assembly language programs for various applications using 8051microcontroller
CO4	Analyze the interfacing of Programmable peripheral devices with 8051 Microcontroller.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1					3				2					2	
CO2	2				3				2					2	
CO3	2				3				2					2	
CO4	2				3				2					2	
AVG	2				3				2					2	

LIST OF LAB EXPERIMENTS

Experiments Based on ALP (8086)

1. Programs on Data Transfer Instructions.
2. Programs on Arithmetic and Logical Instructions.
3. Programs on Branch Instructions.
4. Programs on Subroutines.
5. Sorting of an Array.
6. Programs on Interrupts (Software and Hardware).
7. 8086 Programs using DOS and BIOS Interrupts.

Experiments Based on Interfacing & Microcontroller (8051)

8. DAC Interface-Waveform generations.
9. Stepper Motor Control.
10. Keyboard Interface / LCD Interface.
11. Data Transfer between two PCs using RS.232 C Serial Port
12. Programs on Data Transfer Instructions using 8051 Microcontroller.
13. Programs on Arithmetic and Logical Instructions using 8051 Microcontroller.
14. Applications with Microcontroller 8051.

NOTE: *A minimum of 10(Ten) experiments, choosing 5 (Five) from each part, have to be Performed and recorded by the candidate to attain eligibility for Semester End Examination.*

Linear Integrated Circuits Lab

III B.Tech – I Semester (Code: 18ECL52)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Perform experiments based on 741 op-amp.
- Realize the circuits related to the applications of 555 Timer.
- Test the functionality of voltage regulators using IC 723.
- Measure the lock range of IC 556 (Phase Locked Loop).

Course Outcomes: After studying this course, the students will be able to

CO1	Design different linear applications of Op-Amp like Adder, Integrator, Active filters
CO2	Demonstrate different non-linear applications of operational amplifiers like Oscillators, Waveform Generators, DAC
CO3	Construct multivibrator and oscillator circuits using IC555 and IC556 and perform measurements of frequency and time
CO4	Design and demonstrate a Variable Voltage Regulator using IC 723

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1		2	3	3									2		
CO2	2			3									2		
CO3	2			3									2		
CO4	2		3	3									2		
AVG	2	2	3	3									2		

LIST OF LAB EXPERIMENTS

1. Measurement of Op-amp Parameters.
2. Applications of Op-amp (Adder, Subtractor, Integrator, Differentiator).
3. Design of Full Wave Rectifier using Op-Amp.
4. Design of Low Frequency Oscillators using Op-Amp (Wein Bridge & RC Phase Shift Oscillators).
5. Waveform Generation using Op-amp (Square, Triangular).
6. Instrumentation Amplifier using Op-AmpIC741.
7. Design and Verification of Schmitt Trigger using Op-AmpIC741.
8. Design of Active Filters (First Order LPF&HPF).
9. Design of State Variable Filter using Op-Amps.
10. Applications of 555 Timer ICs (Astable, Monostable, Schmitt Trigger).
11. PLL using IC 556.

12. Design of Fixed Voltage Regulators.
13. Design of Variable Voltage Regulator using IC 723.
14. Design of VCO using IC 566.
15. Design of 3 bit DAC using R-2R Ladder Network.

NOTE: A minimum of 10(Ten) experiments have to be Performed and recorded by the candidate to attain eligibility for Semester End Examination.

Analog and Digital Communications Lab

III B.Tech – I Semester (Code: 18ECL53)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Realize Amplitude Modulation (AM) and demodulation for various message signals.
- Construct a circuit for angle modulation and demodulation (FM and PM).
- Explore the various pulse modulation and demodulation techniques
- Describe some important digital band-pass modulation techniques used in practice

Course Outcomes: After studying this course, the students will be able to

CO1	Demonstrate various continuous modulation and demodulation techniques.
CO2	Verify angle modulation and demodulation techniques.
CO3	Analyze the pulse modulation and demodulation techniques.
CO4	Simulate digital band-pass modulation techniques

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2		3					3				2		2
CO2	2	2		3					3				2		2
CO3	2	2		3	3				3				2		2
CO4	2	2		3	3				3				2		2
AVG	2	2		3	3				3				2		2

LIST OF EXPERIMENTS

1. Amplitude Modulation and Demodulation.
2. DSB SC Modulation and Demodulation.
3. SSB SC Modulation and Demodulation.
4. Frequency Modulation and Demodulation.
5. Pre-Emphasis and De-Emphasis Circuits.
6. Frequency Demodulation using Phase Locked Loop.
7. PAM Generation and Reconstruction.
8. PWM and PPM: Generation and Reconstruction.
9. Generation and Detection of PCM.
10. Generation and Detection of FSK.
11. Generation and Detection of PSK.
12. Write a program to generate digital modulation (Binary and M-ary) and demodulation scheme.
13. Synchronous Detector.
14. Verification of sampling theorem.
15. Delta Modulation and Demodulation.

NOTE: *A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.*

TEXT BOOK:

1. Simon Haykin and Michael Moher, "An Introduction to Analog & Digital Communications",2nd Ed., Wiley, (2007).

**REFERENCE BOOKS: **

1. H Taub& D. Schilling, GautamSahe, "Principles of Communication Systems", TMH, 3rd Edition, (2007).
2. Sam Shanmugam, "Analog and Digital Communication Systems", John Wiley and Sons, 1992.

Constitution of India

III B.Tech – II Semester **(Code: 18EC601)**

Lectures	4	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None.

Course Objective: Students will

- Know importance of fundamental rights as well as fundamental duties.
- Learn powers of Union government in Indian federal system.
- Understand functioning of Indian Parliamentary System at State level.
- Analyze administration of local government and activities of election commission of India.

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

CO 1	Comprehend the Fundamental Rights and Fundamental Duties of the Indian Citizen to implant morality, social values, and their social responsibilities.
CO 2	Analyze the distribution of powers between Center and State and differentiate the roles of President and Cabinet.
CO 3	Differentiate the functioning of Indian Parliamentary System at State level.
CO 4	Get acquainted with Local Administration and Election Commission.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1						3		3							
CO2						3		3							
CO3						3		3							
CO4						3		3							
AVG						3		3							

SYLLABUS

UNIT – I

INTRODUCTION: Constitution' meaning of the term, Indian Constitution: Sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and Duties, DirectivePrinciples of State Policy.

UNIT – II

UNION GOVERNMENT AND ITS ADMINISTRATION: Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central secretariat, LokSabha, Rajya Sabha.

UNIT – III

STATE GOVERNMENT AND ITS ADMINISTRATION: Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT – IV

LOCAL ADMINISTRATION: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal

Corporation, Pachayatiraj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO ZilaPachayat: Position and role, Blocklevel: Organizational Hierarchy (Different departments),Village level: Role of Elected and Appointed officials, Importance of grass root democracy.

ELECTION COMMISSION: Election Commission: Role and Functioning, Chief Election commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

TEXT BOOKS:

1. 'Indian Polity' by Laxmikanth-6th edition-Mcgraw-hillindia
2. 'constitution of india'-Dr. P.K. AgrawalDr. K.N. Chaturvedi -Kindle Edition
3. 'Indian Constitution' by D.D. Basu-24th edition-lexis nexis publishers
4. 'Indian Administration' by Avasti and Avasti-Lakshmi Narain Agarwal Educational Publishers

REFERENCE BOOKS:

1. G. Austin (2004) Working of a Democratic Constitution of India, New Delhi: Oxford University Press.
2. Basu, D.D (2005), An Introduction to the Constitution of India, New Delhi, Prentice Hall.
3. N. Chandhoke&Priyadarshini (eds) (2009) Contemporary India: Economy, Society, Politics, New Delhi: Oxford University Press.

Internet of Things

III B.Tech – II Semester (Code: 18EC602)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives : Students will

- Learnt about the importance of the IOT system applications.
- Gain the knowledge of how to use various sensors in IoT real world scenario.
- Impart fundamental knowledge and programming of edge devices like Arduino and Raspberry Pi.
- Implement different case studies using cloud servers.

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

CO1	Analyzing the architecture of IoT along with statistical growth, levels and
CO2	Practicing how to interface various sensors in practical approach
CO3	Demonstrate the functionality and usage of Arduino and Raspberry pi
CO4	Examine the importance of IoT cloud in various applications using few case studies

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3												3	
CO2	3	2		3	2									3	
CO3	3	2		3	2									3	
CO4	3	2	3	2	2									3	
AVG	3	2.75	3	2.67	2									3	

SYLLABUS

UNIT – I

Introduction to IoT- IoT Growth, A statistical view, Application areas of IoT, Characteristics of IoT, Things in IoT, IoT stack, Enabling techniques: Sensors, Cloud computing, Big Data analysis, Embedded computing boards, Communication protocols, User Interfaces. IoT challenges, IoT levels.

UNIT - II

Sensors and Their Interfacing- Introduction to sensor interfacing, Type of sensors: MQ-02/05-Gas sensor Interfacing with Node MCU/Arduino, Interfacing the Obstacle sensor, Interfacing the Heartbeat sensor, Interfacing the Ultrasonic sound sensor, Interfacing the Gyro sensor, Interfacing the LDR sensor, Interfacing the GPS, Interfacing the colour sensor, Interfacing the pH sensor.

UNIT – III

Getting Familiarized with Arduino IDE -Architecture, Arduino Programming, A simple application, Arduino playground.

Getting Familiarized with Raspberry-Pi- Story behind Raspberry-Pi, Architecture, Compatible peripherals, Add-Ons, and accessories. Operating system for Raspberry Pi, Setting up for Raspberry Pi, Initial configuration for Raspberry Pi.

UNIT – IV

Cloud for IoT - Introduction, IoT with cloud-challenges, Selection of Cloud service provider

for IoT Applications: An overview, Introduction to Fog Computing, Cloud Computing: Security aspects.
Case studies: Smart Lighting, smart irrigation, Smart parking

TEXT BOOKS:

1. Shriram k Vasudevan, abhishek Nagarajan, RMD Sundaram, "Internet of Things", wiley, 1st Edition, 2019
2. Arshdeep Bahga, Vijay Madisetti, "Internet of Things: A Hands-on- Approach", VPT, 1stEdition, 2014.

REFERENCE BOOKS:

1. Sudip Misra, Anandarup Mukherjee, Arijit Roy, Introduction to IoT, Cambridge University Press, 1st edition, Nov 2020.
2. Jeremy Blum, Exploring Arduino: Tools and Techniques for Engineering Wizardry, Wiley, 2013.
3. Simon Monk, Raspberry Pi Cookbook, O'Reilly 3rd Edition, 2019
4. Michael Margolis, Arduino Cookbook, 2nd Edition, December 2011, O'Reilly Media, Inc.

Digital Image Processing

III B.Tech – II Semester (Code: 18EC603)

Lectures	4	Tutorial		Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Learn and summarize the digital image fundamentals and to be exposed to basic image processing techniques.
- Illustrate various filtering techniques for images in terms of spatial and frequency domain.
- Be familiar with different image restoration techniques and fundamentals of color images.
- Compare different image compression techniques and understand the morphological image processing operations.

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

CO1	Review the fundamental concepts of a digital image processing system.
CO2	Demonstrate spatial and frequency domain methods for image enhancement in gray scale images.
CO3	Examine various filtering techniques for Image restoration and understand the fundamentals of color image processing.
CO4	Analyze different lossy and lossless coding techniques for Image compression and understand the different morphological operations.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3													3
CO2	2	3													3
CO3	2	3													3
CO4	2	3													3
AVG	2	3													3

SYLLABUS

UNIT – I

INTRODUCTION: What Is Digital Image Processing? The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

DIGITAL IMAGE FUNDAMENTALS: Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships between Pixels, An introduction to the mathematical tools used in Digital Image Processing.

UNIT – II

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING: Background. Some Basic Intensity Transformation functions, Histogram Processing, Fundamentals of Spatial Filters, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

FILTERING IN THE FREQUENCY DOMAIN: Background, Extension to Functions of two variables, Some properties of 2D Discrete Fourier Transform, The basics of filtering in the Frequency Domain, Image smoothing using frequency domain filters, Image sharpening using frequency domain filters, Selective filtering.

UNIT – III

IMAGE RESTORATION: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Geometric Mean Filter.

COLOR IMAGE PROCESSING: Color Fundamentals, Color Models, Pseudocolor Image Processing, Basics of Full-Color Image Processing, Color Transformations, Smoothing and Sharpening, Image Segmentation based on Color, Noise in Color Images, Color Image Compression.

UNIT – IV

IMAGE COMPRESSION: Fundamentals, Some basic compression Methods, Huffman coding, Golomb coding, Arithmetic coding, LZW coding, Run length coding, Symbol based coding, Bit plane coding, Block transform coding, Predictive coding.

MORPHOLOGICAL IMAGE PROCESSING: Preliminaries, Erosion and Dilation, Opening and Closing, The Hit & Miss Transformation.

TEXT BOOK:

1. R. C. Gonzalez, R. E. Woods, Digital Image Processing 4th Edition, Pearson Education Publishers,2019.

REFERENCE BOOKS:

1. S Jayaraman, S Esakkirajan, T Veerakumar, Digital Image Processing, Mc-Grah Hill Publications, 2010.
2. Milan Sonka, Vaclav Hlavac and Roger Boyle, Image Processing Analysis and Machine Vision,Thomson learning, Second Edition, 2001.
3. S.Sridhar, Digital Image Processing, Oxford University Press, 2016.

Antennas and Wave Propagation

III B.Tech – II Semester (Code: 18EC604)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Apply various approaches to determine the potential functions to evaluate the radiated power and radiation resistance of alternating current element and quarter wave Monopole / half wave dipole
- Attain the knowledge of basic antenna parameters and analyze the fundamental parameters of two-element, N-element and Binomial antenna arrays.
- Analyze the characteristics of HF, VHF, UHF, wideband and special purpose antennas.
- Interpret various radio wave propagation mechanisms and understand the effects of earth's curvature on wave propagation

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

CO1	Analyze the radiation pattern of various basic antennas and mechanism associated with it.
CO2	Evaluate the basic parameters that are important in the design of antennas and parameters of antenna arrays.
CO3	Design and construction of different practical antennas used for wireless applications.
CO4	Analyze the importance of radio wave propagation required for communication

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													3
CO2	2	3													3
CO3	2	3	3												3
CO4	3	2													3
AVG	2.5	2.5	3												3

SYLLABUS

UNIT – I

RADIATION: Radiation Mechanism, Potential functions-heuristic approach, Maxwell's equation approach, Potential functions for sinusoidal oscillations, Alternating current element, Power radiated by current element, Application to short antennas, Assumed current distribution, Radiation from quarter wave Monopole / half wave dipole, Traveling wave antennas.

UNIT – II

ANTENNA FUNDAMENTALS: Isotropic, Directional, Omni-directional patterns, Principle patterns, Field regions, Radiation density, Radiation intensity, Directive gain, Power gain, Half power Beamwidth, Antenna polarization, Power loss factor, Radiation

efficiency, Effective aperture of antenna, Relation between maximum effective aperture and directivity, Friss transmission equation.

ARRAY ANTENNAS: Two element array, Uniform linear array, Side lobe level and beam width of broadside array, Beam width of end fire array, Principle of multiplication of patterns, Effect of earth on vertical patterns, Binomial array.

UNIT – III

Characteristics of typical antennas: Rhombic antennas, Folded Dipole, Loop antenna, Yagi-Uda array, Helical antenna, Log periodic antenna, Pyramidal and conical Horn antenna, Corner reflector antenna, Parabolic reflector antennas –Paraboloid, Cassegrain system of reflectors, Basic principles of slot antennas and micro strip antennas.

UNIT – IV

RADIO WAVE PROPAGATION: Ground wave Propagation, Space-wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Atmospheric effects in space-wave Propagation, Radio-Horizon, Duct Propagation, Extended-range Propagation resulting from Tropospheric Scattering, lonospheric Propagation, Gyro frequency, Refraction and reflection of Sky Waves by the Ionosphere, Critical Frequency, Skip Distance, Maximum Usable Frequency.

TEXT BOOKS:

1. Edward C Jordan and Keith G Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI, 2003.
2. Constantine A Balanis, Antenna Theory: Analysis and Design, Harper and Row Publishers, 2002

REFERENCE BOOKS:

1. J. D. Kraus and Ronald J Marhefka, Antennas For all Applications, TMH, 2003.
2. G. S. N. Raju, Antennas and Wave Propagation, 1st Edition, Pearson Publication.

VLSI Design

III B.Tech – II Semester (Code: 18EC605)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Fundamentals of Digital Electronics

Course Objectives: Students will

- Understand fabrication Process and electrical characteristics of Metal Oxide Semiconductor (MOS) circuits.
- Learn how to draw stick diagrams and layout diagrams for various MOS circuits using lambda based design rules.
- Demonstrate the nature of and approach to structured design through some examples.
- Discuss various concepts like VLSI design flow, Types of ASICs, CPLDs, FPGA architectures

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

CO1	Examine various MOS fabrication processes and basic electrical properties of MOS and BiCMOS circuits
CO2	Illustrate Mos and BiCMOS circuit design processes and basic circuit concepts like Sheet resistance Rs, Standard unit of capacitance, The Delay unit
CO3	Characterize subsystems in structured design approach
CO4	Outline the concepts VLSI design flow, Types of ASICs, CPLDs, FPGA architectures to make simple designs.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2												3	
CO2	3	2	2											3	
CO3	2	2												3	
CO4	2	3												3	
AVG	2.5	2.33	2											3	

SYLLABUS

UNIT- I

An introduction to MOS technology: Introduction to IC technology, Basic MOS transistors, NMOS fabrication, CMOS fabrication and BICMOS technology.

Basic Electrical Properties of MOS and BICMOS Circuits: I_{ds} versus V_{ds} relationships, threshold voltage V_t, Transconductance gm, Figure of merit, pass transistor, NMOS inverter, Pull-up to pull-down ratio, CMOS inverter, BICMOS inverters, Latch up in CMOS circuits.

UNIT- II

MOS and BICMOS circuit Design processes: MOS layers, Stick diagrams, Design rules and layout, Sheet resistance Rs, Standard unit of capacitance, The Delay unit, Inverter delays, Propagation delays, Wiring capacitances, Scaling models, Scaling factors for device Parameters.

UNIT- III

Subsystem design and layout: Architectural issues, Switch logic, Gate Logic, examples of Structured Design (combinational logic and sequential logic). Design of an ALU subsystem.

UNIT- IV

VLSI design flow, Introduction to ASICs, Full Custom ASICs, and standard cell based ASICs, Gate array based ASICs, Programmable logic devices, ROM, PLAs, PALs, CPLDs and FPGAs.

TEXT BOOKS:

1. Douglas A. Pucknell and Kamran Eshraghian, Basic VLSI Design Third Edition , Prentice-Hall of India Pvt.Ltd
2. Neil H E Weste and David Money Harris, CMOS VLSI Design, 4TH Edition, Pearson Education, 2002.

Artificial Intelligence

III B.Tech – II Semester (Code: 18ECD21)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Machine Learning

Course Objectives: Students will

- Gain a historical perspective of AI and its foundations and to learn the difference between optimal reasoning vs human like reasoning.
- Understand the notions of state space representation, exhaustive search, heuristic search along with the time and space complexities and to understand basic principles of AI toward problem solving, inference, perception, knowledge and learning.
- Learn different knowledge representation techniques and to explore the current scope, potential, limitations, and implications of intelligent systems and to explore the current scope, potential, limitations, and implications of intelligent systems.
- Investigate applications of AI techniques in intelligent agents, expert systems, artificial neural networks and other machine learning models and to understand the applications of AI: namely Game Playing, Theorem Proving, Expert Systems.

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

CO1	Demonstrate the ability to formulate an efficient problem space for a problem.
CO2	Exhibit the ability to select a search algorithm for a problem and characterize its time and space complexities.
CO3	Illustrate the skill of representing knowledge using the appropriate technique.
CO4	Utilize AI techniques to solve problems in Game Playing and Expert Systems.

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3														3
CO2	3	2													3
CO3	2	3	2												3
CO4	2	3	2		3										3
AVG	2.5	2.67	2		3										3

SYLLABUS

UNIT – I

Artificial Intelligence (AI) - History and Foundation, AI Techniques, Problem Solving With AI Models, Data Acquisition and Learning Aspects In AI.

Problem Solving – Problem Solving Process, Formulating Problems, Problem Types and Characteristics, Problem Analysis and Representation, Performance Measuring, Problem Space and Search, Toy and Real-World Problems. General Search Algorithms, Uninformed Search.

UNIT – II

Informed Search – Best First Search, Greedy Search, A* Search, AO* Search, Local Search Algorithm and Optimization Problems.

Intelligent Agents: Rationality and Rational Agent, Performance Measure, Rationality and

Performance, Flexibility and Intelligent Agents, Types of Agents.

UNIT – III

Knowledge Representation: Introduction, Approaches to Knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT – IV

Expert System and Applications: Introduction, Phases in Building Expert Systems, Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems,

Application of Expert Systems, List of Shells and Tools.

Uncertainty Measure - Probability Theory: Introduction, Probability Theory, Bayesian Belief Networks, Certainty Factor Theory, Dempster-Shafer Theory.

TEXT BOOKS:

1. Artificial Intelligence: Building Intelligent Systems By Parag Kulkarni and Prachi Joshi, PHI Publications.
2. Saroj Kaushik. Artificial Intelligence. Cengage Learning. 2011
3. Russell, Norvig: Artificial intelligence, A Modern Approach, Pearson Education, Second Edition. 2004.

REFERENCE BOOKS:

1. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition 2009.
2. Introduction to Artificial Intelligence by Eugene Charniak, Pearson.
3. Introduction to Artificial Intelligence and expert systems Dan W.Patterson. PHI.
4. Artificial Intelligence by George Flugerrearson fifth edition.

Information Theory and Coding

III B.Tech – II Semester (Code: 18ECD22)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Information Theory essentials and Source Coding concepts.
- Channel Coding Techniques to Combat Errors – Block Codes, Cyclic Codes, Convolutional Codes.
- To implement Encoder and Decoders for Error Free Transmission and Reception.

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

CO1	Analyze and evaluate fundamental information and source coding techniques for improving efficiency of a communication system.
CO2	Develop channel coding schemes to improve the reliability of a communication system.
CO3	Analyze and evaluate various cyclic redundancy codes suitable in Digital Communication.
CO4	Apply Convolutional coding techniques for error correction in telecommunication systems.

Mapping of Course Outcomes with Program Outcomes & Program Specific															
	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3													2
CO2	3	3													2
CO3	3	3													2
CO4	3	3													2
AVG	3	3													2

SYLLABUS

UNIT – I

SOURCE CODING: Mathematical models of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, coding for discrete memory less Sources, Properties of Codes, Huffman Code, Run Length Codes.

UNIT – II

CHANNEL CODING : Introduction to Linear Block Codes, Generated Matrix, Systematic Linear Block Codes, Encoder Implementation of Linear Block Codes, Parity Check Matrix, Syndrome Testing, Error Detecting and Correcting Capability of Linear Block Codes, Hamming Codes.

UNIT – III

CYCLIC CODES: Algebraic Structure of Cyclic Codes, Binary Cyclic Code Properties, Encoding in Systematic Form, Syndrome Computation and Error Detection, Decoding of Cyclic Codes, Cyclic Hamming Codes

UNIT – IV

CONVOLUTIONAL CODES: Encoding of Convolutional Codes, Structural Properties of Convolutional Codes, State Diagram, Tree Diagram, Trellis Diagram, Maximum, Likelihood Decoding of Convolutional Codes, Viterbi Algorithm.

TEXT BOOKS:

1. "Error Control Coding – Fundamentals and Applications," by SHU LIN and Daniel J. Costello, JR., Prentice Hall Inc.
2. "Communication Systems," Simon Haykin 4th edition.

REFERENCE BOOKS:

1. "Digital Communications – Fundamentals and Applications" by Bernard Sklar, Pearson Education Asis, 2003.
2. "Digital Communications – John G. Proakis, McGraw Hill Publications.
3. "Principles of Digital Communication" J. Das, Sk. Mallik, PK Chattergee – NAI (P) Ltd, 2000.

Embedded System Design

III B.Tech – II Semester (Code: 18ECD23)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will be able

- To impart basic design and architectural concepts of embedded systems
- To impart the concepts of Real-Time Operating Systems and provide the scheduling Algorithms.
- To provide fundamentals of prevalent IP-Core: ARM Cortex M3/M4 & Design of an Embedded system using ARM Cortex Processor.
- To explain instruction set of ARM Cortex M3/M4 processor and explain the ALP's Using ARM processor

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

CO1	Analyze the different technologies for design of embedded systems
CO2	Evaluate the architectural features, instruction set for programming of ARM Cortex M3/M4
CO3	Illustrate RTOS concepts
CO4	Design Embedded systems using TIVA C Microcontroller

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3				2							3	2	2
CO2	2	3		2	2								2	2	2
CO3	2	3											2	2	2
CO4	1	2	3			2							3	3	2
AVG	1.75	2.75	3	2	2	2							2.5	2.5	2

SYLLABUS

UNIT - I

Embedded Systems Design: Introduction to Embedded systems, Design Metrics; Processor technology, IC technology, Design Technology, Custom Single purpose processor Design – GCD Designing Controller/Data path

UNIT - II

ARM Cortex M3/M4: Introduction to ARM family, Cortex M3 fundamentals - Pipeline, Registers, States, Operation modes, Access Levels, Memory Map, Introduction of Memory attributes & Exception Types; Cortex M3 Instruction Set, Basic Assembly programming, ARM Mode & Thumb State Switching.

UNIT - III

RTOS Concepts: Architecture of the Kernel, Tasks and Task scheduler, Types of real time tasks, Task periodicity, Task scheduling, Classification of scheduling algorithms: Clock driven Scheduling, Event driven Scheduling; Resource sharing, Priority inversion problem,

Memory Management, Semaphores, Mutex, Mailboxes, Message Queues, Event Registers, Pipes;

UNIT – IV

Advanced ARM Instructions: Semaphore, State Change, Hint, Barrier instructions;
TIVA C - TM4C123G: Introduction - Features, Block Diagram, GPIO Programming, Timer, PWM, I2C & SPI programming. CC3100 and basic IOT application,

TEXT BOOK:

1. Frank Vahid / Tony Givargis, "Embedded System Design A unified Hardware / Software Introduction" John Wiley & Sons, Inc.
2. Santanu Chattopadyay, Embedded System Design, PHI, 2010.
3. Joseph Yiu, The Definitive Guide to the ARM Cortex-M3 & M4, Elsevier, 3rd Edition, 2013.

REFERENCE BOOKS:

1. KVKK Prasad, Embedded/Real Time Systems, Dreamtech Press, 2005.
2. Muhammad Ali Mazidi, Shujen Chen, Naimi, TI TIVA ARM Programming for Embedded Systems: Programming ARM Cortex M3 TM4C123G with C: Volume 2 (Mazidi & Naimi), Microdigitaled, 1st Edition, 2017.
3. Jonathan W Valvano, Embedded Systems: Real-Time Operating Systems for ARM Corte-M Microcontrollers, CreateSpace, Volume 3, 5th Edition, 2019.
4. Jonathan W Valvano, Embedded Systems: Introduction to ARM Cortex-M Microcontrollers, CreateSpace, Volume 1, 5th Edition 2019.
5. Jonathan W Valvano, Embedded Systems: Real Time Interfacing to ARM Cortex-M Microcontrollers, Createspace, Volume 2, 5th Edition, 2017.
6. Layla B Das, Architecture, Programming, and Interfacing of Low-Power Processors – ARM 7, Cortex-M, Cengage, 2017.

Online Sources:

1. http://users.ece.utexas.edu/~valvano/
2. https://www.cse.iitb.ac.in/~erts/html_pages/Resources/Tiva/TM4C123G_LaunchPad_Workshop_Workbook.pdf
3. http://www.nptelvideos.in/2012/11/embedded-systems.html
4. https://developer.arm.com/ip-products/processors/cortex-m/cortex-m3
5. http://esd.cs.ucr.edu/

Telecommunication Switching Systems and Networks

III B.Tech – II Semester (Code: 18ECD24)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Describe the fundamentals of telecommunication systems
- Explain the working principle of various switching systems in Telecommunication.
- Discuss data networks.
- Recognize differences among telephone network, data network and ISDN.

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

CO1	Discuss the Fundamentals of telecommunication systems with n-stage networks.
CO2	Analyze Working principle of various switching systems in Telecommunication by switching techniques.
CO3	Build various Modern digital data networks like PSTN, LAN, and MAN etc.
CO4	Explore various data networks and Integrated Service Digital Network with their co-existence.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3														3
CO2	2	3													3
CO3	2	3													3
CO4	3	2													3
AVG	2.5	2.67													3

SYLLABUS

UNIT – I

INTRODUCTION: Evolution of Telecommunications, Simple telephone communication, Basics of a switching system, Manual Switching System, Major Telecommunication Networks.

ELECTRONIC SPACE DIVISION SWITCHING: Stored Program Control, Centralized SPC, Distributed SPC, Two stage networks, Three stage networks, n stage networks.

UNIT – II

TIME DIVISION SWITCHING: Basic time division space switching, Basic time division time switching, Combination switching, Three stage combination switching, n stage combination switching.

TELEPHONENETWORKS: Subscriber Loop System, Switching Hierarchy and Routing, Transmission Plan, Transmission Systems, Numbering Plan, Charging Plan, Signaling Techniques, In-channel Signaling, Common Channel Signaling, Cellular Mobile Telephony.

UNIT – III

DATA NETWORKS: Data Transmission in PSTNs, Switching techniques for Data Transmission, Data Communication Architecture, Link-to-Link Layers, End-to-End Layers, Satellite based Data Networks, Local Area Networks, Metropolitan Area Networks, Fiber

Optic Networks, Data Network Standards, Protocol Stacks, Internetworking.

UNIT – IV

Integrated Services Digital Network: Motivation for ISDN, New Services, Network and Protocol Architecture, Transmission Channels, User- Network Interfaces, Signaling, Numbering and Addressing, Service Characterization, Interworking, ISDN Standards, Expert Systems in ISDN, Broadband ISDN, Voice Data Integration.

TEXT BOOK:

1. T Viswanathan, "Telecommunication Switching Systems and Networks", PHI, 2004.

REFERENCE BOOKS:

1. "Digital Telephony"- J. Bellamy, 2nd Edition, 2001, John Wiley.
2. "Data Communications and Networks"- Achyut S. Godbole, 2004, TMH.
3. "Principles of Communication Systems"- H. Taub& D. Schilling, 2nd Edition, 2003, TMH.
4. "Data Communication & Networking"- B. A. Forouzan, 3rd Edition, 2004, TMH.
5. "Telecommunication System Engineering"– Roger L. Freeman, 4th Ed., Wiley-Inter Science, John Wiley & Sons, 2004.

Signal and Image Processing Using Scilab

III B.Tech – II Semester (Code: 18ECL61)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Digital Signal and Image Processing Fundamentals

Course Objectives: Students will be able to

- Implement various aspects of basic operations on signals (1D, 2D, 3D).
- Development of algorithms using SCI-Lab.

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

CO 1	Implement Basic Operations On Signal Processing Like Modulations And Convolution Bt-3
CO 2	Apply Spatial Transformations On Images Like Histogram, Kernal, Masking, Filtering Bt-3
CO 3	Analyse Different Coding And Compression Techniques Bt-4
CO 4	Develop Applications Using Different Image Processing Techniques. Bt-5

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	1	-	-	3				1		1				
CO2	3	1	-	-	3				2		1				
CO3	3	3	2	3	3				3		1				
CO4	3	3	3	3	3	2			3		2	2			
AVG	3	1	-	-	3				1		1				

LIST OF PROGRAMS

1. Amplitude Modulation.
2. Frequency Modulation.
3. Linear and Circular Convolution of two discrete time signals.
4. Histogram and histogram equalization of an image.
5. Kernel processing on images leading to Color image enhancement.
6. Color image histogram manipulation.
7. Display of 2D filters frequency responses and processing the images using these filters.
8. Implementation of arithmetic coding for images.
9. Basic JPEG algorithm implementation.
10. Simple image watermarking algorithms using LSB substitution.
11. Simple content based image retrieval using various distance metrics.

12. Color images manipulations, reading and writing of color images.
13. Special effects implementation on grey and color images.
14. LOG Masks implementation for gray and color images.
15. Simple video reading and writing .avi formats and manipulation of video frames.

NOTE: *A minimum of 10 (Ten) programs are to be executed and recorded to attain eligibility for Semester End Examination.*

INTERNET OF THINGS LAB

III B.Tech – II Semester (Code: 18ECL62)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Problem Solving with Programming, Data Structures using Python and Microprocessors and Microcontrollers

Course Objectives (COs): Students will

- Demonstrate skills in programming edge devices using Arduino board and Node MCU.
- Master skills in programming edge devices using Raspberry Pi.
- Interface different Sensors with Arduino, Raspberry Pi and Node MCU.
- Design & Interface Edge Devices and actuators using various protocols for IoT applications.

Course Outcomes (CLOs): At the end of the lab course, students will be able to

CO1	Experiment with edge devices like Arduino.
CO2	Select appropriate sensors for designing an IoT Application.
CO3	Choose appropriate components with feasible communication interfaces to realize an application.
CO4	Design & develop IoT applications and solutions using latest controllers

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2		3	3				2				2	3	2
CO2	3	2		3	3				2				2	3	2
CO3	3	2		3	3				2				2	3	2
CO4	3	2	3	3	3				2				2	3	2
AVG	3	2	3	3	3				2				2	3	2

LIST OF EXPERIMENTS

Design, Develop and implement Embedded and IOT applications using the following. Software: Arduino IDE; Tinker CAD; Raspbian OS and other Open Source Software. Hardware: Arduino, RaspberryPi, Node MCU andother Latest Controller boards.

Note: *Minimum of 10 experiments to be completed Arduino / RaspberryPi Basic (Optional – Study Experiments)*

a) *Interface Digital I/O–Switch- LED–Turn ON LEDfor1Secafter 2Sec.*
b) *Interface Analog I/O–Potentiometer.*

Using Arduino/ Raspberry Pi

1. Display entered keypad message in Serial Monitor.
2. Acquired Analog Sensor signal data (Ex:LDR/LM35) and display on LCD.
3. Data logic quired signal, display; entered data into an Micro SD Card.
4. Automatic Identification using (Ex:IR, Ultrasonic, RFID tags etc).

5. Automation of actuators based on sensor signals for specific application.
6. Interface Node MCU with display device (Ex: RGBLED)to convey signal information (ON/OFF, Different colors)etc for specific durations (Ex: 2, 3sec.)
7. Android Application Development –Android Studio or MITApp Inventor

Wireless/Internet/CloudConnectivityusingArduino/RaspberryPi/NodeMCU

8. Program to send or receive SMS using any MC.
9. Web Server: Control Motor using Relay, ON/OFF switch button over server web page.
10. Measure/Retrieve Sensor data and upload to Things peak.
11. Monitor or Control IOT application for Sending & Receiving data using a Mobile App.
12. Machine-to-Machine(M2M)Protocol; Publish/subscribe sensor data using MQTT
13. Broker.
14. Demonstration of any of the protocols (Ex: Zigbee, Bluetooth, RF, LoRa, or CAN).

IOT Design &UI Development using Latest Controller Boards &Software:

15. TIVAC/MSP430/MSP432withCC3100/CC3200;
16. PIC-IOTWA,WG/AVR-IOTWA,STM32,Beaglebone,
17. Matlab, Lab VIEW & my RIO
18. GPIO Programming, Sensor/Actuator Interfacing–1
19. GPIO Programming, Sensor/ActuatorInterfacing-2
20. Upload/Read data to or from Cloud–1(Google, AWS,I BM, Microsoft Azure)
21. Upload/Read data to or from Cloud –2(Google, AWS, IBM, Microsoft Azure)
22. Setup my RIO as a standalone device and data logging to Pen Drive.
23. Connect my RIO over a network and Upload/Read data to or from the cloud.
24. Demonstration of IOT using Matlab

NOTE: *A minimum of 10 (Ten) programs are to be executed and recorded to attain eligibility for Semester End Examination.*

Soft Skills Laboratory

III B.Tech – II Semester (Code: 18ELL02)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will be able

- To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
- To know the importance of interpersonal and intrapersonal skills in an employability setting
- To actively participate in group discussions / interviews and prepare & deliver presentations
- To function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, stress management and leadership quality

Course Outcomes: After completion of this lab course, the student will be able to

CO1	Experiment with program edge devices like Arduino.
CO2	Select appropriate IOT Technologies
CO3	Make use of IOT components using appropriate communication interfaces
CO4	Design & develop IOT applications and solutions using latest controllers

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1								2	3	3	2	2			2
CO2								2	3	3	2	2			2
CO3								2	3	3	2	2			2
CO4								2	3	3	2	2			2
AVG								2	3	3	2	2			2

LIST OF EXPERIMENTS

1. Body Language & Identity Management

a. Facial Expressions – Kinesics - Occulesics
b. Haptics - Proxemics
c. Para Linguistics
d. Appearance
e. Identity Management Communication

2. Emotional Intelligence & Life Skills

a. Self-Awareness through Johari Window and SWOC analysis
b. Self Motivation
c. Empathy
d. Assertiveness& Managing Stress

e. Positive Attitude
f. Time Management
g. Goal Setting: Short term, Long Term, Vision, Mission.

3.Business Presentations

a. Preparing effective Presentations Power Point Presentations
b. Power Point Presentations
c. Using Visual Aids
d. Mock Presentations

4.Employability Skills

a. Group Discussion
b. Team Building and Leadership Qualities
c. Interview Skills

Reference Books:

1. Personality Development and Soft skills (Second Edition), Barun K. Mithra. Oxford University Press: 2016
2. The Definitive Book of Body Language, Allan & Barbara. Pease International:2004
3. Working with Emotional Intelligence, Daniel Goleman. Bloomsbury:1998
4. English for Jobseekers, Lina Mukhopadhyay. Cambridge University Press:2013
5. The 7 Habits of Highly Effective People, Stephen R.Covey. St. Martin's Press:2014

Industrial Management & Entrepreneurship Development

IV B.Tech- I Semester (CODE: 18ME002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will be able

- To provide students an insight into the concepts of General & Scientific management and various forms of business organizations
- To provide the students with an understanding of basics of human resource management, marketing management
- To understand inventory control concepts, fundamentals of TQM, and supply chain management.
- To provide an understanding of financial management and realize the importance of entrepreneurship.

Course Outcomes: After completion of the course, the student must be able to

CO 1	Describe the various functions of the management. Learn various forms and structures of business organizations.
CO 2	Understand how resources to be planned and also understand various motivation theories, leadership styles and marketing management.
CO 3	Develop knowledge about inventory control. Gain the knowledge on Total quality management and understand supply chain management.
CO 4	Grasp complete knowledge on importance of entrepreneurship & ability to understand capital and various types of capital.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1									1		3	3			
CO2									1		3	3			
CO3									1		3	3			
CO4	2	3	2	3					1		3	3			
AVG	2	3	2	3					1		3	3			

SYLLABUS

UNIT – I

GENERAL MANAGEMENT: Management definition, Functions of Management and Principles of Management.

SCIENTIFIC MANAGEMENT: Definition, Principles of Scientific Management.

FORMS OF BUSINESS ORGANIZATION: Choice of form of organization, Salient features of Sole Proprietorship, Partnership, Joint Stock Company: Private Limited and Public Limited companies; Merits and demerits.

Organization: Definition, Line, line and staff, functional and matrix organization, Introduction to Strategic Management: Definition and scope

UNIT – II

HUMAN RESOURCE MANAGEMENT: Functions of HR management, human resource planning, recruitment, selection, placement, training & development and

performance appraisal, Motivation theories, leadership styles.

Marketing Management: Concepts of Selling and Marketing, Functions of Marketing, Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle; distribution channels

UNIT – III

MATERIALS MANAGEMENT: Inventory Control, Inventory costs, Basic EOQ model, Model with Price breaks, ABC analysis, FSN Analysis, VED Analysis.

TOTAL QUALITY MANAGEMENT: Importance of quality, Difference between Inspection and Quality control, Components of total quality, Quality Function Deployment

INTRODUCTION TO SUPPLY CHAIN MANAGEMENT

UNIT – IV

FINANCIAL MANAGEMENT: Functions of finance, Types of Capital-Fixed and Working Capital, Break Even Analysis.

ENTREPRENEURSHIP DEVELOPMENT: Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship; Entrepreneurial development-Objectives, Need of Training for enterprises; Finance for the enterprises.

TEXT BOOKS:

1. Essentials of Management /Koontz and Heinz Weihrich/ Tata-McGraw-Hill 10th Ed.
2. Manufacturing Organization and Management / Amrine / Pearson Education
3. Management Science, A. R. Aryasri.

REFERENCE BOOKS:

1. Operations Management, Joseph G Monks.
2. Marketing Management, Philip Kotler.
3. Entrepreneurship, Robert D Hisrich, Michael P Peters, Mathew Manimala &Dean A.
4. Shepherd-McGraw Hill, India-2014 (9th Edition)–ISBN: 9789339205386

Microwave and Radar Engineering

IV B. Tech – I Semester (Code: 18EC701)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Antenna and Wave Propagation

Course Objectives: Students will be able to learn

- Principles of different microwave amplifiers and oscillators.
- To use S-parameter terminology to describe various microwave circuits.
- The concept of RADAR block diagram, Radar range equation.
- The concept of Doppler Effect, CW and Frequency Modulated Radar.
- The functions of various blocks of MTI Radar.

Course Outcomes: After completion of the course the student must be able to

CO1	Evaluate the parameters of various microwave tubes.
CO2	Identify different microwave frequency band designations and analyze microwave passive devices using S-parameters
CO3	Familiarize with the Range equation, Radar Cross Section and Losses of RADAR Systems.
CO4	Analyze the working of CW, FMCW and MTI Radars

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	3													3
CO2	3	2													3
CO3	3														2
CO4	2	3													3
AVG	2.75	2													2.75

SYLLABUS

UNIT I

Microwave Frequency Band Designations, Advantages and Applications of Microwaves.

MICROWAVE TUBES: Limitations of Conventional tubes at Microwave frequencies, Linear Beam (O Type) tubes- Two cavity Klystron amplifier- Operation and Performance characteristics, Reflex Klystron-Construction, operation and operating Characteristics, Travelling Wave Tube- Constructional features of TWT and its Operation M-Type Tubes- Eight cavity Magnetron Operation.

SOLID STATE MICROWAVE DEVICES: Construction and working of PIN diode, Crystal diode, Tunnel diode, Gunn diode, IMPATT diode

UNIT – II

MICROWAVE COMPONENTS: E-plane Tee, H-plane Tee, Magic Tee, Applications of magic Tee, Directional Couplers- Two-Hole Directional Couplers, Applications of Directional Couplers, Faraday Rotation Based Isolator and Circulator, Properties of a Scattering matrix, scattering matrix Calculations for E-plane Tee, H-plane Tee, Magic Tee, Directional Coupler, Circulator and Isolator.

MICROWAVE MEASUREMENTS: Microwave bench general measurement set up,

measurement of power, measurement of VSWR, measurement of Impedance

UNIT-III

Introduction to Radar, the simple form of the Radar equation, Radar block diagram and operation, The Doppler Effect, Simple CW Radar Block Diagram, Block diagram of CW doppler radar with nonzero IF receiver, Applications of CW radar, Block Diagram of Frequency Modulated CW Radar.

UNIT-IV

MTI AND PULSE DOPPLER RADAR: Introduction: Description of operation, Block Diagram of MTI Radar with Power Amplifier Transmitter, Block Diagram of MTI Radar with Power Oscillator Transmitter, Delay line cancellers: Filter Characteristics of delay line canceller, Blind speeds, Double cancellation, Limitations to MTI Performance, Pulse Doppler radar.

TEXT BOOKS:

1. "Microwave and Radar Engineering by Dr.M. Kulkarni", UmeshPublications,fifth edition New Delhi, 2009.
2. "Introduction to Radar Systems", Merrill I Skolnik, 2nd Edition, TMH, 2007.

REFERENCE BOOKS:

1. "Foundations for Microwave Engineering", by RE Collin IEEE Press Series, 2003.
2. "Microwave Devices and Circuits", by Samuel Y Liao 3rd Edition, Pearson Education, 2003.
3. "Microwave Engineering", by "ML Sisodia and V.L.Gupta, New Age International, 2005.
4. "Microwave and Radar Engineering", by GottapuSasiBhushana Rao, Pearson Publications, 2014.
5. "Fundamentals of RADAR, Sonar and Navigation Engineering", KK Sharma, SK Kataria&Sons, Fourth Edition,2014.

Wireless And Mobile Communications

IV B. Tech – I Semester (CODE: 18EC702)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course objectives: Students will

- Understand the examples and fundamental concepts of wireless cellular communication systems.
- Learn the basic signal propagation mechanisms and practical link budget design using path loss models.
- Know the role of equalization in mobile communication and to study different types of equalizers and diversity techniques.
- Study the different wireless communication systems and their standards (1G to 4G).

Course Outcomes: After completion of the course the student must be able to

CO1	Illustrate the fundamental concepts of mobile and cellular communication systems
CO2	Illustrate the basic signal propagation mechanisms and compare various fading techniques.
CO3	Analyze the different equalization and diversity techniques.
CO4	Compare various cellular communication standards (1G to 4G).

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													3
CO2	3	2													3
CO3	2	2													3
CO4	2	2													3
AVG	2.5	2													3

SYLLABUS

UNIT-I

CELLULAR MOBILE COMMUNICATION CONCEPTS: Examples of wireless communication systems, Frequency reuse, Channel assignment strategies, Handoff strategies: types, prioritizing handoff, practical handoff considerations; Interference and system capacity: co-channel and adjacent channel interference, power control for reducing interference; Grade of service: definition, standards; Improving coverage and capacity in cellular systems: cell splitting, sectoring, repeaters for range extension, a microcell zone concept.

UNIT-II

MOBILE RADIO PROPAGATION: Large-Scale Path Loss (Fading): Free space propagation model, The Three basic propagation mechanisms: Reflection, ground reflection (Two-Ray) model, diffraction, scattering; Practical link budget design using path loss models.

SMALL SCALE FADING AND MULTIPATH: Small-scale multipath propagation, Parameters of mobile multipath channels, Types of small-scale fading: Fading effects due

to multipath time delay spread, Fading effects due to Doppler spread.

UNIT-III

EQUALIZATION: Fundamentals of equalization, Training a generic adaptive equalizer, Equalizers in a communication receiver, survey of equalization techniques, Linear equalizers, Nonlinear equalization: Decision feedback equalization (DFE), Maximum likelihood sequence estimation (MLSE) equalizer.

DIVERSITY TECHNIQUES: Practical space diversity considerations: Selection diversity, feedback or scanning diversity, maximum ratio combining (MRC), equal gain combining (EGC), Polarization diversity, Frequency diversity, Time diversity, Rake receiver.

UNIT – IV

EVOLUTION OF CELLULAR TECHNOLOGIES: First generation cellular systems, 2G Digital cellular systems, 3G Broadband wireless systems, Beyond 3G: HSPA+, WiMAX, and LTE.

LTE: Demand drivers for LTE, Key requirements of LTE design, LTE Network architecture, Future of mobile broadband-Beyond LTE.

TEXT BOOKS:

1. Theodore S. Rappaport, Wireless Communications Principles and Practice, 2nd Edition, Pearson Education, 2003. (UNIT I, II, III)
2. Arunabha Ghosh, Jan Zhang, Jefferey Andrews, Riaz Mohammed, Fundamentals of LTE, Pearson Education, 2011. (UNIT IV)

REFERENCE BOOKS:

1. Yi-BingLin, Imrich Chlamtac, Wireless and Mobile Network architectures, Wiley, 2001.
2. W.C.Y. Lee, Mobile Cellular Communications, 2nd Edition, Mc-Graw Hill, 1995.
3. G Sasibhusan Rao, Mobile Cellular Communications, Pearson Education, 2013.

Fiber Optic Communications

IV B.Tech – I Semester (Code: 18EC703)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Analog Communications and EMFT

Course Objectives: Students will

- Learn basic elements of optical fiber transmission link, modes configurations & structures.
- Understand the different kind of losses, signal distortion, SM fibers.
- Understand the construction and working of Optical sources and Detectors.
- Explain the construction of optical communication system and also measurement of various losses.

Course Outcomes: After completion of the course the student must be able to

CO1	Illustrate the basic principles of optics and different types of fibers
CO2	Analyzing various losses and Dispersion in optical communications
CO3	Explain the construction and working of Optical sources and Detectors
CO4	Analyze the construction of optical communication system and also measurement of various losses

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2											2		2
CO2	2	3											2		2
CO3	2	2											2		2
CO4	2	3											2		2
AVG	2	2.5											2		2

SYLLABUS

UNIT – I

INTRODUCTION: Historical development, The general system, Advantages of Optical Fiber communications,

OPTICAL FIBER WAVEGUIDES: Introduction, Ray Theory Transmission: Total internal reflection, Acceptance angle, Numerical Aperture, Skew rays.

CYLINDRICAL FIBER: Modes, Mode coupling, Step index fibers, Graded index fibers, Fiber materials.

UNIT – II

TRANSMISSION CHARACTERISTICS OF OPTICAL FIBERS: Introduction, Attenuation, Material absorption losses in silica glass fibers, Linear scattering losses,

Non-Linear scattering losses, Fiber bend losses, Dispersion, Intramodal dispersion, Intermodal dispersion.

OPTICAL FIBER CONNECTION: Joints And Couplers: Introduction, Fiber alignment and joint loss, Fiber splices, Fiber Connectors, Expanded beam connectors, Fiber Optic couplers.

UNIT – III

OPTICAL SOURCES1: The Laser: Introduction, Basic concepts, Optical emission from semiconductors, Some injection laser structures, Injection laser characteristics, DH Laser, Stripe Geometry Laser, DFB and DBR Lasers.

OPTICAL SOURCES2: The Light Emitting Diode: Introduction, LED power and efficiency.

Led Structures: Planar LED, Dome LED, Surface emitter LEDs, Edge emitter LEDs, Super luminescent LEDs, LED characteristics. Optical Detectors: Introduction, device types, optical detection principles, Semiconductor Photo Diodes Without Internal Gain: PN, P-I-N Photodiode, Semiconductor Photo Diodes with Internal Gain: Avalanche Photodiode, Optical Power Budgeting Schemes.

UNIT– IV

OPTICAL FIBER SYSTEMS1: Intensity Modulation/Direct Detection: Introduction, THE OPTICAL TRANSMITTER CIRCUIT: Source limitations, LED drive circuits. The Optical Receiver circuit: The preamplifier, Agc, Advanced Multiplexing Strategies: Optical time division multiplexing (OTDM), Wavelength division multiplexing (WDM).
OPTICAL FIBER MEASUREMENTS: Optical Time Domain Reflectometry (OTDR).

TEXT BOOK:

1. John M Senior, Optical Fiber Communications: Principles and Practice, 2nd Edition, PHI, 2005.

REFERENCE BOOKS:

1. Henry Zanger and Cynthia Zanger, Fiber Optics: Communication and other Applications, Maxwell Macmillan Edition.
2. JC Palais, Fiber Optic Communications, 2nd Edition, PHI, 2001.
3. W.Tomasi, Advanced Electronic Communication Systems, Pearson Education, 2002.

Introduction to Nanoscience and Nanotechnology

IV B.Tech – I Semester (Code: 18ECD31)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Learn Quantum aspects in relation to nano structures
- Learn various techniques useful for preparation of nanomaterials
- Explore the various characterization techniques to observe nanoparticles and composition
- Device the nano electronic components suitable to various industries

Course Outcomes: After completion of the course the student must be able to

CO1	Scale up synthesis of nanomaterials and understand quantum confinement
CO2	Understand properties of nanomaterials and nano tubes
CO3	Know the characterization techniques of nano materials
CO4	Know the usage of nano particles in nano biology and nano medicine.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3														
CO2	3														
CO3	2			2											
CO4	2				2										
AVG	2.5			2	2										

SYLLABUS

UNIT-I

INTRODUCTION:

Introduction to Nanotechnology; Definitions of terms related to Nano science /Nano technology: (i) Nano Science (ii) Nanotechnology (iii) Nano materials (iv) Nanoparticles; Application areas of Nanotechnology.

QUANTUM NANO-ENGINEERING:

Particle in a Box, Quantum Limit: From 3D to 0D, Quantum Confinement in Semiconductors, 3D Density of States, 2D Model, 1D Model, Q0D Model

UNIT – II

SYNTHESIS OF NANO-MATERIALS:

Top-down and Bottom-up approaches; Ball milling, Physical Vapor Deposition, Electro deposition, Chemical Vapor Deposition, Atomic Layer Deposition (ALD), Sol–Gel techniques, Introduction to lithography, X-ray lithography, Electron beam lithography, Ion-beam lithography

UNIT – III

CHARACTERIZATION OF NANO-MATERIALS:

X-ray Diffraction, Scanning Electron Microscopy, Scanning tunneling Microscopy, UV-

Visible Spectroscopy

UNIT – IV

CARBON NANO MATERIALS:

Carbon Nanotubes (CNT), Properties and applications of CNT, Fullerenes, Graphene, Importance of Graphene, and Applications of Graphene

Applications of Nano materials:

Quantum electronic devices: CNFETS, CNFEDS; Biological applications: Bio-Chemical sensor

TEXT BOOKS:

1. "Introduction to Nano Basics to Nanoscience and Nanotechnology", AmretashisSengupta andChandan Kumar Sarkar Editors:Springer-Verlag Berlin Heidelberg 2015.
2. "Engineering Physics" D.K.Bhattacharya and Poonam Tandom, Oxford university Press 2015

REFERENCE BOOKS:

1. "Introduction To Nanoscience And Nanotechnology",Chris Binns 2010 by John Wiley & Sons, Inc..
2. "An Introduction to Nanoscience and Nanotechnology", Alain Nouailhat2008 by ISTE Ltd and John Wiley & Sons, Inc..

Machine Learning

IV B.Tech – I Semester (Code: 18ECD32)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Probability and Statistics

Course Objectives: Students will

- Understand how a machine learns and various applications of machine learning.
- Distinguish between classification and regression
- Fundamentals of Artificial neural networks
- Gain knowledge in Support Vector Machine and Baye's classifier principles.

Course Outcomes: After completion of the course the student must be able to

CO1	Analyze the mathematical and statistical prospective of machine learning algorithms through python programming
CO2	Evaluate the machine learning models pre-processed through various features
CO3	Design and develop the code for recommender system using Natural Language Processing.
CO4	Apply various Baye's techniques for data clustering.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2	3		3										3
CO2	3	3			3										3
CO3	3	3			3										3
CO4	2	2			3										3
AVG	2.5	2.5	3		3										3

SYLLABUS

Unit - I

INTRODUCTION: Towards Intelligent Machines, Well-Posed Machine Learning Problems, Examples of Applications in Diverse Fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured/Unstructured, Forms of Learning, Machine Learning and Data Mining

SUPERVISED LEARNING: Rationale and Basics, Learning from Observations, Bias and Variance, Why Learning Works: Computational Learning Theory, Occam's Razor Principle and Overfitting Avoidance, Heuristic Search in Inductive Learning, Estimating Generalization Errors, Metrics for Assessing Regression (Numeric Prediction) Accuracy, Metrics for Assessing Classification (Pattern Recognition) Accuracy, An Overview of the Design Cycle and Issues in Machine Learning

Unit - II

Statistical Learning, Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in Learning Techniques, Bayesian Reasoning: A Probabilistic Approach to Inference, k-Nearest Neighbor (k-NN) Classifier, Discriminant Functions and Regression Functions, Linear Regression with Least Square Error Criterion, Logistic Regression for

Classification Tasks, Fisher's Linear Discriminant and Thresholding for Classification Minimum Description Length Principle.

Unit - III

Learning With Support Vector Machines (SVM), Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Linear Maximal Margin Classifier for Linearly Separable Data, Linear Soft Margin Classifier for Overlapping Classes, Kernel-Induced Feature Spaces, Nonlinear Classifier, Regression by Support Vector Machines, Linear Regression, Nonlinear Regression, Decomposing Multiclass Classification Problem Into Binary Classification Tasks, One-Against-All (OAA), One-Against-One (OAO), Variants of Basic SVM Techniques.

Unit - IV

Data Clustering and Data Transformations, Unsupervised Learning, Clustering, Engineering the Data, Overview of Basic Clustering Methods, Partitional Clustering, Hierarchical Clustering, Spectral Clustering, Clustering using Self-Organizing Maps, K-Means Clustering, Expectation-Maximization (EM) Algorithm and Gaussian Mixtures Clustering, Some Useful Data Transformations, Entropy-Based Method for Attribute Discretization, Principal Components Analysis (PCA) for Attribute Reduction. Decision Tree Learning, Introduction, Example of a Classification Decision Tree.

Text Book:

1. Applied Machine Learning , M.Gopal, McGraw Hill Education, 1 Edition , 2018, ISBN-13:978-93-5316-025-8.

Reference Books:

1. Machine Learning by Tom Mitchell, Mc Graw Hill 1997, 1st edition
2. Pattern Recognition and Machine Learning by Bishop, 2006 1st edition , ISBN: 978-0-387-31073-2

Bio-Medical Instrumentation

IV B.Tech – I Semester (Code: 18ECD33)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will learn

- About various types of physiological systems of the human body, and Bio-potentials related to the human body
- Working of devices used to pickup the bio-signals of the body such as ECG, EEG and EMG.
- Measuring cardiovascular parameters such as Blood pressure, blood flow, cardiac output and heart sounds.
- Handling of various types of medical instruments and modern technologies in medical field.

Course Outcomes: After completion of the course the student must be able to

CO1	Understand the physiological nature of biological systems and bio-electric potentials in medical field
CO2	Analyze the ECG, EEG and EMG Waveforms.
CO3	Apply the techniques for the measurement of non-electrical parameters in the human body.
CO4	Gain the Knowledge about the performance of medical assisting and therapy equipment's, clinical instruments such as pacemakers, defibrillators, blood gas analyzers, CT scanner, MRI Scanner, USG.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3					3							2		
CO2	2	3				3						2	2		
CO3	3	3				2						2	2		
CO4	3					2						2	2		
AVG	2.75	3				2.5						2	2		

Syllabus

UNIT – I

INTRODUCTION: Introduction to Bio-Medical Engineering field, Components of Man-Instrument system, problems encountered in measuring a living system

PHYSIOLOGICAL SYSTEMS OF THE BODY: BASIC Features of cardiovascular system, Nervous system, muscular system, respiratory system.

RESTING POTENTIAL & ACTION POTENTIAL CONCEPTS: Resting potential concept, characteristics of resting potential, action potential concept, propagation of action potential.

BIO-ELECTRIC POTENTIALS: Definition for Bio-electric Potential, Typical Examples of Bio-Electric Potential with important features.

UNIT – II

BIO-MEDICAL ELECTRODES: Introduction to Bio-Medical Electrodes, Various types of Bio-Medical Electrodes: surface electrodes, micro electrodes, needle electrodes depth electrodes.

ELECTRO CARDIOGRAHPHY (ECG): Introduction to electro cardiography, ECG LEAD Concept, various types of ECG Lead configurations, typical ECG waveform details, ECG recording, Analysis of Recorded ECG waveform.

ELECTRO ENCEPHALOGRAPHY (EEG): Introduction to Electro Encephalography, EEG Recording EEG in diagnostics

ELECTRO MYOGRAPHY: Introduction to Electro-Myography, EMG Recording, EMG Applications.

UNIT-III

CARDIOVASCULAR MEASUREMENTS: Introduction to various cardiovascular parameters: Blood Pressure Blood flow, cardiac output, Heart sounds. Blood Pressure Measurement techniques: Direct methods & In-direct Methods.

BLOOD FLOW MEASUREMENT TECHNIQUES: Electro Magnetic Blood flow meter, ultrasonic Blood flow meter, Thermal convection method. Cardiac output Measurement techniques: Fick's technique, Indicator dillution method, thermal dilution method, Impedance change method. Phono cardiography: Heart sounds Recording.

UNIT- IV

THERAPEUTIC INSTRUMENTS: Cardiac Pacemakers, Types of pacemakers: External pace makers, Internal Pacemakers, Pacing modes, lead wires & Electrodes for internal pacemakers, power sources for implantable cardiac pacemakers, hemo dialysis. Cardiac defibrillators, defibrillator electrodes, Introduction to diathermy. Various diathermy apparatus: surgical, shortwave, microwave.

INSTRUMENTS FOR CLINICAL LABORATORY: Introduction to Bio-Chemical electrodes, Types of Bio-Chemical electrodes for measurement of various Blood gas parameters such as Blood PH, PO2PCO2 Blood gas analyzer, Blood cell counters.

MODERN TECHNOLOGIES IN BIO-MEDICAL FIELD: Use of X-Rays in medicine, CT scan, ultrasound applications in medicine, MRI scan.

Text Books:

1. Leslie Cromwell, Fred J. Weibell and Erich A,Pleiffer, " Biomedical instrumentation and Measurements", IInd ed, Prentice Hall of India,2004
2. R.S Kandpur. " Handbook of Biomedical Instrumentation, IInd ed, Tata McGraw Hill, 2011

REFERENCE BOOKS:

1. Webster, Medical Instrumentation Application&Design, John Wiley& sons
2. Jog: Electronics in Medicine and Biomedical Instrumentation, Prentice Hall of India,2006
3. Dr.M.Armugam,"Biomedical Instrumentation" IInd ed, Anuradha Publications,2009

E-RESOURCES AND OTHERS :

1. www.iannauniversity.com/2012/07/ei2311-biomedical-instrumentation.html
2. www.eeeuniversity.com/2013/08/ei2311-biomedical-instrumentation.html
3. https:// www.scribid.com/doc/.../biomedical-instrumentation-tic-801

Pattern Recognition and Application

IV B.Tech – I Semester (Code: 18ECD34)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Learn about importance pattern recognition and its applications.
- Study of various linear classification algorithms and Support vector machines.
- Understand different nonlinear classification algorithms and networks.
- Study various feature selection and feature generation methods.

Course Outcomes: After completion of the course the student must be able to

CO1	Analyze probability density function between the patterns using bayes classifier for supervised learning.
CO2	Estimate cost function and minimum mean square error between the pattern classes using linear classifier algorithms such as LMS, Support Vector Machines.
CO3	Estimate the cost choice function and minimum mean square error between the pattern classes using Non-Linear classifier algorithms such as back propagation algorithms, Multi-Layer perceptron Algorithms
CO4	Apply feature selection and generation techniques to identify features and separate objects in an image.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3													3
CO2	2	3													3
CO3	2	3													3
CO4	3	2													3
AVG	2.25	2.75													3

SYLLABUS

UNIT-I

INTRODUCTION: Importance of pattern recognition, Features, Feature Vectors, and Classifiers, Supervised, Unsupervised, and Semi-supervised learning, Introduction to Bayes Decision Theory, Discriminant Functions and Decision Surfaces, Gaussian PDF and Bayesian Classification for Normal Distributions.

UNIT-II

DATA TRANSFORMATION AND DIMENSIONALITY REDUCTION: Introduction, Basis Vectors, The Karhunen Loeve (KL) Transformation, Singular Value Decomposition, Independent Component Analysis (Introduction only). Nonlinear Dimensionality Reduction, Kernel PCA.

UNIT-III

ESTIMATION OF UNKNOWN PROBABILITY DENSITY FUNCTIONS: Maximum Likelihood Parameter Estimation, Maximum a Posteriori Probability

estimation, Bayesian Interference, Maximum Entropy Estimation, Mixture Models, Naive-Bayes Classifier, The Nearest Neighbor Rule.

UNIT-IV

LINEAR & NON LINEAR CLASSIFIERS: Introduction, Linear Discriminant Functions and Decision Hyperplanes, The Perceptron Algorithm, Mean Square Error Estimate, Stochastic Approximation of LMS Algorithm, Sum of Error Estimate. The XOR Problem, The two Layer Perceptron, Three Layer Perceptron, Back propagation Algorithm, Basic Concepts of Clustering, Introduction to Clustering , Proximity Measures.

Text Book:

1. Pattern Recognition: Sergios Theodoridis, Konstantinos Koutroumbas, Elsevier India Pvt. Ltd (Paper Back), 4th edition.

Reference Books:

1. The Elements of Statistical Learning: Trevor Hastie, Springer-Verlag New York, LLC (Paper Back), 2009.
2. Pattern Classification: Richard O. Duda, Peter E. Hart, David G. Stork. John Wiley & Sons, 2012.
3. Pattern Recognition and Image Analysis Earl Gose: Richard Johnsonbaugh, Steve Jost, ePub eBook.

Fiber Optic and Microwave Engineering Lab

IV B.Tech – I Semester (CODE: 18ECL71)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Learn about Optical fibres and their characteristics.
- Understand analog and digital link design practically
- Understand the techniques used to identify and measure various losses
- Knowledge on usage for pulse shaping.

Course Outcomes: After completion of the course the student must be able to

CO1	Analyze the propagating conditions in the optical fiber and measure its NA, Losses.
CO2	Demonstrate the various blocks of microwave bench setup
CO3	Evaluate the parameters of wavuguide junctions.
CO4	Interpret the basics of SDR and design FM Transmitter and Receiver

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2				1		3						3
CO2	3	2	2				2		3						3
CO3	3	2	1				1		3						3
CO4	3	2	1		1		1		3						3
AVG	3	2					1.25		3						3

List of Experiments

Based on Optical Communication

1. Fiber Optics Cable: Numerical Aperture Measurement.
2. Measurement of Coupling and Bending Losses of a Fiber.
3. Analog Link set up using a Fiber.
4. Digital Link set up using a Fiber.
5. Set up of Time Division Multiplexing using Fiber Optics

Based on Microwave Engineering

6. Characteristics of Reflex Klystron

7. Verification of the Expression $1/\lambda_0^2=1/\lambda_g^2+1/\lambda_c^2$
8. Measurement of VSWR using Microwave Bench.
9. Determination of Characteristics of a Given Directional Coupler.
10. Measurement of gain of given horn Antenna

Based on Software Defined Radio

11. FM Transmitter design.
12. FM Receiver design.

13. Pulse Shaping Using USRP.
14. Voice Transmission.
15. Equalizer design

NOTE: *A minimum of 10(Ten) experiments, choosing a minimum of 3 (Three) from each part, have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.*

Wireless and Mobile Communications Lab

IV B.Tech – I Semester (**Code: 18ECL72)**

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None.

Course Objectives: Students will be able to

- To design fading channel models.
- To implement DSSS.
- To design OFDM and MIMO systems

Course Outcomes: After completion of the course the student must be able to

CO1	Analyze the large-scale fading channel models
CO2	Analyze the small-scale fading channel models
CO3	Analyze DSSS modulation technique for use in CDMA system
CO4	Analyze OFDM and MIMO systems

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3			3				3						3
CO2	2	3			3				3						3
CO3	2	3			3				3						3
CO4	2	3			3				3						3
AVG	2	3			3				3						3

List of Experiments

The following experiments can be performed using Matlab/Simulink/Scilab/Virtual Labs.

1. Simulation of Friss Transmission equation.
2. Simulation of Rayleigh fading Channel model.
3. Calculate the probability that the received signal level crosses a certain sensitivity level.
4. Study the outage probability, LCR & ADF in SISO for Selection Combining and MRC.
5. Study the effect of handover threshold and margin on SINR and call drop probability and handover probability.
6. Study the effect of delay spread on frequency selectivity.
7. Plot BER-SNR and Bit Rate-SNR graphs for different types of fading channel
   i. No Fading
   ii. Flat Fading
   iii. Dispersive Fading
8. Simulation of Okumura Outdoor Propagation Model.
9. Simulation of log normal shadowing radio propagation model.
10. Simulation of Walsh Hadamard Code.

11. Study distribution of downlink C/I due to different parameters.
12. Implement Direct Sequence Spread Spectrum modulation technique.
13. Design OFDM based Transmitter and Receiver for different channel environments.
14. Design OFDM system with 2x2, 2x4, 4x4 MIMO systems.
15. Simulate MIMO Channel and estimate BER & SNR.

NOTE: *A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for Semester End Examination.*

Text Books:

1. Digital signal processing for wireless communication using MATLAB, 1st ed. 2016 Edition, Kindle Edition, E.S. Gopi.

References:

1. "Simulation Of Digital Communication Systems Using Matlab",2 edition, Mathuranathan Viswanathan.
2. http://fcmcvlab.iitkgp.ac.in

WIRELESS ADHOC AND SENSOR NETWORKS

IV B.Tech – II Semester **(Code: 18ECD41)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		50	Semester End Examination (3 Hours)				50

Prerequisites: None

Course Objectives: Students will be able

- To understand basic concepts of ad hoc wireless networks.
- To study issues in designing and understanding the types of MAC protocols in Ad Hoc Wireless Networks.
- To have in depth understanding about routing protocols in Ad Hoc Wireless networks
- To study the architecture and development of wireless sensor networks.

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

CO 1	Exemplify the unique issues in ad-hoc/sensor networks.
CO 2	Confer the challenges in designing MAC protocols in wireless ad hoc networks.
CO 3	Familiarize with current technology trends for the implementation of different types of ad hoc routing protocols.
CO 4	Understand the architecture and design principles of wireless sensor networks.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3														2
CO2	3	2													2
CO3	3	2													2
CO4	2	2	2												2
AVG	2.75	3	2												2

SYLLABUS

UNIT-I

Ad hoc Wireless Networks – What is an Ad Hoc Network? Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Ad hoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet.

UNIT-II

Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks – Classifications of MAC Protocol . MACAW – FAMA – BTMA – DPRMA – Real-Time MAC protocol – Multichannel protocols – Power aware MAC Routing Protocols for AD HOC Networks.

UNIT-III

Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of

Routing Protocols -Table-driven protocols – DSDV – WRP – CGSR – On-Demand protocols – DSR – AODV – TORA – LAR – ABR – Zone Routing Protocol – Power Aware Routing protocols. Issues in Designing a Multicast Routing Protocol – Operation of Multicast Routing Protocols – An Architecture Reference Model for Multicast Routing Protocols.

UNIT-IV

Sensor Networks – Architecture : Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks .

TEXT BOOKS:

1. 1. C. Siva Ram Murthy and B. S. Manoj, ―Ad Hoc Wireless Networks Architectures and Protocols, Pearson, 2008.
2. 2. C. K. Toh, - Ad Hoc Mobile Wireless Networks: Protocols and Systems, Prentice Hall, 2001.

REFERENCE BOOKS:

1. Carlos De Morais Cordeiro, Dharma Prakash Agrawal "Ad Hoc & Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.
2. Feng Zhao and Leonides Guibas, "Wireless Sensor Networks", Elsevier Publication – 2002.
3. A Course in Electrical and Electronics Measurements and Instrumentation by Sawhney. A.K, 18th Edition, DhanpatRai& Company Private Limited, 2007.
4. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005.

E-RESOURCES:

1. https://nptel.ac.in/courses/106/105/106105160/

ROBOTICS

IV B.Tech – II Semester **(Code: 18ECD42)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: Students will

- Understand the basic concepts associated with the design and functioning and applications of Robots
- Study about the drives and sensors used in Robots
- Learn about analyzing robot kinematics and robot programming

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

CO1	Describe the concepts of robotics and its applications.
CO2	Design a robot with various links, mechanisms and effectors.
CO3	Choose appropriate sensors for specific applications.
CO4	Apply spatial transformations to obtain forward and inverse kinematics.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2											2	3	
CO2	3	2											2	3	
CO3	3	2											2	3	
CO4	3	2	3		3								2	3	
AVG	3	2	3		3								2	3	

SYLLABUS

UNIT I

FUNDAMENTALS OF ROBOT

Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Functions – Need for Robots – Different Applications

UNIT II

ROBOT DRIVE SYSTEMS AND END EFFECTORS

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, A.C. Servo Motors – Salient Features, Applications and Comparison of Drives End Effectors – Grippers – Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered andThree Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations

UNIT III

SENSORS AND MACHINE VISION

Requirements of a sensor, Principles and Applications of the following types of sensors – Position of sensors (Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, Pneumatic Position Sensors), Range Sensors (Triangulation Principle, Structured, Lighting Approach, Time of Flight Range Finders, Laser Range Meters), Proximity Sensors (Inductive, Hall Effect, Capacitive, Ultrasonic and Optical Proximity Sensors), Touch Sensors, (Binary Sensors, Analog Sensors), Wrist Sensors, Compliance Sensors, Slip Sensors. Camera, Frame Grabber, Sensing and Digitizing Image Data – Signal

Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis – Data Reduction: Edge detection, Segmentation Feature Extraction and Object Recognition - Algorithms. Applications – Inspection, Identification, Visual Serving and Navigation.

UNIT IV

ROBOT KINEMATICS AND ROBOT PROGRAMMING

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional), Four Degrees of Freedom (In 3 Dimensional) – Deviations and Problems. Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effecter commands, and Simple programs

TEXT BOOK:

1. M.P.Groover, "Industrial Robotics – Technology, Programming and Applications", McGraw-Hill, 2001

REFERENCES:

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw-Hill Book Co., 1987
2. Yoram Koren, "Robotics for Engineers", McGraw-Hill Book Co., 1992
3. Janakiraman.P.A., "Robotics and Image Processing", Tata McGraw-Hill, 1995

INTRODUCTION TO MEMS

IV B.Tech – II Semester **(Code: 18ECD43)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Course Objectives: Students will be able

- To introduce the concepts of micro electromechanical devices.
- To know the fabrication process of Microsystems.
- To know the design concepts of micro sensors.
- To know the design concepts of micro actuators.

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

CO1	Interpret the basics of micro electromechanical systems including their applications and advantages.
CO2	Recognize the materials in micro fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA.
CO3	Analyse key performance aspects of electromechanical sensors and actuators.
CO4	Analyse key performance aspects of electromechanical actuators.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3												2		
CO2	2	3											2		
CO3	3	2											2		
CO4	3	2											2		
AVG	2.67	2.33											2		

SYLLABUS

UNIT-1

Historical Background: Silicon Pressure sensors, Micromachining, Micro Electro Mechanical Systems.; Microfabrication and Micromachining: Integrated Circuit Processes, Bulk Micromachining: Isotropic Etching and Anisotropic Etching, Wafer Bonding, High Aspect-Ratio Processes (LIGA).;

UNIT-2

Physical Microsensors : Classification of physical sensors, Integrated, Intelligent, or Smart sensors, Sensor Principles and Examples : Thermal sensors, Electrical Sensors, Mechanical Sensors, Chemical and Biosensors.;Microactuators : Electromagnetic and Thermal microactuation, Mechanical design of microactuators, Microactuator examples, microvalves, micropumps, micromotors-Microactuator systems : Success Stories, Ink-Jet printer heads, Micro-mirror TV Projector.;

UNIT-3

Surface Micromachining: One or two sacrificial layer processes, Surface micromachining requirements, Polysilicon surface micromachining, Other compatible materials, Silicon Dioxide, Silicon Nitride, Piezoelectric materials, Surface Micromachined Systems :

Success Stories, Micromotors, Gear trains, Mechanisms.;

UNIT-4

Application Areas: All-mechanical miniature devices, 3-D electromagnetic actuators and sensors, RF/Electronics devices, Optical/Photonic devices, Medical devices e.g. DNA-chip, micro-arrays.;Lab/Design:(two groups will work on one of the following design project as a part of the course).;RF/Electronics device/system, Optical/Photonic device/system, Medical device e.g. DNA-chip, micro-arrays.

Text Books:

1. Stephen D. Senturia, "Microsystem Design" by, Kluwer Academic Publishers, 2001.
2. Marc Madou "fundamentals of microfabrication",
3. Fundamentals of Microfabrication by, CRC Press, 1997.Gregory Kovacs, Micromachined Transducers Sourcebook WCB McGraw-Hill, Boston, 1998.
4. M.-H. Bao, Micromechanical Transducers: Pressure sensors, accelrometers, and gyroscopes by Elsevier, New York, 2000.

SATELLITE COMMUNICATIONS

IV B.Tech – II Semester **(Code: 18ECD34)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Learn Fundamental concepts of satellite communications and orbital mechanics.
- Understand the various space craft sub systems and satellite link design.
- Compare various multiple access techniques.
- Have fundamental knowledge on GPS.

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

CO1	Analyze fundamental concepts of Satellite Communication and Orbital mechanism.
CO2	Examine the Satellite subsystems and satellite link design.
CO3	Classify the multiple access techniques (FDMA, TDMA, CDMA) used for Satellite Communication and also Describes the VSAT systems along with its
CO4	Illustrate the principles of Global Positioning System (GPS) and working

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													3
CO2	3	2													3
CO3	2	3													3
CO4	3	2													3
AVG	2.67	2.33													3

SYLLABUS

UNIT – I

Introduction: A brief history of Satellite communications, Orbital Mechanics and Launchers: Orbital mechanics, Look angle determination, Orbital perturbations, Orbit determination, Launch and Launch vehicles, Orbital effects in Communication System performance.

UNIT II

Satellites: Satellite sub systems, Attitude and Orbit Control system (AOCS), Telemetry, Tracking, Command & Monitoring, Power Systems, Communication subsystems, satellite antennas.

Satellite Link Design: Introduction, Basic transmission theory, System noise temperature and G/T ratio. Design of Downlinks, Satellite systems using small earth stations, Uplink Design.

Design for specified C/N: Combining C/N and C/I values in satellite links.

UNIT III

Multiple Access: Introduction, FDMA, TDMA, Demand Access Multiple Access (DAMA), Random Access, CDMA.

VSAT systems: Introduction, Overview of VSAT systems, Network Architectures, Access control Protocols, Basic techniques, VSAT Earth Station Engineering.

UNIT IV

Satellite Navigation and Global positioning System: Introduction, Radio and satellite Navigation, GPS position location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, Timing Accuracy, GPS Receiver Operation, GPS C/A code Accuracy, Differential GPS.

TEXT BOOK:

1. "Satellite Communications", Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2nd Edition John Wiley India, 2006.

REFERENCE BOOKS:

1. "Satellite Communications", by Dennis Roddy, McGraw-Hill International Edition.
2. "Advanced Electronic Communication Systems", by W Tomasi, Pearson Education.

Advanced Digital Signal Processing

IV B.Tech – II Semester **(Code: 18ECD51)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Signals and Systems, Digital Signal Processing

Course Objectives: Students will

- Develop practical proficiency in solving diverse filter bank models for signal processing applications.
- Analyze the efficiency of Continuous Wavelet and Short Time Fourier Transform techniques in representing signals in the time-frequency domain.
- Realize the suitability of Wavelet and Short Time Fourier Transform techniques for specific signal representation requirements, considering their strengths and limitations.
- Learn Discrete Wavelet Transform techniques at multiple scales to achieve optimal time-frequency signal representation based on signal characteristics and application needs.

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

CO1	Demonstrate proficiency in solving diverse filter bank models in practical problem- solving scenarios.
CO2	Analyze Continuous Wavelet and Short Time Fourier Transform techniques for efficient time-frequency signal representation.
CO3	Evaluate Wavelet and Short Time Fourier Transform techniques for time-frequency signal representation.
CO4	Apply the various Discrete Wavelet Transform techniques at multiple scales.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2													3
CO2	2	3													3
CO3	2	3													3
CO4	3	2													3
AVG	2.5	2.5													3

SYLLABUS

UNIT-I

Basic sample rate alteration devices, Filters in sampling rate alteration systems, Multistage design of decimator and interpolator, Polyphase decomposition, Arbitrary-Rate sampling rate converters, Digital filter banks, Nyquist filters.

UNIT-II

Two-Channel Quadrature –Mirror Filter banks, Perfect reconstruction Two-Channel FIR Filter banks, L-Channel QMF banks, Cosine-Modulated L-Channel Filter banks, Multilevel Filter banks, Problems on each model.

UNIT – III

Continuous wavelet and Short Time Fourier Transform: Introduction, Wavelet Transform, Mathematical Preliminaries, Continuous Time-frequency representation of signals, Windowed Fourier Transform (STFT), Uncertainty principle and Time-Frequency tiling, Properties of Wavelets used in Continuous Wavelets Transforms, Continuous versus Discrete Wavelet Transform.

UNIT – IV

Discrete Wavelet Transform: Introduction, Haar Scaling functions and Function spaces, Nested Spaces, HAAR Wavelet Function, Orthogonality, Normalization of HAAR bases at different scales, standardizing the Notations, Refinement relation with respect to Normalized bases, Support of a wavelet system, Daubechies Wavelets.

TEXT BOOKS:

1. Digital Signal Processing, A computer Based Approach by Sanjit K Mitra, Tata Mc Graw Hill Publishing.
2. Insight into Wavelets from Theory to Practice by K.P. Soman, K.I. Ramachandran, N.G. Reshmi, PHI Publications, Third Edition, 2010.

REFERENCE BOOKS:

1. Multirate Systems and Filter Banks, P.P.Vaidyanathan, Pearson Education, Low Priced Edition, 2006.
2. Wavelet Transforms - Introduction to Theory and Applications, Raghuveer M. Rao, Ajit opardikar, Pearson Education, Asia

Artificial Neural Networks

IV B.Tech – II Semester **(Code: 18ECD52)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will

- Understand the basics of Artificial neural networks and various activation functions
- Learn classification of patterns and patterns association.
- Acquire basic knowledge in competitive neural networks.
- Gain knowledge on working of Back propagation algorithm.

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

CO1	Understand the functionality of Artificial Neural Model for different structures and activation functions.
CO2	Describe the characteristics of pattern classification.
CO3	Distinguish between competitive and feed forward neural networks.
CO4	Interpret the working of Back propagation algorithm.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	3	2	2	2										3
CO2	2	3	2	2	2										3
CO3	2	3	2	2	2										3
CO4	2	3	2	2	2										3
AVG	2	3	2	2	2										3

SYLLABUS

UNIT – I

ARTIFICIAL NEURAL NETWORKS: **BASIC CONCEPTS**

Introduction, Computation in terms of patterns, The McCulloch-Pitts Neural Model, The Perceptron, Neural Network Architectures, Activation Functions, Learning by Neural Nets

UNIT – II

PATTERN CLASSIFIERS

Hebb Nets, Perceptrons, Adaline, Madaline.

PATERN ASSOCIATORS

Auto-associative Nets, Hetero-Associative Nets, Hopfield Networks, Bi-directional Associative Memory.

UNIT – III

COMPETITIVE NEURAL NETS

The MAXNET, Kohonen's Self Organizing Map (SOM), Learning Vector Quantization (LVQ), Adaptive Resonance Theory(ART)

BACKPROPAGATION

Multilayer Feed forward Net, The Generalized Delta Rule, The Back propagation Algorithm.

UNIT – IV

APPLICATIONS OF NEURAL NETWORKS

Applications of Neural Networks in Forecasting, Applications of Neural Networks in Healthcare, Applications of Neural Networks in Business, Applications of Neural Networks in image processing and compression, Applications of Neural Networks in control systems, Applications of Neural Networks in pattern recognition.

TEXT BOOKS:

1. Introduction to SOFT COMPUTING by Samir Roy and Udit Chakraborty,Pearson Publishing,2013. (Unit I,II, III)
2. Introduction to Neural Networks using Matlab 6.0 by S N Sivanandam,S Sumathi, S N Deepa, Tata McGraw Hill Publishing,7th Reprint, 2008(Unit IV)

REFERENCE BOOKS:

1. Jang J.S.R., Sun C.T., Mizutani E., "Neuro-Fuzzy and Soft Computing", Prentice Hall, 1997
2. Hertz J., "Introduction to the Theory of Neural Computing", Addison-Wesley, 1991

Software Defined Radio (18ECD53)

IV B.Tech – II Semester **(Code: 18ECD52)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Communication Systems

Course Objectives: Students will be able

- To attain knowledge on basic software and hardware architecture of Software Defined Radio.
- To understand the development of Software Defined Radios.
- To analyze the Available Technologies of Software Defined Radios
- To obtain the basic knowledge about concepts of Spectrum Sensing techniques and applications of SDR.

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

CO 1	To attain knowledge on basic software and hardware architecture of Software Defined Radio.
CO 2	To understand the development of Software Defined Radios.
CO 3	To analyze the Available Technologies of Software Defined Radios
CO 4	To obtain the basic knowledge about concepts of Spectrum Sensing techniques and applications of SDR

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												**PSO's**		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	3	2	2	2	1									3	3
CO2	2	2	2	1	1									2	2
CO3	2	2	2	2	1									2	2
CO4	2	2	1	1	1									2	2
AVG	3	2	2	2	1									3	3

SYLLABUS

UNIT I

Software Defined Radio Basic SDR– Software and Hardware Architecture of an SDR – Spectrum Management–Managing unlicensed spectrum–Noise Aggregation.

UNIT II

SDR AS PLATFORM FOR COGNITIVE RADIO Introduction – Hardware and Software architecture – SDR development process and Design – Application software – Component development – Waveform development–cognitive waveform development.

UNIT III

Cognitive Radio Technology Introduction – Radio flexibility and capability – Aware – Adaptive – Comparison of Radio capabilities and Properties – Available Technologies – Funding and Research in CRs.

UNIT – IV

Spectrum Sensing For Cognitive Radio Applications Introduction - Challenges- Spectrum Sensing Methods for Cognitive RadioCooperative Sensing- External Sensing- Statistical Approaches and PredictionSensing Frequency- Hardware Requirements and Approaches- Multidimensional Spectrum Awareness- Spectrum Sensing in Current Wireless Standards.

Text Books:

1. Bruce A Fette, "Cognitive Radio Technology", 2nd edition Academic Press, 2009.
2. HuseyinArslan, "Cognitive Radio, Software Defined Radio and Adaptive wireless system, Springer, 2007.

Reference Books:

1. Mitola, J. and J. Maguire, G. Q., "Cognitive radio: making software radios more personal," IEEE Personal Commun. Mag., vol. 6, no. 4, pp. 13–18, Aug. 1999.
2. TevfikY¨ucek and H¨useyinArslan, "A Survey of Spectrum Sensing Algorithms for Cognitive Radio Applications" , IEEE Communications Surveys & Tutorials, Vol. 11, No.1, First Quarter 2009, Pp 116-130.

FPGA Design for Embedded Systems

IV B.Tech – II Semester **(Code: 18ECD54)**

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: None

Course Objectives: Students will learn

- Digital System design techniques
- FPGA architecture, interconnect and technologies.
- Different FPGA's and implementation methodologies.
- Configuring and implementing digital embedded system, microcontrollers, microprocessors, DSP algorithm on FPGA.

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

CO1	Understand Digital system design using HDL.
CO2	Know FPGA architecture, interconnect and technologies.
CO3	Know different FPGA's and implementation methodologies
CO4	Understand configuring and implementing digital embedded system, microcontrollers, microprocessors, DSP algorithm on FPGA.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes															
	PO's												PSO's		
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**
CO1	2	2	3	2	2								2	3	
CO2	2	3	2	1	2								3	3	
CO3	3	2	2	2	1								2	3	
CO4	2	1	1	2	1								3	3	
AVG	2	2	3	2	2								2	3	

SYLLABUS

UNIT – I

INTRODUCTION

Digital system design options and tradeoffs, Design methodology and technology overview, High Level System Architecture and Specification: Behavioral modelling and simulation, Hardware description languages, combinational and sequential design, state machine design, synthesis issues, test benches.

UNIT II

OVERVIEW OF FPGA ARCHITECTURES AND TECHNOLOGIES

FPGA Architectural options, granularity of function and wiring resources, coarse V/s fine grained, vendor specific issues (emphasis on Xilinx and Altera), Logic block architecture: FPGA logic cells, timing models ,power dissipation I/O block architecture: Input and Output cell characteristics, clock input, Timing, Power dissipation.

UNIT III

PLACEMENT AND ROUTING

Programmable interconnect - Partitioning and Placement, Routing resources, delays; Applications -Embedded system design using FPGAs, DSP using FPGAs, Dynamic architecture using FPGAs, reconfigurable systems, application case studies.

UNIT IV

APPLICATIONS

Simulation/implementation exercises of combinational, sequential and DSP kernels on Xilinx/Altera boards

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TEXT BOOKS:

1. M.J.S. Smith, "Application Specific Integrated Circuits", Pearson, 2000.
2. Peter Ashenden, "Digital Design using VHDL", Elsevier, 2007.
3. Peter Ashenden, "Digital Design using Verilog", Elsevier, 2007.
4. W.Wolf, "FPGA based system design", Pearson, 2004.
5. Clive Maxfield, "The Design Warriors's Guide to FPGAs", Elsevier, 2004.