PACE INSTITUTE OF TECHNOLGY & SCIENCES

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(AUTONOMOUS)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

ACADEMIC REGULATIONS

AND

COURSE STRUCTURE & SYLLABI

(For the students admitted to
B.Tech Regular Four Year Degree Programme from the Academic Year 2018-19
and
B.Tech Lateral Entry Scheme from the Academic Year 2019-20)

ACADEMIC REGULATIONS R-18 FOR B.Tech (REGULAR)

(CHOICE BASED CREDIT SYSTEM)

Applicable for the students of B.Tech (Regular) from the Academic Year 2018-19
&
B.Tech Lateral Entry Scheme from the Academic Year 2019-20

1. ELIGIBILITY CRITERIA FOR ADMISSION

The eligibility criteria for admission into B.Tech programme shall be as per the guidelines issued by the Andhra Pradesh State Council of Higher Education (APSCHE) and/or by any other competent authority.

2. PROGRAMMES OFFERED (UNDER GRADUATE)

A student shall be offered admission into any one AICTE-approved programme as given below:

S.No	PROGRAMME
01	Civil Engineering (CE)
02	Electrical and Electronics Engineering (EEE)
03	Mechanical Engineering (ME)
04	Electronics and Communication Engineering (ECE)
05	Computer Science and Engineering (CSE)
06	Information Technology (IT)
07	Automobile Engineering (AME)

3. AWARD OF DEGREE

A student will be declared eligible for the award of B. Tech. degree, if he/she fulfils the following academic requirements:

i. 4 Year B.Tech Programme:

- The Student shall study a course for not less than four academic years and not more than eight academic years.
- The student shall register for 160 credits and secure all the 160 credits.
- The students, who fail to fulfil all the academic requirements for the award of degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech Programme.

- Students shall secure a satisfactory grade (SA) in all Mandatory Courses (Non Credit Courses/Activities).
- No disciplinary action pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against any student, he/she should not be awarded with the degree.

ii. 3 Year B.Tech Programme under Lateral Entry Scheme (LES):

- The Student shall study a course for not less than three academic years and not more than six academic years.
- The student shall register for 116 credits and secure all the 116 credits.
- The students, who fail to fulfil all the academic requirements for the award of degree within six academic years from the year of their admission, shall forfeit their seat in B.Tech programme.
- Students shall secure a satisfactory grade (SA) in all non-credit courses/ activities. (Non Credit Courses/Activities).
- No disciplinary action pending against the student by the time of the completion of his/her course. If any disciplinary action is pending against the student, he/she should not be awarded with the degree.

4. MEDIUM OF INSTRUCTION

The medium of instruction shall be English in all academic activities.

5. MINIMUM INSTRUCTION DAYS

The minimum instruction days for each Semester shall be 90.

6. CATEGORIZATION OF COURSES

6.1 Choice Based Credit System (CBCS)

The CBCS provides choice for students to select from the prescribed courses (core, elective or minor or soft skill courses). The CBCS provides a 'cafeteria' type approach in which students can take courses of their choice, learn at their own pace and adopt an interdisciplinary approach to learning.

6.2 The curriculum of each programme shall contain various courses indicated in the following categories to train the students for employment, higher learning & research and entrepreneurship.

i. **Humanities and Social Sciences (HS):** These courses include Technical English, Environmental Science and Engineering, Industrial Management, Managerial Economics & Financial Accountancy, Communication skills etc.

ii. **Basic Sciences (BS):** These courses include Mathematics, Physics, Chemistry, Biology etc.

iii. **Engineering Sciences (ES):** These courses include Workshop, Drawing, Basic Electrical/Mechanical/Computer etc.

iv. **Professional Core (PC):** These courses are the core courses that provide the requisite foundation in the chosen Branch of Engineering.

v. **Professional Elective (PE):** These courses are the elective courses opted by the students relevant to the chosen branch of engineering that provides the requisite foundation in a specific area of specialization.

vi. **Open Elective (OE):** These courses are inter-disciplinary in nature offered by other departments and/or any emerging subjects.
The department offers an elective course (PE/OE), if the number of students registered in such a course is a minimum of 20.

vii. **Add-on Courses:** Add-on courses are Skill enhancement courses for the students in the respective branch of engineering.

viii. **MOOCS/Self Study Courses:** An opportunity is given to the students to choose one online course offered by SWAYAM-NPTEL / Foreign institutions/ reputed universities to enhance the learning skills or a self-study course under the guidance of the faculty advisor to enhance the self-learning capabilities which are having Global acceptance.

ix. **Personality Development (PD):** These courses include Integrated Learning Practices (ILPs), Mandatory Courses (MCs) & Extra-curricular/Co-curricular activities and help the students into a well-trained professionals and good human beings with a high employability potential, good communication skills, soft skills, good engineering practices, personality transformation, professional presentation skills and networking skills.

x. **Mandatory Courses (MC):** The Professional Ethics & Human Values, Employability Enhancement Skills. Environmental Sciences, Indian Constitution, Essence of Indian Traditional Knowledge, Problem-assisted learning and Problem-based learning are non-credit courses relevant to the value education and also for enhancing employability skills.

- In addition to the above courses to enhance the overall personality & character of students and make them aware of social needs, the extra-curricular/co-curricular activities are included, which do not carry any credits. These activities include National Service Scheme (NSS), National Cadet Corps (NCC), Yoga & Meditation, Sports & Games and Professional Club Activities.
- The Students shall undergo Industrial /In-house training to expose them to the practical environment.
- A faculty advisor or counselor shall be assigned to a group of 20 students, and he/she will advise the students about the under graduate programme, its course structure and curriculum, choice/option for course based on their competence, progress, pre-requisites and interest.

xi. **Mini-Project:** A student is required to undergo a mini project of his/her choice by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis.

xii. **Summer School Practices:**
Industry Internship: Internship must involve practical work related to systems engineering, industry practices etc. The internship can be carried out at premier institutions/ research laboratories/industries.

7. CREDIT ASSIGNMENT

Each course is assigned a certain number of credits based on the following criteria.

Contact hours per week			Credits
L	**T**	**P**	
1	0	0	1
0	1	0	1
0	0	2	1

8. REGISTRATION OF COURSES

The entire programme of study is for four academic years (three academic years in case of LES), all the years are on semester pattern. As per the curriculum the student shall register for 160 credits from all the courses as specified for the programme of study under regular four years. As per the curriculum the student shall register for 116 credits from all the courses as specified for the programme of study under regular four years.

9. ASSESSMENT AND EVALUATION

The performance of a student in each course shall be evaluated based on Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) or only Continuous Internal Evaluation.

S.No	Category of Course	Marks	
		CIE	SEE
1	Theory Courses	40	60
2	Laboratory Courses	40	60
3	Mandatory Courses	100	-
4	Mini Project	100	-
5	Seminar	100	-

6	Internship	100	-
7	Project Work	80	120

9.1 THEORY COURSES

9.1.1 Continuous Internal Evaluation (CIE):

The CIE of a theory course consists of four components as indicated in the following table.

S.No	Component	Marks
1	Mid-Term- Descriptive Examinations	20
2	Online Quiz Examinations	10
3	Assignments with Viva Voce	05
4	Class Room Test	05
	Total	**40**

a) Mid Term Descriptive Examinations (20 Marks):

There shall be two mid-term descriptive examinations of 120 minutes each. The mid-term examinations shall be conducted with syllabi from units I,II & first half of III for the first mid and second half of III, IV & V units for the second mid. In each theory course, the question paper for the mid-term descriptive examination consists of four questions. A student is required to answer all four questions for maximum 20 marks.

b) Online Quiz Examinations (10 marks):

Two online quiz examinations of 20 minutes each shall be conducted with syllabi from units I,II & first half of III for the first mid and second half of III, IV & V units for the second mid. The online quiz examination shall have 20 multiple choice questions for maximum 10 marks.

c) Assignments with Viva Voce (5 Marks):

A Student shall submit five Assignments with Viva Voce to the concerned faculty from all five units. The Assignment shall be evaluated by the concerned faculty. The average of best four assignment marks shall be considered for awarding 05 marks.

d) Class Room Test (5 Marks):

There shall be conducted 5 Class Room Tests from 5 units. The tests shall be conducted and evaluated by the concerned faculty. The average of best four class room tests considered for awarding 05 marks.

Assignment with Viva Voce and Class Room Tests marks will be evaluated at the end of the Semester.

CIE is Computed as following: Finalized internal marks can be calculated with 80% weightage for the better of the two mid-term examinations and 20% for the other shall be considered for marks of 30 and is added to Assignment with Viva Voce 05 marks, Class Room Tests 05 marks for awarding total 40 marks.

There shall be no Assignment with Viva Voce and Class Room Tests for Applied/Engineering Physics Course. Finalized internal marks for Applied/Engineering Physics Course can be calculated with 80% weightage for the better of the two mid-term examinations and 20% for the other shall be considered for marks of 30 and is added to Virtual Lab-Assignments 10 marks for awarding total 40 marks.

For the courses like Engineering Graphics, Machine Drawing and Design courses the CIE shall be 40 marks (20 marks for day-to-day work, 20 marks for two mid-term examinations) and 60 marks for SEE. A student is required to answer all 4 questions for maximum 20 marks. The final assessment of mid-term examinations is based on 80% weightage for the better and 20% for the other.

9.1.2 Semester End Examinations (SEE)

The semester end examinations for theory courses (including Engineering Graphics and Engineering Drawing) will be conducted covering all the units for 60 Marks. The question paper consists of two parts. In Part-A There shall be compulsory first question containing 5 two marks questions and these are to be set from the entire syllabus. In Part-B There shall be one question from each unit with internal choice. Each question carries 10 marks. Each theory course shall consist of five units of syllabus. Part-A and Part-B put together are given for 60 Marks.

Special Subjects: The SEE question paper for Design courses like Building Planning & Drawing, Design & Drawing of Steel Structures, and Design & Drawing of Steel Structures Reinforced Concrete Structures consists of two parts. In Part-A there shall be one question out of 2 questions is to be answered for 24 marks and in Part-B 3 Questions out of 5 Questions are to be answered of which each carries 12 Marks in 3 hours time. Part-A and Part-B put together are given for 60 Marks.

9.2 LABORATORY COURSES

9.2.1 Continuous Internal Evaluation (CIE)

The continuous internal evaluation for laboratory courses is based on the following parameters:

Parameter	Marks
Day-to-day work	20
Internal test	10
Record	05
Viva voce	05
Total	40

9.2.2 Semester End Examinations (SEE)

The performance of the student in laboratory courses shall be evaluated jointly by internal and external examiners for 3 hours duration as per the parameters indicated below:

Parameter	Marks
Procedure/Algorithm	10
Experimentation/Program Execution	15
Observations/Calculations/Testing	15
Result/Inference	10
Viva Voce	10
Total	**60**

9.3 MANDATORY COURSES (NON CREDIT COURSES)

Mandatory courses are evaluated by the mode of a Presentation/ Comprehensive-Viva Voce/ Evaluation of Assignments. A student shall secure a minimum 40% of marks to get a satisfactory grade (SA). Otherwise unsatisfactory grade (US) will be indicated. However, a student who secures "US" grade /abstains shall reappear in the subsequent semester(s).

9.4 MINI-PROJECT

A student is required to undergo a mini project of his/her choice by applying theoretical concepts to develop a practical component /element/system that includes design/ testing/ analysis. The performance of a student in the mini project shall be evaluated by a three-member committee constituted by the HoD as per the following parameters:

Parameter	Marks
Mini project Report	30
Innovation	25
Presentation	25
Viva Voce	20
Total	**100**

The performance of a student in mini project shall be evaluated based on two reviews, each carries 100 marks. The average marks of these two reviews will be awarded. However, a student who fails to secure minimum 40% marks or abstains will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

9.5 SEMINAR

A student shall deliver a seminar on any emerging topic of his/her choice from the core technical domain. The student shall submit a duly-certified seminar report. A three-member committee constituted by the HoD will finalize the CIE marks based on the following parameters:

Parameter	Marks
Seminar report	30
Innovation	20
Presentation	30
Viva Voce	20
Total	**100**

A student who fails to secure minimum 40% marks or abstains will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

9.6 INTERNSHIP

Internship must involve practical work related to industry practices. The students shall undergo internship for a period of minimum 4 weeks continuously at the end of VI semester and shall be evaluated in VII semester. The internship can be carried out at premier institutions/ research laboratories/industries.

A student shall submit a report on the training undergone, along with a certificate from the organization. A three-member committee constituted by the HoD shall finalize the CIE marks based on the following parameters:

Parameter	Marks
Internship Report	50
Presentation	30
Viva Voce	20
Total	**100**

The Internal guide shall monitor the work progress and regularity of the students in periodic intervals. No financial support shall be provided by the Institute for Internship.

A student, who fails to secure minimum 40% marks or abstains, will be permitted to reappear in the subsequent semester(s). There shall be no semester end examination.

9.7 Project Work

A student is required to undertake a project work by using the knowledge acquired by him/her during the course of study. The student is expected to design and build a complete system or subsystem on an area of interest. The project work consists of two parts namely, project literature review and project implementation. A project work shall be carried out by a batch minimum of 4 Student members under a faculty supervisor.

i. Continuous Internal Evaluation:

The CIE for project work shall be based on project survey and project implementation and is evaluated by a three-member committee consisting of two senior faculties and a project supervisor constituted by the HoD.

¬ **Project Literature Review:**

The performance of a student in project survey shall be evaluated based on the following parameters:

Parameter	Marks
Literature Review	15
Presentation	15
Viva Voce	10
Total	40

¬ **Project Implementation:**

The performance of a student in project implementation shall be evaluated based on two reviews, each carries 40 marks. The average marks of these two reviews will be considered. The evaluation criterion of each review is based on the following parameters:

Parameter	Marks
Contribution	10
Innovation	10
Presentation	10
Viva Voce	10
Total	**40**

The marks secured by a student in project literature review and project implementation shall be awarded cumulatively as CIE of the project work in VIII semester.

ii. Semester End Examination:

A batch of students shall submit a duly-certified project report to the department in a specified time. They shall make a presentation on the project work before a three-member committee consisting of external examiner, internal examiner (HoD) and a project supervisor. The performance of each student is evaluated as per the following parameters:

Parameter	Marks
Project report	40
Innovation	30
Presentation	20
Viva Voce	15
Research Publication (Seminar/Conference/Symposium/Journal)	10
Scope of Implementation	05
Total	**120**

A student who fails to secure minimum 40% marks or abstains is permitted to re-appear in the advanced supplementary examinations or when offered next.

9.8 OTHER COURSES

a. Online (MOOCS) / Self Study Course:

Institute encourages the students to register and satisfy for MOOCs Certificate. A student is awarded certificates for 4 weeks programme – 1 credit, 8 weeks programme – 2 credits and 12 weeks programme – 4 credits. If a student acquires additional 20 credits through online Certification (approved MOOCs), he/she will be awarded Graduate degree with Honours.

If a Student from CE,EEE,ME,ECE & AME secures 20 credits from MOOCs courses (apart from Courses mentioned in Course Structure) in Computer Science & Engineering related courses is he/she will be awarded with additional Minor Engineering with Computer Science & Engineering.

b. Add-On Courses:

ADD-ON Courses are provided by the Institution with Industry Interaction to enhance skills in the domain of the study.

c. Extra-Curricular / Co-Curricular Activities:

The participation of a student is compulsory in any one of the extra-curricular/co-curricular activities (non-credit) such as NSS, NCC, Yoga & Meditation, Sports & Games, Professional club activities during the

semesters I to VII for award a Satisfactory grade (SA). The performance of a student in the extra-curricular/co-curricular activities is evaluated during VII semester by a three member committee constituted by HoD. For physically disabled students, the satisfactory grade (SA) will be awarded, if he/she obtains certificate in co-curricular activities such as essay writing, debate competitions, technical & general quizzes, symposium etc.

However, a student who secures unsatisfactory grade (US) shall reappear in the subsequent semester(s).

10. ATTENDANCE REQUIREMENTS

a. A student is eligible to write the Semester End Examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
b. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in two times upto III Year II Semester and once in IV Year may be granted by the College Academic Committee on medical grounds.
c. A stipulated fee shall be payable towards condonation of shortage of attendance.
d. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.
e. Shortage of Attendance below 65% in aggregate shall not be condoned.
f. A student who is shortage of attendance in semester may seek re-admission into that semester when offered within one week from the date of the commencement of class work.
g. Students whose shortage of attendance is not condoned in any semester are not eligible to write their Semester End Examination of that class.

11. MINIMUM ACADEMIC REQUIREMENTS

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.10.

a. A student shall be deemed to have satisfied the minimum academic requirements, if he/she gains the credits allotted to each course and secures not less than a minimum 35% of marks exclusively at the Semester End Examination. However, the student should secure minimum 40% of marks in both CIE and SEE put together to be eligible for passing the course.
b. A student shall be promoted from II Semester to III Semester if he/she fulfills the minimum attendance requirement.

c. A student will be promoted from IV Semester to V Semester if he/she fulfills the academic requirement of 50% of the credits up to either III Semester or IV Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in IV Semester.

The students admitted under Lateral Entry Scheme shall be promoted to the V semester, if he/she fulfills the minimum attendance requirement in IV Semester.

d. A student will be promoted from VI Semester to VII Semester if he/she fulfills the academic requirement of 50% of the credits up to either V Semester or VI Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in VI Semester.

The students admitted under Lateral Entry Scheme shall be promoted to the VII semester, if he/she fulfills the academic requirement of 50% of the credits up to either V Semester or VI Semester from all the examinations, whether the candidate appears or not for the examinations and secures prescribed minimum attendance in VI Semester.

e. The Students who fail to earn 160 credits as indicated in the course structure within 8 academic years from the year of admission shall forfeit their seat in B.Tech programme and admission stands cancelled.

f. The students admitted under Lateral Entry Scheme, who fail to earn 116 credits as indicated in the course structure within 6 academic years from the year of admission, shall forfeit their seat in B.Tech programme and admission stands cancelled.

12. PROCEDURES FOR SEMESTER END EXAMINATIONS

i. **Supplementary examinations:** There shall be supplementary examinations along with regular semester end examinations for a student to reappear in the course(s) he/she failed or not attempted.

ii. **Advanced supplementary examinations:** Students who fail in the courses in VIII semester (theory/project work) can reappear for advanced supplementary examinations within one month after the declaration of the revaluation results. However, the students who fail in advanced

supplementary examinations shall reappear when offered next along with regular students.

iii. **Recounting:** A student, who wishes to verify the total marks obtained by him/her in any theory course in SEE can apply for recounting in response to the notification along with the prescribed fee. The outcome of the recounting gets reflected in the results sheet and grade card.

iv. **Revaluation:** A student who wishes to apply for revaluation of a theory course in SEE can submit an application along with the prescribed fee as per the notification issued.

a. If the variation in marks of the first valuation and revaluation is ≤ 15% of the total marks, then the better of the two evaluations shall be considered as final marks.

b. If the variation of marks between the first valuation and revaluation is >15% of the total marks, there shall be a third evaluation by another examiner. The average marks of two nearer evaluations shall be taken into consideration. In case of any fractional value of marks, it can be rounded off to the next integer value.

c. If a student secures a higher grade in the revaluation, that grade will be declared as the final grade. Otherwise, the original grade will remain valid.

13. AWARD OF LETTER GRADES

A letter grade and grade points shall be awarded to a student in each course based on his/her performance as per the 10-point grading system given below.

Marks (Max:100)	Letter Grade	Grade Point	Level
≥ 90	O	10	Outstanding
80 to <90	S	9	Excellent
70 to <80	A	8	Very Good
60 to <70	B	7	Good
50 to <60	C	6	Fair
40 to <50	P	5	Pass
<40	F	0	Fail
--	Ab	0	Absent

Marks (Max:100)	Letter Grade	Grade Point	Level
≥ 40	SA	-	Satisfactory
< 40	US	-	Unsatisfactory

--	Ab	-	Absent

a. A student who secures from 'O' to 'D' grades in a course is declared to have successfully completed the course, and is deemed to have secured the credits assigned to that course.

b. A student who secures "F" grade in any course shall be considered "Failed" and is required to reappear as "Supplementary student" in SEE, as and when offered. In such cases, his/her CIE marks in those courses will remain same as obtained earlier.

c. A student, who is absent from any examination shall be treated as "Failed".

d. In general, a student shall not be permitted to repeat any course (s) for the sake of "Grade improvement" or "SGPA/CGPA improvement".

e. As per AICTE guide lines, If a student acquires additional 20 credits through online Certification (approved MOOCs), he/she will be awarded Graduate degree with Honours or additional Minor Engineering.

14. COMPUTATION OF SGPA & CGPA

a. Semester Grade Point Average (SGPA)

The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is the ratio of sum of the product of the number of credits and the grade points scored by a student in all the courses to the sum of the number of credits of all the courses.

SGPA (S_i) = Σ (C_i x G_i) / ΣC_i

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

b. Cumulative Grade Point Average (CGPA)

The CGPA is a measure of the overall cumulative performance of a student. The CGPA is calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme.

CGPA = Σ (C_i x S_i) / ΣC_i

Where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

c. The SGPA and CGPA are rounded off to 2 decimal points and reported in grade cards.

15. AWARD OF CLASS

A student, who satisfies the minimum requirements prescribed for the completion of a programme, is eligible for the award of B.Tech degree and he/she shall be placed in one of the following four classes on a 10 point scale.

Class Awarded	**CGPA to be secured**	From the CGPA secured from 160 Credits
First Class with Distinction	≥ 7.75 with no subject failures	
First Class	≥ 6.75 with subject failures	
Second Class	≥ 5.75 to < 6.75	
Pass Class	≥ 4.75 to < 5.75	

Equivalent percentage = (CGPA – 0.75) x 10

16. GAP YEAR

α. A student is permitted to make use of the gap year facility at the beginning of V / VII semester of the programme and undergo training programs at premier institutions / research laboratories/ industries for a maximum period of one year (two consecutive semesters of academic year), if he/she secures a CGPA of 7.75 and above with no backlog of courses.

β. A student is permitted to avail the gap year facility only once during the entire course of study.

c. The students are permitted to re-join the programme after availing gap year facility. However, their re-joining is subject to the regulations prevailing at that time.

δ. The total period for completion of the programme reckoned from, the commencement of the first semester to which the student is admitted shall not exceed the maximum period in order that the student is eligible for the award of the degree.

ε. If a student fails to report to the department after the expiry of 2 semesters, his/her readmission will be subject to the decision of competent authority.

ϕ. A student seeking a gap year needs to apply in the prescribed format before the last working day of the running semester. The application submitted by the student shall be evaluated by Department Academic Committee and forwarded to the head of the institution for approval.

g. The duration of the gap year shall be reflected in the consolidated grade card.

17. DISCIPLINE

α. A student is required to observe discipline and decorum both inside and outside the college and not to indulge in any activity that may tarnish the prestige of the college. The head of the institution shall constitute a disciplinary committee to enquire into acts of indiscipline and notify the college about the disciplinary action taken. In case of any serious disciplinary action, which leads to suspension or dismissal, a committee shall be constituted by head of the institution for taking final decision.

β. Those students who indulge in examination related malpractices shall be punished as per the scale of punishment notified in Annexure-I.

χ. Those students involved in the illegal acts of ragging shall be punished as per the provisions of Act 26, 1997 of Govt. of Andhra Pradesh (Annexure-II).

18. REVISION OF REGULATIONS, CURRICULUM AND SYLLABI

The college may revise, amend or change the regulations, curriculum, syllabus and scheme of examinations from time to time subject to decisions/recommendations of Board of Studies and the College Academic Council.

19. WITHHOLDING OF RESULTS

If a student fails to clear dues, if any, payable to the institution or any case of indiscipline is pending against him, the result of the student will be withheld, and also the award of his/her degree shall be withheld in such cases.

20. TRANSITORY REGULATIONS

a. A student, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those students who have already passed the courses in the earlier semester(s) he/she is originally admitted into and substitute courses/additional courses are offered in place of them as approved by the Board of Studies.

b. In general, after transition, there will be a fitment formula approved by the competent authority in order to balance course composition and the number of credits.

c. Students admitted by transfer from other institutions shall follow transitory regulations with suitable fitment formulae approved by the competent authority.

d. A student who is seeking readmission shall apply in the prescribed format within one week after the commencement of the class work. However, the readmission of a student shall be approved by the competent authority.

21. COURSE CODE

The Course Codes will be given by the departments concerned to the course. Each course code contains 8 characters. The 8 characters for each subject will be filled as per the following description.

1 2 3 4 5 6 7 8

1 Character : Institute Name as '**P**'

2,3 Characters: Year of Commencement of Regulations as '**18**'

4,5 Characters: Subject/Branch Category such as

HS for Humanities and Social Science Courses

BS for Basic Science Courses

ES for Engineering Science Courses

CE for Civil Engineering Courses

EE for Electrical & Electronics Engineering Courses

ME for Mechanical Engineering Courses

EC for Electronics & Communication Engineering Courses

CS for Computer Science & Engineering Courses

IT for Information Technology Courses

AE for Automobile Engineering Courses

MC for Mandatory Courses

PD for Personality Development

6 Character: Mode of Subject Learning and Evaluation such as

T for Theory Courses

L for Laboratory Courses

S for Seminar
P for Project
M for Mini Project

V for Viva Voce

E for Professional Elective Courses
O for Open Elective Courses
I for Internship

7,8 Characters: Serial number of the course taught by the department in that

Semester such 01, 02, 03,..... etc

22. GENERAL

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

23. STATUTORY DECLARATION

In case the regulations do not specify application of an appropriate rule in a unique case, the decision of the competent authority of the college shall be final.

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ANNEXURE-I

MALPRACTICE RULES

DISCIPLINARY ACTION FOR MALPRACTICE/IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper Conduct	Punishment
1 (a)	If a student possesses or tries to access any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If a student gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	If a student is found to have copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work, and shall not be permitted to appear for the remaining examinations of the subjects of that Semester. The Hall Ticket of the candidate is to be cancelled.
3.	Impersonates any other candidate in connection with the examination	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the Examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is

		subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is to be registered against him.
4.	If a student smuggles inside the exam hall an Answer book or additional sheet or takes out or Arranges to send out the question paper or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all Semester End Examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	If a student uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in the subject.
6.	If a student refuses to obey the orders of the Chief Superintendent/Controller of Examinations / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the	Such a student(s) shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are to be debarred and forfeited their seats. In case of outsiders, they will be handed over to the police and a police case is to be registered against them.

7.	If a student leaves the exam hall taking away answer script or intentionally tears the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and Semester End Examinations. The continuation of the course by the candidate is subjected to the academic regulations in connection with forfeiture of the seat .
8.	If a student possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also to be debarred and forfeited the seat.
9.	If a student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student shall be expelled from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester. The candidate is also to be debarred and forfeited the seat. Person(s) who do not belong to the College will be handed over to police and, a police case shall be registered against them.
10.	If a student comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
11.	If copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester examinations.

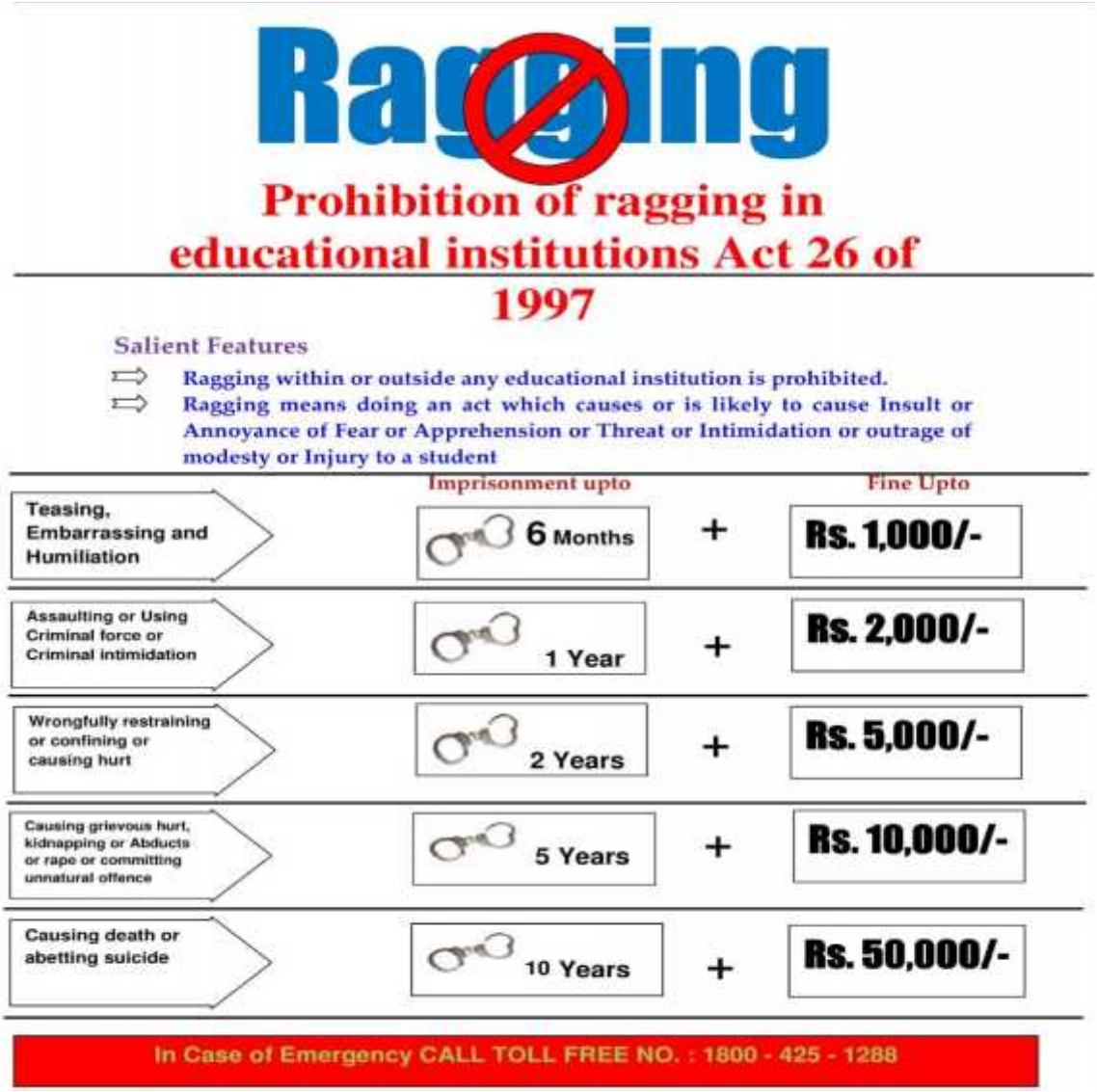
Malpractices identified by squad or special invigilators

- ¬ Punishments to the candidates are as per the above guidelines.
- ¬ Punishment to institutions : (if the squad reports that the college is also involved

in encouraging malpractices)

i. A show cause notice shall be issued to the college.
ii. Impose a suitable fine on the college.
iii. Shifting the examination centre from the college to another college for a specific period of not less than one year.

ANNEXURE-II


Ragging
Prohibition of ragging in educational institutions Act 26 of 1997
Salient Features
Ragging within or outside any educational institution is prohibited.
Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student
Imprisonment upto
Fine Upto
Teasing, Embarrassing and Humiliation
6 Months
+
Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation
1 Year
+
Rs. 2,000/-
Wrongfully restraining or confining or causing hurt
2 Years
+
Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence
5 Years
+
Rs. 10,000/-
Causing death or abetting suicide
10 Years
+
Rs. 50,000/-
In Case of Emergency CALL TOLL FREE NO. : 1800 - 425 - 1288
ABSOLUTELY NO TO RAGGING
1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

B.TECH COURSE STRUCTURE
R-18 REGULATIONS

I Year - I Semester								
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	**P18HST01**	English-I	3	--	--	3	40	60
2	**P18BST01**	Mathematics-I	3	1	--	4	40	60
3	**P18BST03**	Applied Physics	3	1	--	4	40	60
4	**P18EST03**	Programming for Problem Solving	3	--	--	3	40	60
5	**P18EST02**	Engineering Graphics & Design	1	--	3	2.5	40	60
6	**P18HSL01**	English language communication skills Lab-I	--	--	3	1.5	40	60
7	**P18BSL01**	Applied Physics Lab	--	--	3	1.5	40	60
8	**P18ESL03**	Programming for Problem solving Lab	--	--	3	1.5	40	60
9	**P18ESL02**	Engineering Workshop Lab	--	--	3	1.5	40	60
10	**P18MCT01**	Induction Program	--	--	MC	--	--	--
Total Hours			**13**	**2**	**15**	**22.5**	**360**	**540**

I Year - II Semester								
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	**P18HST02**	English-II	3	--	--	3	40	60
2	**P18BST02**	Mathematics-II	3	1	--	4	40	60
3	**P18BST05**	Applied Chemistry	3	1	--	4	40	60
4	**P18EST01**	Basic Electrical & Electronics Engineering	3	--	--	3	40	60
5	**P18EST05**	Python Programming	3	--	--	3	40	60
6	**P18BSL03**	Applied Chemistry Lab	--	--	3	1.5	40	60
7	**P18ESL01**	Basic Electrical & Electronics Engineering Lab	--	--	3	1.5	40	60
8	**P18ESL04**	Python Programming Lab	--	--	3	1.5	40	60
Total Hours			**15**	**2**	**9**	**21.5**	**320**	**480**

II YEAR I SEMESTER								
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	P18ECT01	Semiconductor Devices and Circuits	3	0	0	3	40	60
2	P18CST02	Data Structures	3	0	0	4	40	60
3	P18ECT02	Signals and Systems	3	1	0	4	40	60
4	P18ECT03	Switching Theory and Logic Design	3	0	0	3	40	60
5	P18BST07	Mathematics – III	3	0	0	3	40	60
6	P18EET16	Network Theory	3	0	0	3	40	60
7	P18ECL01	Semiconductor Devices and Circuits Lab	0	0	3	1.5	40	60
8	P18CSL02	Data Structures Lab	0	0	3	1.5	40	60
9	P18MCT02	Environmental Sciences	2	0	0	0	--	--
Total Periods			**20**	**1**	**6**	**23**	**320**	**480**

II YEAR II SEMESTER								
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	P18ECT04	Electronic Circuit Analysis	3	0	0	3	40	60
2	P18ECT05	Electromagnetic Waves and Transmission Lines	3	0	0	3	40	60
3	P18ECT06	Analog Communications	3	0	0	3	40	60
4	P18ECT07	Pulse and Digital Circuits	3	0	0	3	40	60
5	P18ECT08	Random Variables and Stochastic Process	3	0	0	3	40	60
7	P18ECL02	Electronic Circuit Analysis Lab	0	0	3	1.5	40	60
6	P18ECL03	Analog Communications Lab	0	0	3	1.5	40	60
8	P18ECL04	Pulse and Digital Circuits Lab	0	0	3	1.5	40	60
9	P18MCT07	IPR & Patents	2	0	0	0	--	--
Total Periods			**21**	**0**	**5**	**19.5**	**360**	**540**

III YEAR I SEMESTER								
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	P18ECT09	Linear and Digital IC Applications	3	0	0	3	40	60
2	P18ECT10	Digital Communications	3	0	0	3	40	60
3	P18ECT11	Antenna and Wave Propagation	3	1	0	3	40	60
4	P18EET05	Control Systems	3	1	0	4	40	60
5	P18ECO	Open Elective-I	2	0	0	2	40	60
6	P18MCT08	Design Thinking for Innovation	4	0	0	2	---	100
7	P18ECL05	Linear and Digital IC Applications Lab	0	0	3	1.5	40	60
8	P18ECL06	Digital Communications Lab	0	0	3	1.5	40	60
9	P18MCT09	Biology	2	0	0	0	--	100
10	P18ECI01	Internship	4 Weeks			2	100	-
Total Periods			**18**	**2**	**6**	**22**	**420**	**480**

S.No	***Subject Code***	***Offered ByOther Dept.***	***OpenElective–I***	**L**	**T**	**P**	**Credits**	**Internal**	**External**
i)	P18CSO01	CSE	Object Oriented Programming System through JAVA	2	0	0	2	40	60
ii)	P18CSO02	CSE	Block chain Technology	2	0	0	2	40	60
iii)	P18ITO01	IT	Statistical Methods using R-Programming	2	0	0	2	40	60
iv)	P18MBO01	MBA	Management Science	2	0	0	2	40	60

III YEAR II SEMESTER								
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	P18ECT12	Digital Signal Processing	3	0	0	3	40	60
2	P18ECT13	VLSI Design	3	0	0	3	40	60
3	P18ECT14	Microprocessors and Microcontrollers	3	0	0	3	40	60
4	P18ECT15	Microwave Engineering	3	0	0	3	40	60
5	P18ECO	OpenElective–II	2	0	0	2	40	60
6	P18ECL07	Microprocessors and Microcontrollers Lab	0	0	3	1.5	40	60
7	P18ECL08	Digital Signal Processing Lab	0	0	3	1.5	40	60
8	P18ECL09	VLSI Design Lab	0	0	3	1.5	40	60
9	P18MCT13	Entrepreneurship	2	0	0	0	--	--
10	P18ECM01	Mini Project	4 Weeks			2	100	--
Total Periods			**16**	**0**	**9**	**22.5**	**320**	**480**

S.No	***Subject Code***	***Offered ByDept.***	***OpenElective–II***	**L**	**T**	**P**	**Credits**	**Internal**	**External**
i)	P18CSO03	CSE	Introduction To Database Management Systems	2	0	0	2	40	60
ii)	P18CSO04	CSE	Introduction To Computer Networks	2	0	0	2	40	60
iii)	P18CSO05	CSE	Introduction To Machine Learning	2	0	0	2	40	60
iv)	P18EEO08	EEE	Electrical Technology	2	0	0	2	40	60

IV YEAR I SEMESTER								
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	P18ECT17	Radar Systems	3	0	0	3	40	60
2	P18ECT16	Digital Image Processing	3	0	0	3	40	60
3	P18ECT20	Internet of Things	3	0	0	3	40	60
4	P18ECE	Professional Elective-I	3	0	0	3	40	60
5	P18ECE	Professional Elective-II	3	0	0	3	40	60
6	P18ECO	Open Elective-III	2	0	0	2	40	60
7	P18ECL12	Microwave Engineering and Optical Comm. Lab	0	0	3	1.5	40	60
8	P18ECL10	IoT Lab	0	0	3	1.5	40	60
9	P18MCT14	Employability Skills	2	0	0	2	--	--
Total Periods			**19**	**1**	**6**	**22**	**320**	**480**

Professional Elective – I		
S.No	**Course Code**	**COURSE**
i)	P18ECE01	Embedded & Real Time Operating Systems
ii)	P18ECE02	Analog IC Design
iii)	P18ECE03	Biomedical Engineering
iv)	P18ECE04	Electronic Switching Systems

Professional Elective – II		
S.No	**Course Code**	**COURSE**
i)	P18ECE05	Artificial Neural Networks
ii)	P18ECE06	Electronic Measurements and Instrumentation
iii)	P18ECE07	Optical Communications
iv)	P18ECE08	Nano Electronics

S.No	*Subject Code*	*Offered ByDept.*	*OpenElective–III*
i)	P18CSO06	CSE	Fundamentals of Big Data
ii)	P18CSO07	CSE	Fundamentals of Cloud Computing
iii)	P18CSO08	CSE	Introduction to Data Sciences
iv)	P18EEO11	EEE	Power Electronics

IV YEAR II SEMESTER								
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**	**Internal**	**External**
1	P18ECE	Professional Elective-III	3	0	0	3	40	60
2	P18ECE	Professional Elective-IV	3	0	0	3	40	60
3	P18ECP01	Project	0	0	12	6	80	120
Total Periods			**6**	**0**	**12**	**12**	**160**	**240**

Professional Elective –III		
S.No	**Course Code**	**COURSE**
i)	P18ECE09	Wireless Sensor Networks
ii)	P18ECE10	Speech Processing
iii)	P18ECE11	Adhoc Networks
iv)	P18ECE12	Digital IC Design

Professional Elective –IV		
S.No	**Course Code**	**COURSE**
i)	P18ECE13	Satellite Communications
ii)	P18ECE14	Cellular and Mobile Communications
iii)	P18ECE15	Low power VLSI Design
iv)	P18ECE16	Machine Learning For Signal Processing

B.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

English-I

(Common to all Branches)

Internal Marks: 40

Course Code: P18HST01 **External Marks: 60**

Course prerequisites: The students should have basic knowledge of English grammar and LSRW skills.

COURSE OBJECTIVES:

- To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

COURSE OUTCOMES:

On completion of this course, the student is able to:

- Use English Language effectively in spoken and written forms
- Interpret the contextual meaning of words
- Comprehend the given texts and respond appropriately
- Recall and reproduce the theme in a given context
- Communicate confidently in formal and informal contexts

UNIT – I **(9 Lectures)**

The Happy Prince – Oscar Wilde

a. Vocabulary: Synonyms and Antonyms

(http://www.magickeys.com/books/riddles/words.html)

b. Grammar: Prepositions, Sentence structure & Types of sentences

c. Writing: Note Making and Note Taking

UNIT – II **(8 Lectures)**

Technology With a Human Face – E.F.Schumacher

a. Vocabulary: One word substitutes & Idioms

b. Grammar: Subject–verb Agreement (Concord), Question tags and Modal Auxiliaries

c. Writing: Information Transfer

UNIT –III **(9 Lectures)**

Presidential Address – APJ Abdul Kalam

a. Vocabulary: Word formation, Root Words

(www.englishhints.com,www.enchantedlearning.com,

www.learnenglish.de/grammar/prefixtext.html)

b. Grammar: Parts of Speech and Punctuation

c. Writing: Paragraph Writing

UNIT- IV **(9 Lectures)**

The Road Not Taken – Robert Frost

a. Vocabulary: Prefixes, Suffixes and Affixes

(http://www.magickeys.com/books/riddles/words.html)

b. Grammar: Articles

c. Writing: Letter Writing

UNIT – V **(10 Lectures)**

Good Manners – J.C Hill

a. Vocabulary: Homonyms, Homophones and Homographs

(http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)

b. Grammar: Tenses

c. Writing: E- mail Writing

Textbooks:

1. New Horizons – Pearson Publishers
2. Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
3. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.

References:

1. Meenakshi raman, Sangeetha, Sharma Fundamentals of technical communication, Pg: 119-153 Oxford University press, 2015
2. Rutherford, Andhrea. J, Communication skills for technology. Pearson, New Delhi.2001
3. Raymond Murphy, Murphy's English Grammar, Cambridge University Press 2004
4. Meenakshi raman, Sangeetha, Sharma,Technical communication: English Skills for Engineers, Oxford University press, 2009
5. Michael Swan, Practical English Usage, Oxford University press, 1996

Online Resources:

1. (www.englishhints.com,www.enchantedlearning.com, www.learnenglish.de/grammar/prefixtext.html)
2. (http://www.magickeys.com/books/riddles/words.html)
3. (http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
4. http://www.yourdictionary.com
5. http://www.learnenglish.com
6. http://www.cambridge.org
7. http://www.eslcafe.com
8. http://www.eslgames.com
9. http://www.penguin.co.uk
10. http://www.edufind.com/english/practice

B. Tech- I Year I Semester **Course structure**

L T P C

3 0 0 3

MATHEMATICS-I (Differential equations and Laplace transforms)

(Common to All Branches)

Internal Marks: 40

Course code: P18BST01 **External marks: 60**

Course Prerequisite: The basic knowledge of Matrices, Trigonometry, Differentiation and Integration.

Course Objectives:

- To learn the methods solving the differential equations of first order with their applications.
- To learn the methods of solving differential equations of second and higher order with their applications .
- To learn to find the Laplace transform of different functions and obtained the solution of Design.
- To understand the concepts Partial Differential.

Course Outcomes: After learning the contents of this paper the student must be able to

- Solve first order differential equations and their applications.
- Usage of higher order differential equations that are applied to real world problems.
- Find the Laplace transform of derivatives, integrals and periodic functions.
- Use the method of Laplace transforms to solve systems of linear first-order differential equations.
- Calculate total derivative, Jocobian, Maxima and minima of functions of two variables.

UNIT-I: Differential equations of first order and first degree:

Linear-Bernoulli-Exact-Reducible to exact.

Applications: Newton's Law of cooling-Law of natural growth and decay-Orthogonal trajectories.

UNIT-II: Linear differential equations of higherorder:

Non-homogeneous equations of higher order with cons tant coefficients with RHS term of the type e^{ax},sin a x, cos ax, polynomials in x, $e^{ax}V(x)$, xV(x)- Method of Variation of parameters.

Applications: LCR circuit.

UNIT-III: Laplace Transforms:

Laplace transforms of standard functions– First shifting Theorem, Change of scale property, Multiplication by t^n, division by t, Transforms of derivatives and integrals – Second shifting theorem– Laplace transform of Periodic functions.

UNIT IV: Inverse Laplace Transforms:

Inverse Laplace transforms – Convolution theorem.

Application of Laplace transforms to ordinary differential equations of first and second order.

UNITV: Partial Differentiation:

Introduction- Homogeneous function-Euler's theorem-Total derivative-Chain rule-Generalized Mean value theorem for single variable (without proof)-Taylor's and Mc Laurent's series expansion of functions of two variables– Functional dependence-Jacobian.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
4. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

Web Resources:

1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. http://mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

B.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

APPLIED PHYSICS

(Common to ECE, CSE & IT)

Internal Marks: 40

Course code: P18BST03 **External Marks: 60**

Course Prerequisites

The basics of analytical and conceptual understanding of physics.

Course Objectives

1. To study the wave nature of light through Interference and diffraction.
2. To learn the basic principles of Lasers and fiber optics.
3. To express the physics of electrostatics and electromagnetic wave concepts through Maxwell's equations.
4. To study the basic concepts of Quantum mechanics.
5. Aware of limits of classical free electron theory and apply band theory of solids.
6. Acquire the knowledge of semiconductor physics.

Course Outcomes

1. Understanding the basic concepts of optics and how to apply them for engineering applications.
2. Acquire the knowledge of fundamentals of Lasers and fiber optics enables the students to develop Laser devices to apply them in various systems like communications, Industries and medicine.

3. Set students to be exposed to Electrostatics, Maxwell's equations, electromagnetic waves and fundamental concepts of quantum mechanics.
4. Enable to learn the fundamental concepts of free electron theory and band theory of solids.
5. Develop knowledge of band theory of solids for fundamentals of Semiconductor physics enables the students to apply the knowledge to various systems like communications, solar cell, photo cells and so on.

UNIT-I

WAVE OPTICS (12 lectures)

Interference: Introduction, Superposition of waves, Interference of light by wave front splitting and amplitude splitting, interference in thin films, Newton's rings.

Diffraction: Introduction, differences between interference and diffraction, difference between Fraunhoffer and Fresnel diffraction, Fraunhoffer diffraction at single slit, Diffraction grating (N-slits qualitative), diffraction at circular aperture, resolving power of microscope, and telescope.

UNIT-II

LASERS AND FIBER OPTICS (8 lectures)

Lasers: Introduction, Characteristics of laser, Absorption, spontaneous emission, stimulated emission, Einstein's coefficients, Pumping, Types of Lasers: Ruby laser, He-Ne laser.

Fiber optics: Introduction, Total internal reflection-wave propagation in optical fiber, Acceptance angle, numerical aperture.

UNIT-III **(12 lectures)**

ELECTROSTATICS, MAXWELL'S EQUATIONS AND ELECTROMAGNETIC WAVES

Electrostatics: Coulombs law, electric field, electric field intensity, electric flux Density, electrostatic potential, divergence of electric field, Laplace's and Poisson's equations for electrostatic potential, Gauss theorem in electrostatics.

Maxwell's equations and electromagnetic waves: Gauss theorem in magneto statics, Faraday's law of electromagnetic induction, Ampere's law, displacement current, Maxwell's equations in vacuum, electromagnetic wave equation in dielectric medium, velocity of propagation of electromagnetic wave, poynting vector and poynting theorem.

UNIT-IV **(14 lectures)**

QUANTUM MECHANICS, FREE ELECTRON THEORY AND BAND THEORY

Quantum Mechanics: Introduction to quantum physics, de-Broglie's hypothesis and properties of matter waves, Schrodinger's time independent wave equation, Particle in one dimensional box, physical significance of wave function.

Free electron theory: Free electron theory of metals assumptions and failures, Fermi Dirac distribution function- Fermi level, density of states.

Band theory of solids: Introduction, Bloch's theorem, Kronig penny model(qualitative), E-K diagram, Brillouin's zones, classification of solids into metals, semiconductors and insulators, effective mass of electron and concept of hole

UNIT-V **(8 lectures)**

SEMICONDUCTOR PHYSICS

Semiconductor physics: Introduction**,** Intrinsic and Extrinsic semiconductors. carrier concentration in intrinsic semiconductors, carrier concentration in N-type and P-type semiconductors, Dependence of Fermi energy on carrier-concentration and temperature,

diffusion and drift, Hall effect and its applications, mechanism in LED, solar cell and photo conductor

TEXT BOOKS:

1. A Textbook of Engineering Physics by Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.
2. Optics by Ajoy Ghatak, Tata McGraw-Hill Publishing company limited
3. Lasers and nonlinear optics by BB Laud, New age International Publishers
4. Introduction to Electrodynamics by David Griffiths, Cambridge University Press
5. Introduction to Quantum physics by Eisberg and Resnick.
6. Solid state physics by AJ Dekker.

REFERENCES:

1. Applied physics by Palanisamy (Scitech publications)
2. Optics by Eugene Hecht, Pearson Education.
3. Principle of Lasers by O.Svelto
4. Electricity, magnetism and light by W. Saslow
5. Introduction to Quantum mechanics by D.J.Griffiths. Cambridge University Press
6. Quantum mechanics by Richard Robinett.
7. Quantum Chemistry by Daniel McQuarrie
8. Semiconductor Optoelectronics by J. Singh, Physics and Technology, Mc Graw-Hill inc
9. Engineering Physics by B.K. Pandey, S. Chaturvedi - Cengage Learing.
10. Physics by Halliday and Resnick

WEB REFERENCES:

1. http://jntuk-coeerd.in/
2. http://www.youtube.com
3. http://en.wikipedia.org
4. http://nptel.ac.in/syllabus/122106027/

B.Tech I Year I Semester **CURRICULUM**

L	T	P	C
1	0	3	2.5

ENGINEERING GRAPHICS

(Common to all branches)

Internal Marks: 40

Course Code: P18EST02 **External Marks: 60**

Course objectives:

1. To introduce the students to the "universal language of Engineers" for effective communication through drafting exercises.
2. To enable the students to acquire requisite knowledge, techniques and attitude required for advanced study of engineering drawing.
3. To enable the students to construct the layout development of basic solids for practical situations.
4. To enable the students to gain the ability to convert the Isometric views in to Orthographic views.
5. To enable the students to gain the ability to convert the Orthographic views in to Isometric views.

Course Outcomes:

After completion of the course the student will be able to

1. Gain the knowledge of various Geometrical Elements used in Engineering Practice.
2. Understand concepts of all 2 D elements like polygons, Conic Sections.
3. Understand concepts of 3 D Objects like various Prisms, Cylinders, Pyramids and Cones.
4. Draw and represent the Projections of various objects.
5. Convert the 3 D views in to 2 D views and vice versa.

UNIT-I: INTRODUCTION TO ENGINEERING GRAPHICS (15 Lectures)

Introduction to Drawing instruments and their uses, construction of regular polygons, Conic sections- ellipse, parabola, hyperbola using general method, Scales- Diagonal scale, Vernier scale.

UNIT-II: PROJECTIONS OF POINTS & LINES (12 Lectures)

Principle of orthographic projection-Method of Projection – First and third angle projection methods- Projections of Points –Projection of straight lines- parallel to one plane and inclined to the other plane.

UNIT-III: PROJECTIONS OF LINES & PLANES (18 Lectures)

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclinations and traces.

Projections of Planes: Projections of plane figures: triangle, square, rectangle, pentagon and hexagon, circle with surfaces inclined to both the reference planes.

UNIT-IV: PROJECTIONS OF SOLIDS & SURFACE DEVELOPMENT

(15 Lectures)

Projections of Solids: Projections of regular solids with the axis inclined to only one reference plane.

Development of surfaces for basic solids- prisms, pyramids, cylinder and cone.

UNIT – V: PROJECTIONS OF PICTORIAL VIEWS (15 Lectures)

Conversion of isometric views into orthographic views and conversion of orthographic views in to isometric views.

Text Book:

1. Engineering Drawing by N.D. Bhatt & V.M. Panchal, Charotar Publications, 2014.

2. Engineering Drawing by Basant Agrawal and C.M. Agrawal ,McGraw Hill Education Pvt. Limited, 2013.
3. Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah, Scitech Publications, 2010.

Reference Book:

1. Engineering Graphics with AutoCAD 2002 by James D. Bethune, PHI, 2011.
2. Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd, 2010.
3. Engineering drawing – P.J. Shah .S.Chand Publishers, 2010.
4. Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers, 2010.
5. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson, 2009.

Web References:

1. https://lecturenotes.in/subject/436/engineering-drawing-ed.
2. web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf.
3. https://www.smartzworld.com/notes/engineering-drawing-pdf-1st-year-notes-ppts
4. https://www.researchgate.net/305754529_A_Textbook_of_Engineering_Drawing
5. www.academia.edu/32510080/N_d_bhatt_engineering_drawing_pdf

B.Tech I Year - I Semester

L	T	P	C
3	0	0	3

C - Programming for Problem Solving

(Common to all Branches)

Course Code: P18EST03 **Internal Marks: 40**

External Marks: 60

Course Objectives:

1. To impart adequate knowledge on the need of programming languages and problem solving techniques.
2. To impart problem solving skills.
3. To enable student to write programs in C and to solve the problems.

Course Outcomes:

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

1. Design algorithms and flowchart / Pseudo code for a given problem.
2. Design programs involving decision structures and loops.
3. Implement different operations on arrays and solve problems using functions.
4. Understand pointers and strings.
5. Implement structures, unions and file operations in C programming for a given application problem.

Unit-I: **(8 Lectures)**

Introduction to Programming: Computer hardware, Bits and Bytes, programming languages, application and system software, the software development process.

Idea of algorithm: steps to solve logical and numerical problems. Representation of algorithm: flowchart/pseudo code with examples, from algorithms to programs.

Unit-II: **(9 Lectures)**

Introduction to C: Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing Input and Output. Decision Making - Branching and

Looping. Enumerated Data type, Renaming Data type with typedef, Type Casting.

UNIT-III **(12 Lectures)**

Arrays: Definition, Declaration, Initialization, Assignment, Processing array, Passing array to a function, Two and multi dimensional array.

Functions: Defining a function, Accessing a function, Passing argument to functions, Function prototypes, Nested function call, Storage classes.

UNIT-IV **(10 Lectures)**

Pointers: Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memory allocation.

Strings: C Strings, String Input / Output functions, arrays of strings, string manipulation functions.

UNIT-V **(9 Lectures)**

Structures: Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions.

File Handling: Types, operations on files, modes, file I/O functions, Random Access Functions.

Text Books:

1. Byron S Gottfried, —Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006.
2. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.
3. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
2. Yashavant P. Kanetkar. —Let Us C, BPB Publications, 2011.

B.Tech. I Year I Semester **Course Structure**

L	T	P	C
3	0	0	1.5

English Language Communication Skills Lab

(Common to all Branches)

Internal Marks: 40

Course Code: P18HSL01 **External Marks: 60**

Course Prerequisite:

- Basic knowledge of English grammar.
- Basic understanding of English vocabulary.
- Ability to speak simple sentences.
- Have interest to learn the language.

Course Objectives

- To facilitate computer assisted multimedia instructions enabling individualized and independent language learning.
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
- To bring about a consistence accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency of students in spoken English and neutralize their mother tongue influence.
- To train students to use language appropriately for public speaking, group discussion and interviews.

Course Outcomes

- Better understanding of nuances of English language through audio visual experience and group activities.
- Neutralization of accent for intelligibility.
- Speaking skills with clarity and confidence which in turn enhances their employability skills.
- Better understanding of the production of sounds of language.
- Suitable body language for employability.

Scope:

The curriculum of the **ELCS Lab** is designed to focus on the production and practice of sounds of language and to familiarize the students with the use of English in everyday situations and contexts.

EXERCISE – I (3 Sessions)

- **A.** Ice – Breaking Activity, Greeting, Introducing and taking leave
- **B.** Introduction to Phonetics

  Vowel sounds – Pure Vowels & Diphthongs

  Consonant sounds

EXERCISE – II (2 Sessions)

- **A.** JAM Session, Situational Dialogues, Giving Directions & Narration
- **B.** Structure of Syllables - Plural markers & Past tense Markers

EXERCISE – III (2 Sessions)

- **A.** Role play, Giving Information and Asking Information
- **B.** Word Stress & Listening Comprehension – Listening for General Details

EXERCISE – IV (2 Sessions)

- **A.** Describing objects, events, places etc. & Presentation Skills – Extempore, Public Speaking.

- **B.** Consonant Cluster, Rules of ‘r’ pronunciation and Neutralization of Mother Tongue Influence

EXERCISE – V (3 Sessions)

- **A.** Interview Skills & Group Discussion
- **B.** Intonation & Listening Comprehension – Listening for Specific Details

Textbooks:

1. *Strengthen your Communication Skills* - Maruthi Publication, Hyderabad 2013

2. *A textbook of English Phonetics* for Indian Students by T. Balasubramanian (Macmillan)

References:

- INFOTECH English (Maruthi Publications).
- Personality Development and Soft Skills (Oxford University Press, New Delhi)
- Suresh Kumar, E. & Sreehari, P. 2009. A Handbook for English Language Laboratories. New Delhi: Foundation
- Speaking English Effectively 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
- Sasi Kumar, V & Dhamija, P.V. How to Prepare for Group Discussion and Interviews. Tata McGraw Hill
- Hancock, M. 2009. English Pronunciation in Use. Intermediate. Cambridge: CUP
- Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad
- Hewings, M. 2009. English Pronunciation in Use. Advanced. Cambridge: CUP
- Marks, J. 2009. English Pronunciation in Use. Elementary. Cambridge: CUP

- Nambiar, K.C. 2011. Speaking Accurately. A Course in International Communication. New Delhi : Foundation
- Soundararaj, Francis. 2012. Basics of Communication in English. New Delhi: Macmillan
- Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
- English Pronouncing Dictionary Daniel Jones Current Edition with CD.

Online Resources:

- http://www.cambridge.org
- http://www.edufind.com/english/practice
- http://www.learnenglish.com
- http://www.penguin.co.uk

B.Tech. I Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

APPLIED PHYSICS LAB

(Common to ECE, CSE & IT)

Internal Marks: 40

Course code: P18BSL01 **External Marks: 60**

Course Prerequisites: The basics of analytical and conceptual understanding of physics.

Course Objective:

1. Deploy scientific method of experiments in the laboratory.
2. Develop the procedures and observational skills for appropriate use of simple and complex apparatus.
3. Enable analytical techniques, statistical analysis and graphical analysis.
4. Reinforce ideas and concepts covered in lecture host of experiments.
5. Train to find the radius of curvature of a Plano-convex lens forming Newton's rings.

Course Outcomes:

1. Apply the phenomenon of interference and diffraction of light waves.
2. Implement the concept of resonance in LCR circuit and Sonometer.
3. Analyze the SHM to determine its dependent properties.
4. Evaluate the behavior of electronic components and its characteristics.

List of Experiments

(Any eight of the following to be done)

1. Determination of Radius of Curvature of Plano - Convex lens by

forming Newton's Rings.

2. Determination of Wavelengths of various spectral lines using diffraction grating with the normal incidence method.
3. Determination of wavelength of laser radiation.
4. Determination of Refractive index of a given prism..
5. Study of magnetic field along the axis of a current carrying coil and to verify Stewart-Gee's method.
6. Determination of energy gap of PN junction Diode.
7. Determination of hall coefficient and carrier concentration using Hall effect
8. Study of V-I characteristics of Zener diode.
9. Study of V-I characteristics of PN junction diode.
10. Determination of frequency of a vibrating bar or electrical tuning fork using Melde's apparatus.
11. Determination of acceleration due to gravity using compound pendulum
12. Verification of laws of transverse waves by Sonometer.
13. Determination of Velocity of sound by volume resonator.
14. Determination of rigidity modulus by Torsional Pendulum.

TEXT BOOKS:

1. Madhusudhanrao, "Engineering Physics lab manual" Ist edition,Scietech Publication, 2015.

2. Ramarao Sri, Choudary Nityanand and Prasad Daruka, Lab Manual of Engineering physics 5th ed, Excell books, 2010.

3. Physics lab manual, department of physics, PACE Institute of Technology and Sciences.

I B.Tech

L	T	P	C
0	0	2	0

APPLIED/ENGINEERING PHYSICS - VIRTUAL LABS – ASSIGNMENTS

Objective: *Training Engineering students to prepare a technical document and improving their writing skills.*

LIST OF EXPERIMENTS

1. Hall Effect
2. Crystal Structure
3. Hysteresis
4. Brewster's angle
5. Magnetic Levitation / SQUID
6. Numerical Aperture of Optical fiber
7. Photoelectric Effect
8. Simple Harmonic Motion
9. Damped Harmonic Motion
10. LASER – Beam Divergence and Spot size
11. B-H curve
12. Michelson's interferometer
13. Black body radiation

URL: ***www.vlab.co.in***

B. Tech- I Year I Semester **Course structure**

L	T	P	C
0	0	3	1.5

ENGINEERING WORKSHOP

(Common to all branches)

Internal Marks: 40

Course Code: P18ESL02 **External Marks: 60**

Course Pre-requisite: NIL

Course Objectives:

- To provide hands on experience about use of different engineering materials, tools, equipment and processes those are common in the engineering field.
- To provide the students hands on experience to make different joints in carpentry with hand tools like jack plane, various chisels & hand saws.
- To provide the students hands on experience to make different joints in Sheet metal work with hand tools like snips, stacks, nylon mallets etc.
- To provide the students hands on experience to make different connections in house wiring with hand tools like cutting pliers ,tester ,lamps& lamp holders etc.
- To develop a right attitude, team working, precision and safety at work place.

Course Outcomes:

At the end of the course the student will be able to

- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
- Familiarize with the basics of tools and equipment used in Carpentry.
- Fabricate various basic components using Sheet metal.

- Apply basic electrical engineering knowledge for house wiring practice.
- Gain the hands on experience to form different models in Black smithy.

LIST OF EXPERIMENTS:

Minimum two experiments should be conducted from each trade

1. **Carpentry** **(6 Lectures)**
   a) Cross-Lap joint
   b) Dove tail joint
   c) T - Lap joint
   d) Mortise & Tenon joint
2. **Fitting** **(6 Lectures)**
   a) Square fit
   b) V - Fit
   c) Half round fit
   d) Dovetail fit
3. **Tin Smithy** **(6 Lectures)**
   a) Rectangular Tray
   b) Cylinder
   c) Square box without lid
   d) funnel
4. **Black Smithy** **(6 Lectures)**
   a) Round rod to Square
   b) S-Hook
   c) Round Rod to Flat Ring
   d) Round Rod to Square headed bolt
5. **House wiring** **(6 Lectures)**
   a) One lamp controlled by one switch
   b) Parallel and Series connections
   c) Fluorescent lamp fitting
   d) Stair case wiring

REFERENCE BOOKS:

1. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers, 2015.
2. Engineering Practices Lab Manual, Jeyapoovan, SaravanaPandian, Vikas publishers, 2009.
3. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House, 2003.

B.Tech. I Year I Semester **L T P C**

0 0 3 1.5

C - Programming for Problem Solving Lab
(Common to all Branches)

Course Code: **P18ESL03** **Internal Marks: 40**

External Marks: 60

Course Prerequisite: None

Course Objectives:

1. To understand the various steps in program development.
2. To understand the basic concepts in C Programming Language.
3. To understand different modules that includes conditional and looping expressions.
4. To understand how to write modular and readable C Programs.
5. To write programs in C to solve problems using arrays, structures and files.

EXPERIMENT WISE PROGRAMS

Experiment-1

a) Write a simple C program to Print "Hello World"
b) Write a simple C Program to Calculate Area and Circumference of Circle
c) Write a simple C program to implement basic arithmetic operations - sum, difference, product, quotient and remainder of given numbers.

Experiment-2

Write C programs to demonstrate the following operators

a) Assignment Operator.
b) Relational and Logical Operator.
c) Increment and decrement operator.
d) Bitwise operators.
e) Ternary operator.

Experiment-3

a) Write a C programs - to find the largest and smallest of 2 numbers(if – else), to find the largest and smallest of 3 numbers(Nested if – else), roots of quadratic equation(else – if ladder).

b) The total distance travelled by vehicle in‘t’ seconds is given by distance=ut+1/2at2 where ‘u’ and ‘a’ are the initial velocity and acceleration.
Write a c program to find the distance travelled at regular intervals of time given the Values of ’u’ and ‘a’. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of ‘u’ and ‘a’.

c) Write a c program, which takes two integer operands and one operator from the user, performs the operation and the prints the result. (consider the operators +,-,*,/,% and use switch statement).

Experiment-4

a) Write a C program to find the sum of individual digits of a positive integer

b) A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1.Subsequent terms are found by adding the preceding two terms in the sequence .Write a c program to generate the first n terms of the sequence.

c) Write a c program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

Experiment-5

a) Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:
$1+x+x^2+x^3+\ldots\ldots\ldots\ldots+x^n$.

b) Write a C program to generate Pascal's triangle.

c) Write a C program to construct a pyramid of numbers

Experiment-6

a) Write a c program to find both the largest and smallest number in a list of integers.

b) Write a c program that uses functions to perform the following:

i) Addition of Two Matrices.
ii) Multiplication of Two Matrices.

Experiment-7

a) Write a programs that use both recursive and non-recursive functions
b) To find the factorial of a given integer.
c) To find the GCD of two given integers.

Experiment-8

a) Write a c program that uses functions to perform the following operations:
   i) To insert a sub-string in given main string from a given position.
   ii) To delete n Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.

Experiment-9

a) Write a C program that displays the position or index in the string S Where the string T begins, or - 1 if S doesn't contain T.
b) Write a C program to count the lines, words and characters in a given text .

Experiment-10

a) Write a program to print the details of a student like(Name, Rollno, marks) using nested structures.
b) Write a C Program to Calculate Difference Between Two Time Period.

Experiment-11

a) Write a C program that uses functions to perform the following operations:
   i) Reading a complex number
   ii) Writing a complex number
   iii) Addition of two complex numbers
   iv) Multiplication of two complex numbers
   (Note: represent complex number using a structure.)

Experiment-12

a) Write a C program which copies one file to another and display the contents of a file
b) Write a C program to reverse the first n characters in a file.
c) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

B.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

English-II

(Common to all Branches)

Internal Marks: 40

Course Code: P18HST02 **External Marks: 60**

Course prerequisites: The students should have basic knowledge of English grammar and LSRW skills.

COURSE OBJECTIVES:

- To enable the engineering students to develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To integrate English Language learning with employability skills and training.
- To enhance the students' proficiency in reading skills enabling them meet the academic demands of their course

COURSE OUTCOMES:

On completion of this course, the student is able to:

- Use English Language effectively in spoken and written forms
- Interpret the contextual meaning of words
- Comprehend the given texts and respond appropriately
- Recall and reproduce the theme in a given context
- Communicate confidently in formal and informal contexts

UNIT – I **(8 Lectures)**

My Struggle for an Education – Booker T. Washington

a. Vocabulary: Collocations

b. Grammar: Finite verbs, Non- finite verbs, Gerund, Transitive and Intransitive Verbs

c. Writing: Precis Writing

UNIT – II **(9 Lectures)**

In London – M.K.Gandhi

a. Vocabulary: Commonly confused words

b. Grammar: Active voice and Passive voice

c. Writing: Technical Report Writing

UNIT –III **(10 Lectures)**

Principles of Good Writing – L A Hill

a. Vocabulary: Commonly Misspelt Words

b. Grammar: Direct & Indirect Speech

c. Writing: Essay Writing

UNIT- IV **(9 Lectures)**

The Secret of Work – Swami Vivekanada

a. Vocabulary: Technical vocabulary

b. Grammar: Degrees of Comparison

c. Writing: Curriculum vitae, Cover Letter and Resume Writing. (Functional, Chronological and standard Resumes)

UNIT – V **(9 Lectures)**

Oh Father Dear Father – Raj Kinger

a. Vocabulary: Phrasal verbs

b. Grammar: Simple, Compound and Complex Sentences

c. Writing: Hints Development

Textbooks:

1. Board of Editors, "Sure Outcomes"– Orient Blackswan, Hyderabad, 2013
2. "Panorama" – Oxford University Press, New Delhi, 2016
3. "Fluency in English", A Course Book for Engg. Students, Published by Orient Black Swan, Hyderabad, 2016 print.
4. "Technical Communication- Principles and Practice", Third Edition. New Delhi: Oxford University press.

References:

1. Murphy, “English Grammar with CD”, Cambridge University Press, New Delhi, 2004.
2. Rizvi Asheaf M, “Effective Technical Communication”, Tata McGraw Hill, New Delhi, 2008
3. Baradwaj Kumkum, Professional Communication”, I.K. International- Principles and Practice”. Third Edition. New Delhi: Oxford University Press.2015
4. Trailblazers – Board of Editors – Orient Blackswan
   New Delhi).

Online Resources:

1. (www.englishhints.com,www.enchantedlearning.com, www.learnenglish.de/grammar/prefixtext.html)
2. (http://www.magickeys.com/books/riddles/words.html)
3. (http://www.pinnacle.edu.in/campusfiles/1826_campusFile_1.pdf)
4. http://www.yourdictionary.com
5. http://www.learnenglish.com
6. http://www.cambridge.org
7. http://www.eslcafe.com
8. http://www.eslgames.com
9. http://www.penguin.co.uk
10. http://www.edufind.com/english/practice

B. Tech- I Year II Semester Course structure

L T P C

3 0 0 3

MATHEMATICS-II
(**Linear algebra and Vector calculus**)
(Common to All Branches)

Internal Marks: 40

Course code: P18BST02 External marks: 60

Course Prerequisite: Mathematics-I (P18BST01)

Course Objectives: To learn

- The subject gives the knowledge about matrices and applications to solve linear equations.
- The course intends to provide an overview of Eigen values and Eigen vectors which occur in Physical and engineering problems.
- To integration over the regions.
- The concepts of vector differentiation.
- Line integral, Surface and volume integrals, Vector integral theorems.

Course Outcomes: After learning the contents of this paper the student must be able to

- Apply this knowledge to solve linear equations.
- Eigen values and Eigen vectors of a given matrix and solve simultaneous linear equations.
- Determine double integral over a region and triple integral over a volume.
- Analyze the Vector differentiation in various domains.
- Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT I: Linear systems of equations:

Rank-Echelon form-Normal form – Solution of linear systems – Gauss elimination – Gauss Jordon- Gauss Jacobi and Gauss Seidal methods.

Applications: Finding the current in electrical circuits.

UNIT II: Eigen values - Eigen vectors and Quadratic forms:

Eigen values - Eigen vectors– Properties – Cayley-Hamilton theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- Diagonalization- Quadratic forms-Reduction of quadratic form to canonical form – Rank - Positive, negative and semi definite - Index – Signature.

UNIT III: Multiple integrals:

Double and triple integrals – Change of variables – Change of order of integration.
Applications: Finding Areas, surface areas and Volumes.

UNIT IV: Vector Differentiation:

Gradient-Directional derivative, Divergence- Solenoidal vector, Curl –Irrotational Vector, Vector identities.
Applications: Equation of continuity, potential surfaces.

UNIT V: Vector Integration:

Line integral – Work done – Potential function – Area- Surface and volume integrals
Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and related problems.
Applications: Work done, Force.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley-India
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press
4. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning.
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press.
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co. Pvt. Ltd, Delhi.

Web Resources:

1. http://tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. http://mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

B.Tech I Year II Semester **Course Structure**

L	T	P	C
3	1	0	4

APPLIED CHEMISTRY

(Common to ECE, CSE, IT)

Internal Marks: 40
External Marks: 60

Course Code: P18BST05

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.

Course Objectives

- In this course. Student will learn the concepts and applications of chemistry in engineering.
- It aims at strengthening the students with the fundamental concepts of chemistry. Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace industries.
- It enables the students to know analysis of Advanced materials and used in diverse fields.
- It makes the students to effectively use of electro chemistry, battery technology, and corrosion science in engineering applications
- It enables the students to Spectroscopic techniques and applications.

Course Outcomes: After completion of course student will be able to

- **CO1:** The advantages and limitations of plastic materials and their use in design would be understood.
- **CO2:** Analyze the different types of electrodes and batteries for technological applications.
- **CO3:** To understand the 3D structure of the organic molecules.
- **CO4:** Analyze the structure of the chemical compounds.
- **CO5:** The students would aware of materials like nanomaterials, liquid crystals, green chemistry.

UNIT I: HIGH POLYMERS AND PLASTICS (12 Lectures)

Polymerization: Introduction, classification, types of polymerization, Stereo regular polymers, Methods of polymerization (emulsion and suspension), Physical and mechanical properties.

Plastics as engineering materials: Advantages and limitations, Thermoplastics and Thermosetting plastics, Compounding and fabrication (4/5 techniques), Preparation, properties and applications of poly ethene, PVC, Bakelite and Teflon

Elastomers: Natural rubber, compounding and vulcanization, Synthetic rubbers : Buna S, Buna N, Thiokol- preparation ,properties and applications, applications of elastomers. Composite materials & Fiber reinforced plastics, Conducting polymers.

UNIT II: ELECTROCHEMISTRY AND CORROSION (11 Lectures)

Introduction, Single electrode potential**,** EMF, Galvanic cell, Nernst equation and applications. Reference Electrodes-SHE, calomel electrode. Electro chemical series and uses of this series, Concentration cells

Batteries: Introduction, Types: Dry Cell, Ni-Cd Cells, Pb-acid storage cells, Li ion cells.

Corrosion: Causes Theories of Corrosion (chemical and Electro chemical), types-galvanic, differential aeration, stress corrosion, corrosion control methods– material selection and designing aspects, Cathode protection – sacrificial anodic protection and impressed current cathode. Galvanizing, Tinning, Electroplating of Copper and electro less plating of nickel.

UNIT III: STEREOCHEMISTRY (12 Lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

UNIT-IV: SPECTROSCOPIC TECHNIQUES AND ORGANIC SYNTHESIS OF DRUG MOLECULE (10 Lectures)

Principles of spectroscopy and selection rules. Electronic spectroscopy. Vibrational and rotational spectroscopy. Basic concepts of Nuclear magnetic resonance spectroscopy, chemical shift. Introduction to Magnetic resonance imaging.

Synthesis of commonly used drug molecules- Ibuprofen, Aspirin, Paracetamol.

UNIT -V: CHEMISTRY OF ADVANCED MATERIALS (10 Lectures)

Nano materials:- Introduction – Sol-gel method & chemical reduction method of

preparation – Characterization by BET method and TEM methods - Carbon nanotubes and fullerenes: Types, preparation, properties and applications.

Liquid crystals: - Introduction, Types, Applications.

Super conductors: Introduction, Type-I & Type-II super conductors, properties and applications.

Green Chemistry: - Principles, 3or 4 methods of synthesis with examples and applications.

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai Publication & Co.
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press.
3. Physical chemistry by K.Bahl and Tuli
4. Elementary organic spectroscopy by Y.R. Sharma, S.Chand publications
5. Spectroscopic techniques by H.Kaur. Pragati Prakashan publications

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others.
2. Engineering Chemistry by Prasanth Rath, Cengage Learning.
3. A text book of engineering Chemistry by S. S. Dara; S. Chand & Co Ltd., Latest Edition
4. Applied Chemistry by H.D. Gesser, Springer Publishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others.

WEB REFERENCES:

1. **http://jntuk-coeerd.in/**
2. **http://en.wikipedia.org/wiki/title**
3. **http://nptel.ac.in/coures/105106/.com**
4. **https://en.wikipedia.org/wiki/Electrochemistry**
5. **https://www.youtube.com/watch?v=WLyaZbT97EI&list=PLzW3l18TEXrpqo3jRarGr9ao-61tB2184**
6. **http://encyclopedia.che.engin.umich.edu/Pages/Polymers/PolymerProduction/PolymerProduction.html**
7. **http://encyclopedia.che.engin.umich.edu/Pages/ProcessParameters/Spectrometers/Spectrometers.html**

B.Tech. I Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common to all Branches)

Internal Marks: 40

Course Code: P18EST01 **External Marks: 60**

Course Prerequisite: Physics.

COURSE OBJECTIVE:

1. To study the concepts of passive elements, and understand the applications of network theorems for analysis of electrical networks.
2. To study the concept of magnetic coupled circuit.
3. To understand the Principle and operation of Various Electrical Machines.
4. To study the operation of PN junction diode, half wave, full wave rectifiers and OP-AMPs.
5. To learn the operation of PNP, NPN transistors and various amplifiers.

COURSE OUTCOMES:

After completion of this course, the student is able to:

1. Able to solve various electrical networks in presence of active and passive elements and by using principles of network theorems.
2. Able to solve magnetic circuit with various dot conventions.
3. Able to understand the principle of operation and construction details of DC machines, Transformers, Alternators,3-phase Induction motor.
4. Able to analyze the operation of half wave, full wave bridge rectifiers and OP-AMPs.
5. Able to analyze operation of PNP, NPN transistors and CE amplifiers

UNIT – I **(12 Lectures)**

ELECTRICAL CIRCUITS

Basic definitions – Types of network elements- Types of sources - Ohm's Law - Kirchhoff's Laws –Inductive networks - Capacitive networks – Series - Parallel circuits- Star-delta and delta-star transformations - Source transformation - nodal analysis and mesh analysis - Super position theorem.

UNIT – II **(12 Lectures)**

AC CIRCUIT ANALYSIS

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R,L, C, RL, RC, RLC combinations. Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT –III **(12 Lectures)**

MAGNETIC CIRCUITS AND TRANSFORMERS

Basic definition of Magnetic quantities - Faraday's laws of electromagnetic induction- Analogy between electrical and magnetic circuits. Concept of self and mutual inductance. Principle of operation and construction of single phase transformers–EMF equation – Applications.

UNIT- IV **(10 Lectures)**

ROTATING MACHINES

Construction and Principle of operation of DC Machines EMF equation – Torque equation –Speed control of DC Shunt Motor- power losses and efficiency - Principle of operation and construction of 3-phase Induction motor - Principle of operation and construction of alternators.

UNIT – V **(10 Lectures)**

INTRODUCTION TO SEMICONDUCTOR DEVICES

PN junction diode - Diode applications -Half wave -Full wave rectifiers – Characteristics of Operational Amplifiers - Types of Transistors - PNP and NPN junction transistors, transistor as an amplifier- Frequency response of CE Amplifier.

TEXTBOOKS:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company,6 th Edition
2. Electrical Technology by Surinder Pal Bali, Pearson Publications.
3. Electronic Devices and Circuits, R.L. Boylestad and Louis Nashelsky, 9th Edition, PEI/PHI 2006.
4. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill

REFERENCES:

1. Electrical Circuit Theory and Technology by John Bird, Routledge Taylor &Francis Group
2. Electrical Machines by D. P.Kothari, I .J .Nagarth, Mc Graw Hill Publications, 4th Edition
3. Electrical Machines by R.K.Rajput, Lakshmi publications, 5th Edition.
4. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah, TMH Publications
5. Electronic Devices and Circuits by David A. Bell, Oxford University Press
6. Electronic Devices and Circuits – Salivahanan, Kumar, Vallavaraj, TATA MC Graw Hill, Second Edition

WEB REFERENCES:

1. https://embeddedengineers.files.wordpress.com/2015/09/electronic-devices-and-circuits-by-salivahanan.pdf
2. https://electricalanswers.files.wordpress.com/2014/09/a-textbook-of-electrical-technology-volume-i-basic-electrical-engineering-b-l-theraja.pdf

B.Tech I Year - II Semester **CURRICULUM**

L	T	P	C
3	0	0	3

PYTHON PROGRAMMING

(Common to ALL Branches)

Course Code: P18EST05 **Internal Marks: 40**
External Marks: 60

Course Objectives:

1. To read and write simple Python programs.
2. To develop Python programs with conditionals and loops.
3. To define Python functions and apply OOP concept.
4. To use Python data structures –- lists, tuples, dictionaries.
5. To develop GUI applications in Python.

Course Outcomes:

At the end of this course, the students will be able to

1. Understand the basics of python programming.
2. Understand control flow and implement various data structures provided by python.
3. Implement packages, methods and functions.
4. Develop real-world applications using oops and exception handling.
5. Build GUI Applications in Python.

UNIT-I **(9 Lectures)**

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT-II **(10 Lectures)**

Types, Operators and Expressions: Types - Integers, Strings, Booleans, Expressions and order of evaluations, Control Flow- if, if-elif-else, for, while, break, continue, pass.

Data Structures Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences, Comprehensions.

UNIT III **(11 Lectures)**

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

Modules: Creating modules, import statement, from. Import statement, name spacing,

Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages

UNIT IV **(9 Lectures)**

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

Error and Exceptions: Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions.

UNIT V **(9 Lectures)**

Brief Tour of the Standard Library & Files - Operating System Interface - String Pattern Matching, Mathematics, Internet Access, Dates and Times, Data Compression, Multithreading, GUI Programming, Turtle Graphics, file operations.

Text Books

1. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist’’, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016 (http://greenteapress.com/wp/thinkpython/).
2. Guido van Rossum and Fred L. Drake Jr, “An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books

1. John V Guttag, “Introduction to Computation and Programming Using Python’’, Revised and expanded Edition, MIT Press , 2013
2. Kenneth A. Lambert, “Fundamentals of Python: First Programs”, CENGAGE Learning, 2012.
3. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
4. Charles Dierbach, “Introduction to Computer Science using Python: A Computational Problem Solving Focus, Wiley India Edition, 2013.

B.Tech I Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

APPLIED CHEMISTRY LAB

Internal Marks: 40

Course Code: P18BSL03 **External Marks: 60**

Course Prerequisite: Basic Chemistry at Intermediate or equivalent level.

Course Objectives:

The purpose of this course to provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

Course Outcomes: After completion of this course, the students should be able to

- Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.
- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.

LIST OF EXPERIMENTS:

Introduction to chemistry laboratory – Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

VOLUMETRIC ANALYSIS:

1. Estimation of Na_2CO_3 using standard HCl solution
2. Estimation of Mohr's salt using potassium dichromate ($K_2Cr_2O_7$) solution
3. Estimation of $CuSO_4$ using sodium thio sulphate ($Na_2S_2O_3$) solution.

WATER ANALYSIS:

4. Determination of hardness of water sample by EDTA method
5. Determination of alkalinity of water sample
6. Determination of free chlorine in bleaching powder

INSTRUMENTAL TITRATIONS:

7. Conduct metric Titrations between strong acid and strong base.
8. Conduct metric Titrations between strong acid and weak base.

9. Potentio metric Titration between Ferrous iron and potassium dichromate ($K_2Cr_2O_7$) solution

FOOD ANALYSIS & SEPARATION OF COMPOUNDS:

10. Estimation of Vitamin-c
11. Thin layer chromatography

PREPARATION OF POLYMERIC RESIN:

12. Preparation of phenol formaldehyde resin
13. Preparation of urea formaldehyde resin

Lab Manual: Engineering/Applied Chemistry Lab Manual, Dept. of Chemistry, Pace Institute of Technology and Science, Vallur, Prakasam Dist., Andhra Pradesh, India.

REFERENCE BOOKS:

1. Dr. Jyotsna Cherukuris (2012) Laboratory Manual of engineering chemistry-II,
2. VGS Techno Series 3. Chemistry Practical Manual, Lorven Publications

B.Tech. I Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

BASIC ELECTRICAL & ELECTRONICS ENGINEERING LAB

(Common to all Branches)

Internal Marks: 40

Course Code: P18ESL01 **External Marks: 60**

Course Prerequisite: None

COURSE OBJECTIVE:

1. To verify and demonstrate on safety precautions and Kirchhoff laws.
2. To demonstrate various protective devices and construction of transformer and rotating machines.
3. To verify superposition theorem and control of dc shunt motor using speed control methods.
4. To analyze the characteristics of PN junction diode & transistor
5. To analyze the characteristics of CE amplifier and Half & Full wave rectifiers.
6. To analyze the characteristics of OP –Amp and CE amplifier

COURSE OUTCOMES:

After completion of this course, the student is able to:

1. Get an exposure on safety precautions and verify Kirchhoff laws.
2. Get an exposure on construction of transformer and various protective devices.
3. Verify superposition theorem and control the speed of DC shunt motor using speed control methods.
4. Analyze the characteristics of CE amplifier and Half & Full wave rectifiers.
5. Analyze the characteristics of OP –Amp and CE amplifier

Any Ten from the following experiments are required to be conducted as compulsory experiments:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Kirchhoff laws.
3. Demonstration of construction of Transformer and Rotating machines.
4. Demonstration on various protective devices.
5. Verification of superposition theorem
6. Speed control of D.C. Shunt motor by
    a) Armature Voltage control b) Field flux control method
7. PN junction diode characteristics
    a. Forward bias
    b. Reverse bias (Cut in voltage and resistance calculations)
8. Transistor CE characteristics (Input and output)
9. CE Amplifier Characteristics
10. Half Wave rectifier and Full Wave Rectifier without filters
11. Frequency Response of CE Amplifier.
12. Op-Amp Characteristics

I Year - II Semester **Course structure**

L	T	P	C
0	0	3	3

PYTHON PROGRAMMING LAB
(Common to ALL Branches)

Course Code: P18ESL04 **Internal Marks: 40**

External Marks: 60

Course Outcomes:

1. Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python.
2. Express different Decision Making statements and Functions.
3. Interpret Object oriented programming in Python.
4. Understand File handling operations.
5. Design GUI Applications.

Exercise1 - Basics

a) Running instructions in Interactive interpreter and a Python Script

b) Write a program to purpose fully raise Indentation Error and Correct it

Exercise 2 - Operations

a) Write a program to compute distance between two points taking input from the user (Pythagorean Theorem).

b) Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Exercise 3 – Control Flow

a) Write a Program for checking whether the given number is a even number or not.

b) Using a for loop, write a program that prints out the decimal equivalents of 1/2,1/3,1/4,...,1/10.

c) Write a program using a for loop that loops over a sequence. What is sequence?

d) Write a program using a while loop that asks the user for a number, and prints a count down from that number to zero.

Exercise 4 – Control Flow-Continued

a) Find the sum of all the primes below two million. Each new term in the Fibonacci sequence is generated by adding the previous two terms. By starting with 1 and 2, the first 10 terms will be:

1, 2, 3, 5, 8, 13, 21, 34, 55, 89, ...

b) By considering the terms in the Fibonacci sequence whose values do not exceed four million, find the sum of the even-valued terms.

Exercise 5 - DS

a) Write a program to count the numbers of characters in the string and store them in a dictionary data structure.

b) Write a program to use split and join methods in the string and trace a birth day with a dictionary data structure.

Exercise 6- DS-Continued

a) Write a program combine_lists that combines these lists into a dictionary.

b) Write a program to count frequency of characters in a given file. Can you use characterfrequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise 7 - Files

a) Write a program to print each line of a file in reverse order.

b) Write a program to compute the number of characters, words and lines in a file.

Exercise 8 - Functions

a) Write a function dups to find all duplicates in the list.

Write a function unique to find all the unique elements of a list

Exercise 9 - Functions –Problem Solving

a) Write a function cumulative_product to compute cumulative product of a list of numbers.

b) Write a function reverse to reverse a list. Without using the reverse function.

c) Write function to compute gcd, lcm of two numbers. Each function shouldn't exceed one line.

Exercise 10 – Multi - D Lists

a) Write a program to perform addition of two square matrices.
b) Write a program to perform multiplication of two square matrices.

Exercise 11 - OOP

Class variables and instance variable and illustration of the self variable

i)Robot.

ii)ATM Machine.

Exercise - 12 GUI, Graphics

a) Write a GUI for an Expression Calculator using tk.
b) Write a program to implement the following figures using turtle

B. Tech II Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

SEMICONDUCTOR DEVICES AND CIRCUITS

Internal Marks: 40

Course Code: P18ECT01 **External Marks: 60**

Course Prerequisite: Engineering Physics, Engineering Chemistry

Course Objectives:

1. The basic concepts of semiconductor devicces will be reviewed.
2. Study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes.
3. The application of diodes as rectifiers with their operation and characteristics with and without filters are discussed.
4. The principal of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics are explained.
5. The need of transistor biasing and its significance is explained. The quiescent point or operating point is explained.

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

1. Understand the basic concepts of semiconductor physics.
2. Understand the formation of p-n junction and how it can be used as a p-n junction as diode in different modes of operation.
3. Know the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.
4. Understand the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations.
5. Know the need of transistor biasing, various biasing techniques for BJT and FET and stabilization concepts with necessary expressions.

UNIT I **(9 Lectures)**

Semi Conductor Physics: Basics of semiconductors, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors, Hall Effect, Carrier Life Time.

UNIT II **(9 Lectures)**

Junction Diode Characteristics : Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, LED, LCD, Photo Diode, Varactor diode, Tunnel Diode, Construction, operation and characteristics and application of all the diodes, Principles of SCR,UJT, comparison of various diodes in terms of doping levels.

UNIT III **(9 Lectures)**

Rectifiers and Filters: Basic Rectifier setup**,** half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, comparison of various filter circuits in terms of ripple factors. . Voltage regulators, zener diode regulator, IC regulator.

UNIT IV **(9 Lectures)**

Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, typical transistor junction voltage values.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT V **(9 Lectures)**

Transistor Biasing and Thermal Stabilization : Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability.FET Biasing-methods and stabilization. Transistor hybrid model, determination of h-parameters, generalized analysis of transistor amplifier model using h-parameters.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, 2nd Edition, 2007.
2. Integrated Electronics- Jacob Millman, C. Halkies, C.D.Parikh, Tata Mc-Graw Hill, 2nd Edition, 2009.

Reference Books:

1. Electronic Devices and Circuits-K. Satya Prasad, VGS Book Links, 2nd Edition, 2014.
2. Electronic Devices and Circuits – Bell, Oxford, 5th Edition, 2010.

Web References:

1. physics.info/semiconductors/
2. www.allaboutcircuits.com/technical-articles/characteristics-of-junction-diodes/
3. www.academia.edu/8160398/Transistor_Biasing_and_Stabilisation

B. Tech II Year I Semester **Course Structure**

L	T	P	C
3	0	0	4

DATA STRUCTURES

Internal Marks: 40

Course Code: P18CST02 **External Marks: 60**

Course Prerequisite: C-Programming

Course Objectives:

1. Comprehensive knowledge of data structures and ability to implement the same in software applications.
2. Exposure to algorithmic complexities, recursive algorithms, searching techniques.
3. Exposure to sorting technique, Applying stack techniques for logical operations.
4. Applying queue techniques for logical operations, Exposure to list representation models in various types of applications.
5. Implementation of tree in various forms, Advanced understanding of other variants of trees and their operations.
6. Orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs.

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

1. Choose appropriate data structure as applied to specified problem definition.
2. Implement appropriate sorting/searching technique for given problem
3. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
4. Implement Linear and Non-Linear data structures

UNIT-I **(9 Lectures)**

Data Structure, Recursion & **Searching:** Preliminaries of algorithm, Algorithm analysis and complexity. **Data Structure:** Definition, types of data structures.

Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Types of recursion (Linear, binary and Tail), recursive algorithms for factorial function, GCD Computation, Fibonacci sequence.

Searching: List Searches using Linear Search, Binary Search, Fibonacci Search

UNIT-II **(9 Lectures)**

Sorting Techniques: Basic Concepts, Sorting by: Insertion (Insertion Sort), Selection (heap sort), Exchange (Bubble sort, Quick Sort), distribution (Radix sort) and merging (Merge sort) Algorithms.

Stacks: Basic Stack operations, Representation of a stack using arrays, Stack Applications: Reversing list, Infix to postfix transformation.

UNIT-III **(9 Lectures)**

Queues: Introduction, Representation of a Queue using arrays, Queue Operations, Applications of queues- Round Robin Algorithm, Circular Queues, Priority Queues.

Linked List: Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, Reversing a single linked list, applications: single linked list to represent polynomial expressions, Circular linked list, Double linked list.

UNIT-IV **(9 Lectures)**

Trees: Basic tree concepts, Binary Trees: Properties, Representation of Binary Trees using arrays, operations on a Binary tree, Binary Tree Traversals (recursive).

Advanced Tree Concepts: Binary search tree, Basic concepts, BST operations: Searching, insertion, deletion, Balanced search trees-AVL Trees-Definition and Examples only, B-Trees Definition and Examples only.

UNIT-V **(9 Lectures)**

Graphs: Basic concepts, Graph Representations- Adjacency matrix, Adjacency lists, Graph algorithms: Graph Traversals (BFS & DFS), applications: Dijkstra's shortest path, Minimum Spanning Tree using Prim's & Kruskal's Algorithm.

Text Books:

1. Data Structures, 2/e, Richard F, Gilberg , Forouzan, Cengage, 2nd Edition, 2007
2. Data Structures and Algorithms, G.A.V.Pai, TMH, 1st Edition, 2008.
3. Data Structures and Algorithms Made Easy, Narasimha Karumanchi , 2nd Edition, 2011.

Reference Books:

1. Data Structure with C, Seymour Lipschutz, TMH, 1st Edition, 2017.
2. Classic Data Structures, Debasis ,Samanta, PHI, 2nd Edition, 2009 .
3. Fundamentals of Data Structure in C, Horowitz,Sahni, Anderson Freed, University Press, 2nd Edition, 2008.

Web References:

1. www.geeksforgeeks.org
2. www.hackr.io.
3. www.letsfindcourse.com

B. Tech II Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

SIGNALS AND SYSTEMS

Internal Marks: 40

Course Code: P18ECT02 **External Marks: 60**

Course Prerequisite: Basic knowledge of Integration, Differentiation, Complex Numbers

Course Objectives:

1. To understand the terminology of signals and systems.
2. To understand Fourier tools through the analogy between vectors and signals.
3. To study the concept of sampling and reconstruction of signals.
4. To analyze the linear systems in time and frequency domains.
5. To study z-transform as mathematical tool to analyze discrete-time signals and systems.

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

1. Characterize the signals and systems and principles of vector spaces, Concept of orthgonality.
2. Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
3. Apply sampling theorem to convert continuous-time signals to discrete-time signal and reconstruct back.
4. Understand the relationships among the various representations of LTI systems
5. Understand the Concepts of convolution, correlation, Energy and Power density spectrum and their relationships.
6. Apply z-transform to analyze discrete-time signals and systems.

UNIT I **(12 Lectures)**

Introduction: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex, Exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and

ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions.

UNIT II **(12 Lectures)**

Fourier Series and Fourier Transform: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform.

UNIT III **(8 Lectures)**

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

UNIT IV **(12 Lectures)**

Analysis of Linear Systems: Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time. Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function. Relation between convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering.

UNIT V **(16 Lectures)**

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

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

Text Books:

1. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edition, 1997
2. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2nd Edition, 2003.
3. Signals & Systems- Narayan Iyer and K Satya Prasad, Cenage Publications, 1st Edition, 2011

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition, 2011
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2nd Edition, 2015
3. Signals and Systems – K Raja Rajeswari, B Visweswara Rao, PHI, 2nd Edition, 2014
4. Signals and Systems – A. Anand Kumar, PHI, 1st Edition, 2011

Web References:

1. nptel.ac.in/courses/108101039/mathematics/node3.html
2. www.tutorialspoint.com/signals_and_systems/signals_sampling_theorem
3. www.dspguide.com/ch3/2.html

B. Tech II Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

SWITCHING THEORY AND LOGIC DESIGN

Internal Marks: 40

Course Code: P18ECT03 **External Marks: 60**

Course Prerequisite: Set theory (Mathematics), Basic logic operations like bit wise operations, Shift operations, flow charts, ASCII codes, etc. (Computer Programming)

Course Objectives:

1. To learn basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems
2. To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
3. To implement simple logical operations using combinational logic circuits
4. To design combinational logic circuits, sequential logic circuits
5. To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
6. To implement synchronous state machines using flip flops.

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

1. Manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
2. Manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
3. Design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
4. Design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

UNIT I (9 Lectures)

Number Systems: Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, Codes - Binary codes, Binary Coded Decimal code and its properties, Unit distance codes, Alpha Numeric codes, Error detecting and correcting codes.

Boolean algebra: Basic theorems and properties.

Switching Functions: Canonical and Standard forms, Algebraic simplification of digital logic gates, Properties of XOR gates , Universal gates, Multilevel NAND-NAND and NOR-NOR realizations.

UNIT II **(9 Lectures)**

Minimization and Design of Combinational Circuits: Introduction, The Minimization with theorem, The Karnaugh Map Method, up to Six variable Maps, Prime and Essential Implications, Don't care Map entries, Using the maps for Simplifying, Tabular method, Multi-Output Minimization,

Combinational Logic Circuits Design: (Arithmetic and logical functions) Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4-bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, look-a-head adder circuit, 4-bit digital comparator.

UNIT III **(9 Lectures)**

Combinational Logic Circuits Design:(Data transmission, Code converters and PLD's) : Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

Introduction Of PLD's: PROM, PAL, PLA-Basics structures, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA, merits & demerits of PROM, PAL, PLA comparison.

UNIT – IV **(9 Lectures)**

Sequential Machines Fundamentals: Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, the Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D- Latch Flip-Flop, the Clocked T Flip-Flop, the clocked J-K Flip-Flop, Design of a clocked Flip-flop, conversion from one Type of Flip-Flop to another, Timing and Triggering considerations.

UNIT V **(9 Lectures)**

Counters: Design Of Single Mode Counters; Ripple Counter, Ring Counter, Shift Register, universal shift register Shift Register Sequences, Ring and johnson Counter using Shift Register .

Sequential Circuits Design and Analysis: Introduction, State diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous

sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops.

Sequential Circuits: Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines.

Text Books:

1. Switching & Finite Automata theory – Zvi Kohavi and Neeraj K Jha, Cambridge, 3rd Edition, 2009.
2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.

Reference Books:

1. Switching Theory and Logic Design by A. Anand Kumar, PHI, 2nd Edition, 2014.
2. Introduction to Switching Theory and Logic Design – Fredriac J Hill, Gerald R Peterson, John Willey and Sons Inc, 3rd Edition, 1974.
3. Digital Fundamentals – A Systems approach – Thomas L Floyd, Pearson, 3rd Edition, 2013.
4. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004
5. Modern Digital Electronics by RP Jain, TMH, 4th Edition, 2009.

Web References:

1. www.oreilly.com/library/ view/fundamentals-of-digital
2. edwardbosworth.com/

B. Tech II Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

MATHEMATICS-III (Numerical Methods and Fourier Analysis)

(Common to All Branches)

Internal Marks: 40

Course Code: P18BST07 **External Marks: 60**

Course Prerequisite: Mathematics-I, Mathematics-II

Course Objectives:

1. The course is designed to equip the students with the necessary mathematical skills and techniques that are essential for an engineering course.
2. The Fourier series of a periodic function and its application to the solution of partial differential equations.
3. To calculate the Fourier transform or inverse transform of common functions including Delta, Unit-Step.
4. Learn to find Solution of One dimensional Wave, Heat equation

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

1. Calculate a root of algebraic and transcendental equations. Explain relation between the finite difference operators.
2. Solve ordinary differential equations numerically using Euler's and RK method.
3. Analyze the spectral characteristics of signals using Fourier analysis. Classify
4. systems based on their properties and determine the response
5. Find Fourier series and Fourier transforms for certain functions.
6. Identify/classify and solve the different types of partial differential equations.

UNIT I **(9 Lectures)**

Solution of Algebraic and Transcendental Equations and Interpolation:

Introduction- Bisection method – Method of false position – Newton- Raphson method.

Interpolation: Introduction- Forward differences- Backward differences. Newton's formula for interpolation- Lagrange's interpolation formula.

UNIT II **(9 Lectures)**

Numerical Integration and Solution of Ordinary Differential Equations: Trapezoidal rule- Simpson's 1/3rd and 3/8th rule. Solution of ordinary differential equations by Taylor's series- Euler's method –Modified Euler's method, Runge-Kutta method of fourth order.

UNIT III **(9 Lectures)**

Fourier Series: Introduction- Determination of Fourier coefficients – even and odd functions –change of interval– Half-range sine and cosine series.

UNIT IV **(9 Lectures)**

Fourier Transforms: Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier Transforms.

UNIT V **(9 Lectures)**

First order Partial Differential Equations: Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nWebar (standard types) equations. Method of separation of Variables- Solution of One Dimensional Wave, Heat equation.

Text Books:

1. B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 1965.
2. N.P.Bali, Engineering Mathematics, Lakshmi Publications, 3rd Edition, 2015

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley-India, 10th Edition, 2014.
2. Micheael Greenberg, Advanced Engineering Mathematics, Pearson edn, 2nd Edition, 2002
3. Dean G. Duffy, Advanced engineering mathematics with MATLAB, CRC Press, 4th Edition, 2003
4. Peter O'neil, Advanced Engineering Mathematics, Cengage Learning, 7th Edition, 2011
5. Srimanta Pal, Subodh C.Bhunia, Engineering Mathematics, Oxford University Press, 1st Edition, 2015
6. Dass H.K., Rajnish Verma. Er., Higher Engineering Mathematics, S. Chand Co.Pvt. Ltd, Delhi, 1st Edition, 2011

Web References:

1. tutorial.math.lamar.edu/Classes/DE/DE.aspx
2. mathworld.wolfram.com/topics
3. http://www.nptel.ac.in/course.php

B. Tech II Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

NETWORK THEORY

Internal Marks: 40

Course Code: P18EET16 **External Marks: 60**

Course Prerequisite: Basic Electrical & Electronics Engineering

Course Objectives:

1. To understand the applications of network topology to electrical circuits.
2. To study the concept of magnetic coupled circuits & resonance
3. To understand the applications of network theorems for analysis of electrical networks
4. To study the performance of a network based on input and output excitation/response.
5. To study the transient behavior of electrical networks with DC and AC excitations.

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

1. Understand Electrical networks with network topology concepts.
2. Solve magnetic circuit with various dot conventions & also solve different types of resonance
3. Solve Electrical networks by using principles of network theorems.
4. Estimate the different types of two port network parameters.
5. Find out transient response of electrical networks with DC and AC excitations.

UNIT I **(9 Lectures)**

Network Topology: Extension of Node and Mesh Analysis to AC networks - Principal of Duality with examples - Definitions of branch, node, tree, planar, non-planar graph - incidence matrix - basic tie set schedule - basic cut set schedule.

UNIT – II **(9 Lectures)**

Coupled Circuits: Self inductance - Mutual inductance - Coefficient of coupling - analysis of coupled circuits - Dot rule of coupled circuits - conductively coupled equivalent circuits- numerical problems.

Resonance: Introduction - Definition of Q - Series resonance - Bandwidth of series resonance - Parallel resonance - Condition for maximum impedance - current in anti

resonance - Bandwidth of parallel resonance - general case resistance present in both branches - anti resonance at all frequencies.

UNIT–III **(9 Lectures)**

Network Theorems: Thevenin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Maximum Power Transfer and Tellegen's theorems – numerical problems.

UNIT- IV **(9 Lectures)**

Two Port Network: Relationship of two port networks - Z-parameters - Y-parameters - Transmission line parameters - h-parameters - Inverse h-parameters, Inverse Transmission line parameters - Relationship between parameter sets - Parallel connection of two port networks - Cascading of two port networks - series connection of two port networks – numerical problem.

UNIT – V **(9 Lectures)**

Transients: First order differential equations - Definition of time constants - R-L circuit - R-C circuit with DC excitation - Evaluating initial conditions procedure - second order differential equations - homogeneous and non-homogenous – numerical problems with DC excitation and AC excitation - Solutions using Laplace transform method.

Text Books:

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, McGraw Hill Company, 6th edition, 2007
2. Network Analysis – ME Van Valkenburg, PHI, 3rd Edition, 2000.

Reference Books:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, Mc Graw Hill Education (India), 5th Edition, 2013.
2. Linear Circuit Analysis by De Carlo, Lin, Oxford publications, 2nd Edition, 2008.
3. Electric Circuits– (Schaum's outlines) by Mahmood Nahvi & Joseph Edminister, Adapted by Kuma Rao, McGraw Hill, 5th Edition, 2012.
4. Electric Circuits by David A. Bell, Oxford publications, 7th Edition, 2009.
5. Introductory Circuit Analysis by Robert L Boylestad, Pearson Publications, 12th Edition, 2013.

6. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, DhanpatRai & Co, Paperback , 7th Edition, Paperback2009.

Web References:

1. www.allaboutcircuits.com/textbook/
2. www.electronics-tutorials.ws/

B. Tech II Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

SEMICONDUCTOR DEVICES AND CIRCUITS LAB

Internal Marks: 40

Course Code: P18ECL01 **External Marks: 60**

Course Prerequisite: Engineering Physics, Engineering Chemistry

Course Objectives:

1. To create interest in Hardware Technology
2. To identify active and passive components
3. To study multimeter, Function Generator, Regulated Power Supply and CRO
4. To analyze the V-I characteristics of diodes and transistor
5. To understand the fabrication of electronic circuits on PCB

Course Outcomes: At the end of this course the student will able to do:

Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

List of Experiments: (Minimum of Ten Experiments has to be performed)

1. P-N Junction Diode Characteristics
   Part A: Germanium Diode (Forward bias& Reverse bias)
   Part B: Silicon Diode (Forward Bias only)
2. Zener Diode V-I Characteristics
3. Zener Diode as Voltage Regulator
4. Rectifiers (without filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
5. Rectifiers (with filter)
   Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier

6. BJT Characteristics (CE Configuration)
   Part A: Input Characteristics
   Part B: Output Characteristics
7. BJT Characteristics (CB Configuration)
   Part A: Input Characteristics
   Part B: Output Characteristics
8. FET Characteristics (CS Configuration)
   Part A: Drain Characteristics
   Part B: Transfer Characteristics
9. SCR Characteristics
10. UJT Characteristics
11. Transistor Biasing (self biasing)
12. CRO Operation and its Measurements

Equipment Required:

1. Regulated Power supplies
2. Analog /Digital Storage Oscilloscopes
3. Analog /Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

B. Tech II Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

DATA STRUCTURES LAB

Internal Marks: 40

Course Code: P18CSL02 **External Marks: 60**

Course Prerequisite: C- Programming

Course Objectives:

1. To choose the appropriate data structure and algorithm design method for a specified application.
2. To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps binary search trees, and graphs and writing programs for these solutions.

Course Outcomes: At the end of this course the student will able to do:

1. Analyze worst-case running times of algorithms using asymptotic analysis and implement various data structures like linked lists.
2. Understand and implement stacks and queues using arrays and linked lists.
3. Analyze and implement various searching and sorting algorithms.
4. Design and implement appropriate hash function and collision-resolution algorithms

Exercise 1:

Write recursive program for the following

a) Write recursive C program for calculation of Factorial of an integer

b) Write recursive C program for calculation of GCD (n, m)

c) Write recursive program which computes the n^{th} Fibonacci number

Exercise 2:

a) Write recursive C program for functions to perform Linear search for a Key value in a given list.

b) Write recursive C program for functions to perform Binary search for a Key value in a given list.

c) Write recursive C program for functions to perform Fibonacci search for a Key value in a given list.

Exercise 3:

a) Write C program that implement Bubble sort, to sort a given list of integers in ascending order.

b) Write C program that implement Quick sort, to sort a given list of integers in ascending order

c) Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise 4:

a) Write C program that implement heap sort, to sort a given list of integers in ascending order

b) Write C program that implement radix sort, to sort a given list of integers in ascending order

c) Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise 5:

a) Write C program that implement stack (its operations) using arrays

b) Write C program that implement stack (its operations) using Linked list

Exercise 6:

a) Write a C program that uses Stack operations to Convert infix expression into postfix expression

b) Write C program that implement Queue (its operations) using arrays.

c) Write C program that implement Queue (its operations) using linked lists

Exercise 7:

a) Write a C program that uses functions to create a singly linked list

b) Write a C program that uses functions to perform insertion operation on a singly linked list

c) Write a C program that uses functions to perform deletion operation on a singly linked list.

Exercise 8:

a) Write a C program to Create a Binary Tree of integers

b) Write a recursive C program for Traversing a binary tree in preorder, inorder and postorder.

Exercise 9:

Write a C program for BST operations (insertion, deletion)

Exercise 10:

a) Write a C program for finding minimum spanning tree in a graph by using Prim's algorithm.

b) Write a C program for finding minimum spanning tree in a graph by using Kruskal's algorithm.

B. Tech II Year I Semester **Course Structure**

L	T	P	C
2	0	0	0

ENVIRONMENTAL SCIENCE

(Common to all Branches)

Internal Marks: 100

Course Code: P18MCT02

Course Prerequisite: Basic knowledge about sciences up to intermediate or equivalent level.

Course Objectives:

1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities
4. An understanding of the environmental impact of developmental activities
5. Awareness on the social issues, environmental legislation and global treaties

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

1. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web
2. The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources
3. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices
4. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity
5. Social issues both rural and urban environment and the possible means to combat the challenges and environmental assessment stages involved in EIA and the environmental audit.

UNIT I **(9 Lectures)**

Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance– Need for Public Awareness. Renewable energy Resources, Solar energy-solar cells, solar batteries, wind energy, wind mills, ocean energy, tidal energy and

nonrenewable energy resources: LPG, water gas, producer gas. World food problems, degradation and Soil erosion - overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity.

UNIT II **(8 Lectures)**

Ecosystems: Concept of an ecosystem. – Structure, Components and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Ecological pyramids - Food chains, food webs and Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem. b. Grassland ecosystem c. Desert ecosystem d. Aquatic – River and Lake Ecosystems.

UNIT III **(8 Lectures)**

Biodiversity and Its Conservation: Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India –Value of biodiversity: consumptive use, Productive use, social, ethical and aesthetic values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT IV **(9 Lectures)**

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

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

Disaster Management: floods, earthquake, cyclone and landslides.

UNIT V **(8 Lectures)**

Social Issues and The Environment: From unsustainable to sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management –Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies Population growth – Impacts on society, variation among nations. Environmental Impact Assessment (EIA) and Environmental Protection Acts.

Text Books:

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press, 1st Edition, 2005.
2. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi, 3rd Edition, 2017.

Reference Books:

1. Environmental Science & Engineering by Dr. A. Ravikrishnan, Hitech Publishing Company Pvt. Ltd. 1st Edition, 2013.
2. Perspectives in Environmental Studies, Anubha Koushik and C.P. Koushik, New Age International (P) Limited, Publishers, 2nd Edition, 2004.

Web References:

1. Environmental Science - Oxford Research Encyclopedia
2. Environmental Science - Museum of Science and Industry
3. www.collegesat.du.ac.in/

B. Tech II Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

ELECTRONIC CIRCUIT ANALYSIS

Internal Marks: 40

Course Code: P18ECT04 **External Marks: 60**

Course Prerequisite: Semiconductor Devices and Circuits

Course Objectives:

1. Familiarize the student with the analysis and design of different amplifier circuits (single and multi stage) using BJTs.
2. Understand the concepts of MOS Characteristics and analyze MOS amplifier.
3. Understand the concepts of feed back in amplifiers and emphasis on feedback amplifiers (ckts of different implementing different topologies) and oscillators.
4. Familiarize with different power amplifier circuits using BJT and designing the power amplifier.
5. Learn about various tuned amplifiers and their frequency responses.

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

1. Analyze various transistor amplifier circuits and their freq. responses at low, mid and high frequencies.
2. Designing amplifier circuits using BJTs.
3. Analyze the concepts of both positive and negative feedback in electronic circuits.
4. Design, construct & analyze oscillator circuits to generate signals in various frequency ranges.
5. Design different types of power amplifiers for practical applications of desired specifications.
6. Understand the concepts MOS characteristics and amplifier
7. Analyze different tuned amplifiers circuits.
8. Acquire experience in building and troubleshooting simple electronic analog circuits.

UNIT I **(8 Lectures)**

Single Stage Amplifiers: Classification of Amplifiers – Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model, Analysis of CE amplifier with emitter resistance and emitter follower, Miller's theorem and its dual, Design of single stage RC coupled Amplifier using BJT.

Multistage Amplifiers: Analysis of Cascaded RC coupled BJT amplifiers, Cascode Amplifier, Darlington Pair, Different Coupling Schemes used in Amplifiers – RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier.

UNIT II **(12 Lectures)**

BJT Amplifiers-Frequency Response: Logarithms, Decibels, General frequency considerations, Frequency response of BJT Amplifier, Analysis at low and high frequencies, Effect of coupling and bypass capacitors. The Hybrid pi model – Common Emitter Transistor Model, CE Short Circuit current gain, current gain with resistive load, Single stage CE transistor Amplifier Response, Gain –Bandwidth Product, Emitter follower at high frequencies.

MOS Amplifiers: Basic Concepts, MOS Small signal model, Common source amplifier with resistive load.

UNIT III **(9 Lectures)**

Feedback Amplifiers: Concepts of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations, Illustrative examples.

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge and crystal Oscillators, Stability of Oscillators

UNIT IV **(8 Lectures)**

Large Signal Amplifiers: Classification of amplifiers, Class A Large signal amplifiers, Transformer Coupled Class A Audio Power amplifier, Efficiency of class A amplifier, Class B amplifier, Efficiency of class B Amplifier, class B Push pull Amplifier, Complementary Symmetry Class B Push Pull Amplifier, Distortion of Power Amplifiers, Thermal Stability and Heat sinks

UNIT V **(8 Lectures)**

TUNED AMPLIFIERS: Introduction, Q Factor, Small signal Tuned Amplifiers, Effect of Cascading Single tuned Amplifiers on bandwidth, Effect of Cascading Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of tuned amplifiers.

Text Books:

1. Integrated Electronics – by J. Millman and C.C. Halkias, -1991 ed 2008 TMH.
2. Electronic Devices and Circuits – by B.P. Singh, Rekha Singh, Pearson, 2nd Edition, 2013.
3. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH, 1st Edition, 2008.

Reference Books:

1. Electronic Devices and Circuits Theory-Robert L. Boylestad and Louis Nashelsky, PHI, 9th Edition , 2008
2. Micro Electronic Circuits – by Sedra A.S. and K.C. Smith, Oxford University Press, 5th Edition, 2013
3. Electronic Devices and Circuits – by K. Lal Kishore, BSP, 3rd Edition, 2008 .
4. Electronic Devices and Circuits – by S.Salivahanan, N.Suresh Kumar,A.Vallavaraj, TMH , 2nd Edition 2009.
5. Electronic Circuit Analysis – A.P.Godse- Technical Publications,1st Edition, 2009
6. Electronic Devices and Circuits – by G K Mittal, Kanna Publications, 23rd Edition, 1988.
7. Electronic Circuit Analysis-– by K. Lal Kishore, BS Publications/BSP Books; 4th Edition, 2016

Web References:

1. electronicspost.com/single-stage-transistor-amplifier/
2. www.niu.edu/remotelab/samplegui/tunedamp.shtml

B. Tech II Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

ELECTROMAGNETIC WAVES AND TRANSMISSION LINES

Internal Marks: 40

Course Code: P18ECT05 **External Marks: 60**

Course Prerequisite: Three Dimensional Coordinate Systems, Vector Calculus

Course Objectives:

1. To recognize and classify the basic Electrostatic theorems and laws.
2. To classify the basic Magneto static theorems and laws.
3. To establish the proof and estimate the polarization features, reflection and transmission coefficients for UPW propagation
4. To explain the characteristics of transmission lines and its losses
5. To analyze the transmission lines and their parameters using the Smith Chart and learn about striplines.

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

1. Display an understanding of fundamental electromagnetic laws and concepts
2. Write Maxwell's equations in integral, differential and phasor forms and explain their physical meaning.
3. Analyze the Wave Equations for good conductors and good dielectrics
4. Derive the expressions for input impedance of transmission lines.
5. Analyze impedance matching by stubs using smith charts also analyze the planar striplines.

UNIT I (9 Lectures)

Electrostatics: Review of Co-ordinate Systems, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

UNIT II **(9 Lectures)**

Magneto Statics : Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magneto static Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems**.**

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface: Dielectric-Dielectric and Dielectric-Conductor Interfaces. Illustrative Problems

UNIT III **(9 Lectures)**

EM Wave Characteristics: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics–Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

UNIT IV **(9 Lectures)**

Transmission Lines - I : Types, Parameters, T&π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Loading - Types of Loading. Illustrative Problems.

UNIT V **(9 Lectures)**

Transmission Lines – II : Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations λ/4, λ /2, λ/8 Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Stub Matching-single & double, Illustrative Problems.

Planar Transmission Lines: Electromagnetic fields in striplines, microstriplines, and co-planar waveguides.

Text Books:

1. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, ,Oxford University Press, Aisan 6th Edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, Tech. India Publications, New Delhi, 1st Edition, 2001

Reference Books:

1. Engineering Electromagnetics – Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2nd Edition, 2005.
2. Networks, Lines and Fields – John D. Ryder, PHI, 2nd Edition, 1999.
3. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, TMH, 7th Edition, 2006,
4. Electromagnetic Field Theory and Transmission Lines – G.S.N. Raju, Pearson Education, 3nd Edition, 2009.

Web References:

1. science.nasa.gov/ems/
2. physics.info/em-waves
3. nptel.ac.in/courses/117101056

B. Tech II Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

ANALOG COMMUNICATIONS

Internal Marks: 40

Course Code: P18ECT06 **External Marks: 60**

Course Prerequisite: Signals and Systems, Probability Theory

Course Objectives:

1. Familiarize with the fundamentals of analog communication systems.
2. Familiarize with various techniques for analog modulation and demodulation of signals distinguish the figure of merits of various analog modulation methods.
3. Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.
4. Familiarize with basic concepts of transmitters and receivers and its characteristics.
5. Knowledge gain on noise and its impact on the performance of communication systems.

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

1. Know the basic functions of communication systems and importance of modulation
2. Differentiate various Analog modulation and demodulation schemes and their spectral characteristics
3. Analyze the performance of FM systems
4. Analyze noise characteristics of various analog modulation methods
5. Analyze various functional blocks of radio transmitters and receivers.

UNIT I **(9 Lectures)**

Amplitude Modulation: Introduction to communication system, Need for modulation, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square

law detector, Envelope detector, Concept of Multiplexing, Frequency Division Multiplexing.

UNIT II **(9 Lectures)**

DSB & SSB Modulation: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. SSB- Time domain description, Frequency domain description, Frequency discrimination and Phase discrimination method for generating AM SSB Modulated waves, Demodulation of SSB Waves. VSB- Time domain description, Frequency domain description, Generation of VSB Modulated wave, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT III **(9 Lectures)**

Angle Modulation: Basic concepts, Frequency Modulation: Single tone frequency modulation, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave – Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Phase locked loop, Comparison of FM & AM.

Pulse Modulation: Time Division Multiplexing, Types of Pulse modulation, PAM, PWM: Basic concept, Generation & demodulation of PWM, PPM: Basic concept, Generation and demodulation of PPM, Comparisons TDM Vs FDM.

UNIT IV **(9 Lectures)**

Transmitters & Receivers:

Radio Transmitter – Classification of Transmitter, AM Transmitter, Classification of AM transmitters, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter.

Radio Receiver – Receiver Types – Characteristics of Receivers ,Tuned radio frequency receiver, Superhetrodyne receiver, Intermediate frequency, Image rejection ratio, AGC, FM Receiver, Comparison with AM Receiver, FET based Amplitude limiting.

UNIT V **(9 Lectures)**

Noise: Review of noise and noise sources, noise figure, Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation systems, and Threshold effect in FM, Pre-emphasis & de-emphasis.

Text Book:

1. Principles of Communication Systems – H Taub & D. Schilling, Gautam Sahe, TMH, 3rd Edition, 2007
2. Communication Systems – B.P. Lathi, BS Publication,1st Edition, 2018.
3. Analog Communication Systems by Sanjay Sharma - S K Kataria and Sons, 1st Edition, 2010.

Reference Books:

1. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Edition, 2007
2. Communication Systems– R.P. Singh, SP Sapre, TMH, 2nd Edition, 2007.
3. Fundamentals of Communication Systems - John G. Proakis, Masond, Salehi PEA, 1st Edition, 2006.

Web References:

1. analogcommunication4u.blogspot.com/p/lesson-plan.html
2. nptel.ac.in/courses
3. www.electronics-notes.com

B. Tech II Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

PULSE AND DIGITAL CIRCUITS

Internal Marks: 40

Course Code: P18ECT07 **External Marks: 60**

Course Prerequisite: Electronic Devices and Circuits, Network Analysis.

Course Objectives:

1. To understand the concept of Linear and non-linear wave shaping circuits.
2. To analyze different types of Multi vibrators and their design procedures.
3. To Introduce to Time-base Generators in sweep signal generation.
4. To Understand Sampling Gates and to Design NAND and NOR gates using various logic families.

Course Outcomes: After completion of the course the student will be able to

1. Design linear and non-linear wave shaping circuits.
2. Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
3. Understand the applications of diode as clippers, clamper circuits.
4. Design different Multivibrators for various applications, Time base generators.
5. Realize logic gates using diodes and transistors and Difference between logic gates and sampling gates.

UNIT-I **(9 Lectures)**

Linear Wave Shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator, Attenuators and its applications in Crop robe, RL and RLC circuits and their response for step input.

UNIT-II **(9 Lectures)**

Non-Linear Wave Shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Comparators, applications of voltage comparators, Clamping operation, clamping circuits taking source and diode resistances taking into account, Clamping circuit theorem, effect of diode characteristics on clamping voltage.

UNIT-III **(9 Lectures)**

Multivibrators: Transistor as a switch, break down voltages, Transistor switching times, Triggering circuits, Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger circuit using BJT.

UNIT-IV **(9 Lectures)**

Time Base Generators: General features of a time base signal, Methods of generating time base waveform, Sweep generation by UJT, basic principles in Miller and Bootstrap time base generators, Transistor Miller time base generator, Transistor Bootstrap time base generator, Transistor current time base generators.

UNIT-V **(9 Lectures)**

Logic Families: Realization of digital logic gates with Diode Logic, Transistor Logic, Diode-Transistor Logic, Transistor-Transistor Logic, Emitter Coupled Logic, Comparison of Digital Logic Families.

Sampling Gates: Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Six-Diode Gates, Reduction of Pedestal in Sampling Gates, Applications of Sampling Gates.

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, 2nd Edition, 2007.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edition, 2002.

Reference Books:

1. Jacob Miman, Christos C. Halkias, "Integrated electronics" Tata McGraw Hill Publication, 2nd Edition, 2017.
2. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2nd Edition, 2005.
3. Ronald J. Tocci, Fundamentals of Pulse and Digital Circuits", PHI, 3rd Edition, 2008.

Web References:

1. www.npteliitm.ac.in
2. www.modernelectronics.org
3. www.electronicsforyou.com

B. Tech II Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

RANDOM VARIABLES AND STOCHASTIC PROCESSES

Internal Marks: 40

Course Code: P18ECT08 **External Marks: 60**

Course Prerequisite: Simple geometry theory, multiple integration and differentiation

Course Objectives:

1. To give students an introduction to elementary probability theory, in preparation for courses on statistical analysis, random variables and stochastic processes.
2. To mathematically model the random phenomena with the help of probability theory concepts.
3. To introduce the important concepts of random variables and stochastic processes.

Course Outcomes: After completion of the course the student will be able to

1. Apply the specialized knowledge in probability theory and random processes to solve practical engineering problems.
2. Gain some knowledge in various probability distribution and density functions and solve the major noise removal problems in communication systems.
3. Apply the theory of stochastic processes student will able to determine the temporal and spectral characteristics of random signals response of a given linear system.
4. Describe the concept of random processes and determine mean and correlation of random processes.
5. Understand the concept of random processes in frequency domain and determine the relation between correlation and power spectral density function.

UNIT I **(9 Lectures)**

Probability and Random Variables: Basics of Probability Theory, Basics of Set Theory, Introduction to Random Variable, Types of Random Variables, Distribution

and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.

UNIT II **(9 Lectures)**

Operations on One Random Variable: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Continuous Random Variable.

UNIT III **(9 Lectures)**

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

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

UNIT IV **(9 Lectures)**

Random Processes – Temporal Characteristics: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, N^{th}-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes.

UNIT V **(9 Lectures)**

Random Processes – Spectral Characteristics: The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

Text Books:

1. Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition, 2001.
2. Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S.Unnikrisha, PHI, 4th Edition, 2002.

Reference Books:

1. Probability Theory and Stochastic Processes – B. Prabhakara Rao, BS Publications, 1st Edition, 2012.
2. Probability and Random Processes with Applications to Signal Processing, Henry Stark and John W. Woods, Pearson Education, 3rd Edition, 2002.
3. An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook, 1st Edition, 1968.
4. Probability Theory and Random Processes, P. Ramesh Babu, McGrawHill, 1st Edition, 2014.

Web References:

1. www.ee.iitb.ac.in
2. nptel.ac.in
3. ocw.usu.edu
4. www.smartzworld.com

B. Tech II Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

ELECTRONIC CIRCUIT ANALYSIS LAB

Internal Marks: 40

Course Code: P18ECL02 **External Marks: 60**

Course Prerequisite: Semiconductor Devices and Circuits

Course Objectives:

1. Frequency response of single stage and multi stage amplifiers.
2. Working of Power amplifier.
3. How frequency response varies by applying negative feedback on amplifiers.
4. Different frequency sinusoidal signal generation.

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

1. Measure the f_T of the given transistor.
2. Simulate and evaluate single stage and two stage amplifiers
3. Realize the given performance using feedback amplifiers
4. Design and test Oscillator circuits using BJT and FET.
5. Implement and Simulate the performance of power amplifiers
6. Analyze and implement the tuned amplifiers

List of Experiments :(Minimum of Ten Experiments has to be performed)

1. Determination of f_T of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Class A Series-fed Power Amplifier
8. Transformer-coupled Class A Power Amplifier
9. Class B Push-Pull Power Amplifier
10. Complementary Symmetry Class B Push-Pull Power Amplifier
11. Single Tuned Voltage Amplifier
12. Double Tuned Voltage Amplifier

Equipment Required:

Hardware:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components

Software:

1. Multisim/ Equivalent Industrial Standard Licensed simulation software tool.
2. Computer Systems with required specifications

Note: The students are required to design the circuit and perform the simulation using Multisim/ Equivalent Industrial Standard Licensed simulation software tool. Further they are required to verify the result using necessary hardware equipment.

B. Tech II Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

ANALOG COMMUNICATIONS LAB

Internal Marks: 40

Course Code: P18ECL03 **External Marks: 60**

Course Prerequisite: Signals and Systems, Probability Theory

Course Objectives:

1. Analyze and specify the fundamental parameters of a communication system.
2. Evaluate the advantages and disadvantages of communications systems, from the point of view analog modulations.
3. To strengthen the ability to identify and apply the suitable modulation techniques for the given real world problem.
4. To gain knowledge in practical applications of communication systems.
5. To write and execute programs in MATLAB Simulink to implement various modulation techniques

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

1. Demonstrate understanding of various amplitude modulation and demodulation techniques.
2. Demonstrate understanding of frequency modulation and demodulation technique.
3. Explain the Sampling Theorem.
4. Understand and explain the AGC Characteristics.
5. Compare different modulations and to recognize the advantages and disadvantages of them.
6. Write programs using MATLAB Simulink

List of Experiments

(Ten experiments to be done- The students have to calculate the relevant Parameters)

(a. Hardware, b. MATLAB Simulink, c. MATLAB Communication tool box)

1. Amplitude Modulation - Modulation & Demodulation.
2. AM - DSB SC - Modulation & Demodulation.
3. Spectrum Analysis of Modulated signal using Spectrum Analyser
4. AM Diode Detector
5. Pre-emphasis & De-emphasis
6. Frequency Modulation - Modulation & Demodulation.
7. AGC Circuits
8. Sampling Theorem
9. Pulse Amplitude Modulation - Modulation & Demodulation.
10. PWM, PPM - Modulation & Demodulation.
11. PLL.
12. Radio receiver characteristics

Equipment Required:

Hardware:

1. RPS - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multimeters
6. Spectrum Analyzer

Software:

1. Computer Systems with latest specifications
2. Connected in LAN (Optional)
3. Operating system (Windows XP)
4. Simulations software (Simulink & MATLAB)

B. Tech II Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

PULSE AND DIGITAL CIRCUITS LAB

Internal Marks: 40

Course Code: P18ECL04 **External Marks: 60**

Course Prerequisite: Pulse and Digital Circuits, Network Analysis.

Course Objectives: To familiarize student with

1. Generation and processing of sinusoidal and non-sinusoidal signals.
2. Fundamentals of basic logic gates and its applications.
3. Analysis and design of various multivibrator circuits.
4. Design and analysis of UJT relaxation oscillator and boot-strap sweep circuits

Course Outcomes: After the completion of the lab, the student will be able to

1. Generate and process sinusoidal and non-sinusoidal signals.
2. Understand fundamentals of basic logic gates and design applications.
3. Design and analyze various multivibrator circuits.
4. Design and analyze UJT relaxation oscillator and boot-strap sweep circuits

Minimum Twelve experiments to be conducted:

1. Linear wave shaping (RC Integrator & RC differentiator).
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & Some applications.
6. Half adder & Full adder.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap sweep circuit.
14. Constant Current Sweep Generator using BJT.

Equipment Required:

1. RPS: (0 – 30) V
2. CRO: (0 – 20) MHz
3. Function Generators :(0 – 3) MHz
4. Components
5. Multi Meters

B. Tech II Year II Semester **Course Structure**

L	T	P	C
2	0	0	0

INTELLECTUAL PROPERTY RIGHTS AND PATENTS

Internal Marks: 100

Course Code: P18MCT07

Course Prerequisite: Nil

Course Objectives:

1. This course is aimed at familiarizing researchers with the nuances of Intellectual Property Rights (IPR) so as to help them integrate the IPR process in their research activities.
2. IPR internalization process to help the researchers to set targeted objectives in their research project and also to design and implement their research.
3. To give the Students "hands- on –training" in literature, including patent search and documentation of research activities that would aid an IPR expert to draft apply and prosecute IPR applications.
4. To make the students familiar with basics of IPR and their implications in Research, development and commercialization.
5. Facilitate the students to explore career options in IPR.

Course Outcomes: After completion of the course the student will be able to

1. have an understanding of the fundamental legal principles relating to confidential information, copyright, patents, designs, trademarks and unfair competition;
2. be able to identify, apply and assess principles of law relating to each of these areas of intellectual property;
3. understand the legal and practical steps needed to ensure that intellectual property rights remain valid and enforceable;
4. be able to demonstrate a capacity to identify, apply and assess ownership rights and marketing protection under intellectual property law as applicable to information, ideas, new products and product marketing;
5. understand current and emerging issues relating to the intellectual property protection, including those relating to indigenous knowledge or culture, information technology especially the distribution of material on the internet, biotechnology and international trade

Unit I **(7 Lectures)**

Introduction to Intellectual Property Law – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights.

Unit II **(7 Lectures)**

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration – Limitations – Infringement of Copyright – International Copyright Law Semiconductor Chip Protection Act.

Unit III **(7 Lectures)**

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

Unit IV **(7 Lectures)**

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

Unit V **(7 Lectures)**

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreement – Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

Text Books:

1. Intellectual Property Rights and the Law, Dr. G.B. Reddy, Gogia Law Agency, 12th Edition, 2017.
2. Law relating to Intellectual Property, Dr. B.L.Wadehra, Universal Law Publishing Co., 5th Edition, 2012.
3. Law of Intellectual Property, Dr.S.R. Myneni, Asian Law House, 7th Edition, 2014.

Reference Books:

1. Deborah E.Bouchoux: "Intellectual Property". Cengage learning , New Delhi, 4th Edition, 2012.
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press), 2nd Edition, 2015.
3. Prabhuddha Ganguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi, 1st Edition, 2015.
4. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi, 1st Edition, 2008.

Web References:

1. www.ipindia.nic.in
2. ipindia.nic.in/girindia
3. ipindia.nic.in/tmr_new/default.htm

B. Tech III Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

LINEAR AND DIGITAL IC APPLICATIONS

Internal Marks: 40

Course Code: P18ECT09 **External Marks:** 60

Course Prerequisite: Semiconductor Devices and Circuits, Switching Theory and Logic Design

Electronic Circuit Analysis, Pulse and Digital Circuits

Course Objectives:

1. Understand the basic features of Operational Amplifier and its applications.
2. Understand the design of Op-Amp based Active Filters, Waveform generators, functionality of

   555 Timer and 565 ICs and their applications.
3. Understand the design of various types of ADCs and DACs.
4. Introduction of digital logic families and interfacing concepts for digital design is considered and VHDL fundamentals were discussed to modeling the digital system design blocks.
5. VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.

Course Outcomes: On completion of this course, students shall be able to

1. Explain the concepts of Operational Amplifier and its features and apply the concepts of Op- Amps in the design of Summing Amplifier, Subtractors, Comparators, differentiators, Integrators and Voltage Regulators.
2. Analyze and design Op-Amp based circuits namely Active Filters, Waveform generators; Design and apply Astable and Mono-stable multi vibrator modes using 555 Timer IC; Conceptualize Phase Locked Loop using 565 IC and explain its applications.
3. Analyze and design DACs and ADCs using various methods of implementation.
4. Explain the structure of commercially available digital integrated circuit families and the IEEE Standard 1076 Hardware Description Language (VHDL).
5. Design complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis and rapid system prototyping.

UNIT I (9 Lectures)

Operational Amplifier: Introduction to Emitter Coupled Differential Amplifier using BJTs, Operational Amplifier Block Diagram, Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non- Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Design of Voltage Regulator using IC723.

UNIT II (9 Lectures)

Applications of OPAMP IC741, IC-555 & IC 565: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis and Design of 1st order and 2nd order LPF

& HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block

Schematic, Description of Individual Blocks, Applications.

UNIT III (7 Lectures)

Analog to Digital and Digital to Analog Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT IV (11 Lectures)

Introduction to logic families: CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Introduction to VHDL: Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms.VHDL Programming using structural and data flow modeling. **Behavioral Modeling:** Process statement, variable assignment statement, signal assignment statement, wait statement , if statement, case statement ,null statement, loop statement, exit statement, next statement,assertion statement, more on signal assignment statement, Inertial Delay Model, Transport Delay Model ,Creating Signal Waveforms, Signal Drivers , Other Sequential Statements , Multiple Processes. Logic Synthesis, inside a logic Synthesizer.

UNIT V **(9 Lectures)**

Combinational Logic Design: Binary Adder-Subtractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and demultiplexers, parity circuits, comparators. Design considerations of the above combinational logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

Sequential Logic Design: SSI Latches and flip flops, Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Design considerations of the above sequential logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.

Text Books:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003
2. Op-Amps & Linear Integrated Circuits – Ramakanth A. Gayakwad, PHI, 2003.
3. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
4. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

Reference Books:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria&Sons;2nd Edition,2010
2. Linear Integrated Circuits and Applications – Salivahana, TMH.
3. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, ZvonkoVranesic, McGrawHill, 3rd Edition.

Web References:

1. https://swayam.gov.in/nd1_noc20_ee55/preview
2. https://www.tutorialspoint.com/linear_integrated_circuits_applications/index.htm

B. Tech III Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

DIGITAL COMMUNICATIONS

Internal Marks: 40

Course Code: P18ECT10 **External Marks:** 60

Course Prerequisite: ANALOG COMMUNICATIONS.

Course Objectives:

1. To have basic knowledge of digital communication system
2. To have a detailed study of different pulse digital modulation techniques and their comparison
3. To be familiarize with various digital modulation techniques and calculation of their error probabilities
4. To learn the concept of information and different source coding techniques
5. To get familiarize with block codes, cyclic codes and convolutional codes

Course Outcomes:

1. Acquire basic knowledge about the fundamentals of digital communication system.
2. Explain the working of different digital modulation and demodulation techniques.
3. Analyze the performance of baseband and pass band digital communication system in terms of error rate and spectral efficiency.
4. Acquire knowledge about information theory and analyze various source coding techniques for data transmission and provide mathematical solution.
5. Apply linear block codes and convolution codes for data transmission and provide mathematical solution.

UNIT I **(9 Lectures)**

PULSE DIGITAL MODULATION: Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM).Delta modulation, its draw backs, adaptive delta modulation,comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II **(9 Lectures)**

DIGITAL MODULATION TECHNIQUES: Introduction, ASK, FSK, PSK, DPSK, DEPSK, QPSK, M-ary PSK, ASK, FSK, similarity of BFSK and BPSK.

UNIT III **(9 Lectures)**

DATA TRANSMISSION : Base band signal receiver, probability of error, the optimum filter, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK, calculation of error probability of ASK, BPSK,BFSK,QPSK.

UNIT IV **(9 Lectures)**

INFORMATION THEORY: Discrete messages, concept of amount of information and its properties. Average information, Entropy and its properties.Information rate, Mutual information and its properties.

SOURCE CODING: Introductions, Advantages, Shannon's theorem, Shanon-Fano coding, huffman coding, efficiency calculations, channel capacity of discrete and analog Channels, capacity of a Gaussian channel,bandwidth –S/N trade off.

UNIT V **(9 Lectures)**

LINEAR BLOCK CODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, BCH Codes.

CONVOLUTION CODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram decoding using Viterbi algorithm.

Text Books:

1. Digital communications - Simon Haykin, John Wiley, 2005
2. Principles of Communication Systems – H. Taub and D. Schilling, TMH, 2003.

Reference Books:

1. Digital and Analog Communication Systems - Sam Shanmugam, John Wiley, 2005.
2. Digital Communications – John Proakis, TMH, 1983. Communication Systems Analog & Digital – Singh &Sapre, TMH, 2004.
3. Modern Analog and Digital Communication – B.P.Lathi, Oxford reprint, 3rd edition, 2004.

Web References:

1. https://swayam.gov.in/nd1_noc20_ee17/preview
2. https://www.tutorialspoint.com/digital_communication/digital_communication_quadrature_phase_shift_keying.htm

B. Tech III Year I Semester **Course Structure**

L	T	P	C
3	1	0	3

ANTENNA AND WAVE PROPOGATION

Internal Marks: 40

Course Code: P18ECT11 **External Marks:** 60

Course Prerequisite: Electromagnetic Waves and Transmission Lines

Course Objectives:

1. Understand the radiation phenomena associated with various types of antennas along with emphasis on their applications
2. Understand array system of different antenna and field analysis under application of different currents to the individual antenna elements.
3. Introduce the working principles of various types of antennas
4. Employ the radiation mechanism to design different types of antennas
5. understand the concepts of radio wave propagation in the atmosphere

Course Outcomes:

1. Identify basic antenna parameters and Quantify the fields radiated by various types of antennas.
2. Design and analyze antenna arrays.
3. Design and analyze wire antennas, helical antennas and microstrip antennas.
4. Design and analyze Reflector antennas, lens antennas, and horn antennas .
5. Identify the characteristics of radio wave propagation.

UNIT I **(9 Lectures)**

ANTENNA FUNDAMENTALS & THIN LINEAR WIRE ANTENNAS: Introduction, Radiation Mechanism – single wire, 2 wire, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beamwidths, Polarization, Beam Area, Radiation Intensity, Beam Efficiency, Directivity,Gain and Resolution, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.

Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height. Antenna Theorems – Applicability and Proofs for equivalence of directional characteristics, Loop Antennas: Small Loops - Field Components, Comparison of far fields of small loop and short dipole, Concept of short magnetic dipole, D and Rr relations for small loops.

UNIT II **(9 Lectures)**

ANTENNA ARRAYS: 2 element arrays – different cases, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison; Concept of Scanning Arrays. Directivity Relations (no derivations), Related Problems. Binomial Arrays, Arrays with Parasitic Elements, Yagi-Uda Arrays, Folded Dipoles and their characteristics.

UNIT III **(9 Lectures)**

NON-RESONANT RADIATORS: Introduction, Traveling wave radiators – basic concepts, Long wire antennas – field strength calculations and patterns, Microstrip Antennas-Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas –Geometry and Parameters, Impact of different parameters on characteristics. Broadband Antennas: Helical Antennas – Significance, Geometry, basic properties; Design considerations for monofilar helical antennas in Axial Mode and Normal Modes (Qualitative Treatment).

UNIT IV **(9 Lectures)**

VHF, UHF AND MICROWAVE ANTENNAS: Reflector Antennas : Flat Sheet and Corner Reflectors.Paraboloidal Reflectors – Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, ApertureBlocking, Off-set Feeds, Cassegrain Feeds. Horn Antennas – Types, Optimum Horns, Design Characteristics of Pyramidal Horns; Lens Antennas – Geometry,Features, Dielectric Lenses and Zoning, Applications, Antenna Measurements – Patterns Required, Set Up, DistanceCriterion, Directivity and Gain Measurements (Comparison, Absolute and 3-Antenna Methods).

UNIT V **(9 Lectures)**

WAVE PROPAGATION: Concepts of Propagation – frequency ranges and types of propagations. Ground Wave Propagation–Characteristics, Parameters, Wave Tilt, Flat and Spherical Earth Considerations. Sky Wave Propagation – Formation of Ionospheric Layers and their Characteristics, Mechanism of Reflection and Refraction,Critical Frequency, MUF and Skip Distance – Calculations for flat and spherical earth cases, Optimum Frequency,LUHF, Virtual Height, Ionospheric Abnormalities, Ionospheric Absorption. Fundamental Equation for Free-Space Propagation, Basic Transmission Loss Calculations. Space Wave Propagation – Mechanism, LOS and Radio Horizon. Tropospheric Wave Propagation – Radius of Curvature of path, Effective Earth's Radius, Effect of Earth's Curvature, Field Strength Calculations, M-curves and Duct Propagation, Tropospheric Scattering.

Text Books:

1. Antennas for All Applications – John D. Kraus and Ronald J. Marhefka, 3rd Edition, TMH, 2003.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd Edition, 2000.

Reference Books:

1. Antenna Theory - C.A. Balanis, John Wiley and Sons, 2nd Edition, 2001.
2. Antennas and Wave Propagation – K.D. Prasad, SatyaPrakashan, Tech India Publications, New Delhi, 2001.
3. Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio, vol. 5,Standard Publishers Distributors, Delhi.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Edition, 1955.
5. Antennas – John D. Kraus, McGraw-Hill, 2nd Edition, 1988.

Web References:

1. https://nptel.ac.in/courses/108/101/108101092/
2. https://www.virtulearn.in/course/antenna-and-wave-propagation
3. https://www.tutorialspoint.com/antenna_theory/index.htm

B. Tech III Year I Semester **Course Structure**

L	T	P	C
3	1	0	4

CONTROL SYSTEMS

Internal Marks: 40

Course Code: P18EET05 **External Marks: 60**

Course Prerequisites: Laplace Transformation & Differential Equations.

Course Objectives:

1. To learn the mathematical modelling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
2. To analyze the time response of first and second order systems and improvement of Performance by PI, PD & PID controllers
3. To investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
4. To present the Frequency Response approaches for the analysis of linear time invariant (LTI) systems using Bode plots, polar plots and Nyquist stability criterion. To discuss basic aspects of design and compensation of linear control systems using Bode plots.
5. Ability to formulate state models and analyze the systems. To present the concepts of Controllability and Observability.

Course Outcomes: After completion of the course the student will be

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

UNIT-I **(15 Lectures)**

MATHEMATICAL MODELING OF CONTROL SYSTEMS: Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, Transfer function of linear system, Differential equations of electrical networks, mechanical systems. Transfer Function of DC Servo motor & AC Servo motor- Synchro transmitter and receiver - Block diagram algebra – Representation by Signal flow graph - Mason's gain formula.

UNIT-II **(10 Lectures)**

TIME RESPONSE ANALYSIS: Standard test signals - Time response of first and second order systems - Time domain specifications - Steady state errors and error constants – Effects of PI, PD and PID control systems.

UNIT-III **(15 Lectures)**

STABILITY ANALYSIS IN S-DOMAIN: The concept of stability – Routh's stability criterion –limitations of Routh's stability – Root locus concept - construction of root loci (Simple problems). Introduction to Frequency domain specifications - Bode diagrams - transfer function from the Bode Diagram - Phase margin and Gain margin - Stability Analysis from Bode Plots.

UNIT-IV **(10 Lectures)**

FREQUENCY RESPONSE ANALYSIS & CLASSICAL CONTROL DESIGN TECHNIQUES: Lag, Lead, Lag-Lead compensators, design of compensators – using Bode plots. Polar Plots, Nyquist plot - Stability criterion.

UNIT-V **(10 Lectures)**

STATE SPACE ANALYSIS OF LTI SYSTEMS: Concepts of state, state variables and state model - state space representation of transfer function, Transfer function from State Space Representation, Solving the time invariant state equations – State transition matrix and it's Properties – Concepts of Controllability and Observability.

Text Books:

1. Control Systems principles and design by M.Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition, 2014.
2. Automatic control systems by Benjamin C.Kuo, Prentice Hall of India, 2nd Edition, 2012.

Reference Books:

1. Modern Control Engineering by Kotsuhiko Ogata, Prentice Hall of India, 2010.
2. Control Systems by ManikDhanesh N, Cengage publications, 2012.
3. Control Systems Engineering by I.J.Nagarath and M.Gopal, Newage International Publications, 5th Edition, 2015.
4. Control Systems Engineering by S.Palani, TataMcGraw Hill Publications, 2016.

Web references:

1. www.easyengineering.net
2. www.books.google.co.in

B. Tech III Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

OPEN ELECTIV-I

OBJECT ORIENTED PROGRAMMING THROUGH JAVA

Internal Marks: 40

Subject Code: P18CSO01 **External Marks: 60**

Course Prerequisites: Object-Oriented Programming

Course Objectives:

1. To understand Object Oriented Programming concepts and basic characteristics of Java
2. To understand the principles of packages, inheritance and interfaces
3. To Implement exceptions and use I/O streams
4. To design and build simple Graphical User Interface application.

Course Outcomes:

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

1. Implement OOPS concepts in Java programs
2. Develop Java programs with the concepts of inheritance and interfaces
3. Design a Java applications using exceptions and I/O streams
4. Design interactive Java application using swings

UNIT I **(9 Lectures)**

OOPS-Fundamentals- Object Oriented Programming concepts - Abstraction - objects and classes - Encapsulation- Inheritance -Polymorphism- OOP in Java - Characteristics of Java-Java Source File -Structure- Compilation- Data Types - Variables and Arrays - Operators - Control Statements.

UNIT II **(9 Lectures)**

Inheritance and Interface Classes-Objects-Methods-constructors-Inheritance-polymorphism-Access specifier- Static members-Abstract classes-Interfaces.

UNIT III **(9 Lectures)**

Exception Handling ane Packages Exception handling -try-catch, throw, throws, finally block, user definedexception-built-inexceptions-Packagesand Inner classes-Array Lists - Strings.

UNIT IV **(9 Lectures)**

Files and Concurrent Programming--Input -Output Basics - Streams - Byte streams and Character streams - Reading and Writing Console - Reading and Writing Files.Multi-threaded programming - thread life cycle- interrupting threads - thread states - thread priorities- thread synchronization- Inter-thread communication.

UNIT V **(9 Lectures)**

Graphics Programming- Applets- Applet class, Applet structure, An Example Applet Program, Applet Life Cycle - Frame - Components- java.awt package, Layouts, Basics of event handling - event handlers -AWT event hierarchy - Swing Components- Text Fields, Text Areas - Buttons- Check Boxes – Radio Buttons - Lists- choices- Scrollbars - Windows -Menus - Dialog Boxes.

Text Books:

1. Java The complete reference, 8th Edition, Herbert Schildt, McGraw Hill Education, 2011.
2. Core Java Volume-I Fundamentals, 9th edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, 2013.

Reference Books:

1. Java 2 Black book, Steven Holzner, Dream tech press, 2011.
2. The JAVA programming language, Third edition, K. Arnold and J. Gosling, Pearson Education, 2000.
3. An introduction to Object-oriented programming with Java, Fourth Edition, C.Thomas Wu, Tata McGraw-Hill Publishing company Ltd., 2006.

Web References:

1. www.tutorialspoint.com
2. www.beginnersbook.com
3. www.w3schools.com
4. www.udemy.com

B. Tech III Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

BLOCKCHAIN TECHNLOGY

OPEN ELECTIV-I

Internal Marks: 40
Subject Code: P18CSO02 **External Marks: 60**

Course Prerequisite: NIL

Course Objectives:

The main objectives of this course are:

1. Understand how block chain systems (mainly Bit coin and Ethereum) work and to securely
2. Interact withthem, Design, build, and deploy smart contracts and distributed applications,
3. Integrate ideas from block chain technology into their ownprojects.

Course Outcomes:

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

1. Demonstrate the foundation of the Block chain technology and understand the processes in payment andfunding.
2. Identify the risks involved in building Block chainapplications.
3. Review of legal implications using smartcontracts.
4. Choose the present landscape of Blockchain implementations and Understand Crypto
5. Currencymarkets Examine how to profit from trading cryptocurrencies.

Unit I: **(9 Lectures)**

Introduction: Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain: Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players inMarket.

Unit II: **(9 Lectures)**

Blockchain Concepts: Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

Unit III: **(9 Lectures)**

Architecting Blockchain solutions:Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Blockchain Applications.

Unit IV: **(9 Lectures)**

Ethereum Blockchain Implementation: Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEtherWallet, Ethereum Networks/Environments, Infura, Etherscan, Ethereum Clients, Decentralized Application, Metamask, Tuna Fish Use Case Implementation, OpenZeppelinContracts.

Unit V: **(9 Lectures)**

Hyperledger Blockchain Implementation: Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Advanced Concepts in Blockchain: Introduction, InterPlanetary File System (IPFS), Zero-Knowledge Proofs, Oracles, Self-Sovereign Identity, Blockchain with IoT and AI/ML Quantum Computing and Blockchain, Initial Coin Offering, Blockchain Cloud Offerings, Blockchain and its Future Potential.

TEXT BOOKS:

1) “Blockchain for Enterprise Application Developers”, Ambadas, Arshad SarfarzAriff, Sham - Wiley

2) “Mastering Bitcoin: Programming the Open Blockchain”, Andreas M. Antonpoulos,O’Reilly

REFERENCES:

1) Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph Bambara, Paul R. Allen, Mc GrawHill.

2) Blockchain: Blueprint for a New Economy, Melanie Swan,O’Reilly

WEB:RESOURCES:

1)https://github.com/blockchainedindia/resources

B. Tech III Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

STATISTICAL METHODS USING R-PROGRAMMING

OPENELECTIV-I

Internal Marks: 40
Subject Code: P18ITO01 **External Marks: 60**

Course Prerequisite:

Course Objectives: After taking the course, students will be able to

1. Use R for statistical programming, computation, graphics, and modeling,
2. Write functions and use R in an efficient way,
3. Fit some basic types of statistical models
4. Use R in their own research,
5. Be able to expand their knowledge of R on their own.

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

1. List motivation for learning a programming language
2. Access online resources for R and import new function packages into the R workspace
3. Import, review, manipulate and summarize data-sets in R
4. Explore data-sets to create testable hypotheses and identify appropriate statistical tests
5. Perform appropriate statistical tests using R Create and edit visualizations with

UNIT I **(11 Lectures)**

Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types, Vectors, Conclusion, Advanced Data Structures, Data Frames, Lists, Matrices, Arrays, Classes**.**

UNIT II **(11 Lectures)**

R Programming Structures, Control Statements, Loops, - Looping Over Nonvector Sets,- If-Else, Arithmetic and Boolean Operators and values, Default Values for Argument, Return Values, Deciding Whether to explicitly call return- Returning Complex Objects, Functions are Objective, No Pointers in R, Recursion, A Quicksort Implementation-Extended Extended Example: A Binary Search Tree.

UNIT III **(11 Lectures)**

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability-Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting, Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector

cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /out put, Accessing the Keyboard and Monitor, Reading and writer Files.

UNIT IV **(11 Lectures)**

Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot() Function – Customizing Graphs, Saving Graphs to Files.

UNIT V **(11 Lectures)**

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests,- ANOVA. Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression, - Poisson Regression- other Generalized Linear Models- Survival Analysis, Nonlinear Models, Splines- Decision- Random Forests.

TEXT BOOKS:

1. The Art of R Programming, Norman Matloff, Cengage Learning
2. R for Everyone, Lander, Pearson

REFERENCE BOOKS:

1. R Cookbook, PaulTeetor, Oreilly.
2. R in Action,Rob Kabacoff, Manning

Web References:

1. https://www.w3schools.com/
2. http://nptel.ac.in/

B. Tech III Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

MANAGEMENT SCIENCE

OPEN ELECTIV-I

Internal Marks: 40

Course Code: P18MBO01 **External Marks:** 60

Course Prerequisite:

Course Objectives:

1. To understand the application of management science in decision making process& its importance, evaluation of management thought, how organisation structure is designed and its principle and types.
2. To understand the types of management about work study, how quality is controlled, control charts and inventory control and their types.
3. To learn the main functional areas of organisation i.e., Financial Management, Production Management, Marketing Management, Human resource Management, Product life cycles and Channels of Distribution.
4. The learning objective of this unit is to understand the Development of Network and Identifying Critical Path.
5. The learning objective of this unit is to understand the concept of strategic management, and the basic concepts of MIS, MRP, JIT, TQM, Six sigma, CMM, Supply chain management, ERP, Business Process Outsourcing, bench marking and business process re-engineering.

Course Outcomes:

1. Able to apply the concepts & principles of management in real life. The student will be able to design & develop organization structure for an enterprise.
2. Able to apply PPC techniques, Quality Control, Work-study principles in industry.
3. The student can identify and apply Marketing, HRM, and Production Strategies and implement them effectively.
4. Able to develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.

5. Able to develop Mission, Objectives, Goals & strategies for an enterprise in dynamic environment and apply modern management techniques MIS, ERP, TQM, SCM, BPR, and Bench Marking wherever possible

UNIT-I **(9 Lectures)**

Introduction to management: Concept –nature and importance of Management –Generic Functions of Management – Evaluation of Management thought- Theories of Motivation – Decision making process-Designing organization structure- Principles of organization – Organizational typology- International Management: Global Leadership and Organizational behavior Effectiveness(GLOBE) structure.

UNIT – II **(9 Lectures)**

Operations Management: Principles and Types of Management – Work study- Statistical Quality Control- Control charts (P-chart, R-chart, and C-chart) Simple problems- Material Management: Need for Inventory control- EOQ, ABC analysis (simple problems) and Types of ABC analysis (HML, SDE, VED, and FSN analysis).

UNIT – III **(9 Lectures)**

Functional Management: Concept of HRM, HRD and PMIR- Functions of HR Manager-Wage payment plans (Simple Problems) – Job Evaluation and Merit Rating - Marketing Management- Functions of Marketing – Marketing strategies based on product Life Cycle, Channels of distributions. Operationalising change through performance management.

UNIT-IV **(9 Lectures)**

Project Management: (PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability- Project Crashing (Simple Problems)

UNIT –V **(9 Lectures)**

Strategic Management: Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process –SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy Alternatives. Global strategies.

Contemporary Management Practices: basic concepts of MIS, Total Quality Management (TQM), Six Sigma, Supply chain management, Enterprise Resource Planning(ERP), Business process Re- engineering and Bench Marketing,

Text Books:

1. Dr. P. Vijaya Kumar & Dr. N. Appa Rao, '*Management Science'* Cengage, Delhi, 2012.
2. Dr. A. R. Aryasri, *Management Science'* TMH 2011.

References:

1.Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
2. Biswajit Patnaik: Human Resource Management, PHI, 2011
3. Hitt and Vijaya Kumar: Starategic Management, Cengage learning
4. Seth & Rastogi: Global Management Systems, Cengage learning , Delhi, 2011

Web References:

1. https://mrcet.com/downloads/digital_notes/ECE/II%20Year/Management%20Scien ce .pdf
2. https://books.askvenkat.org/management-science-textbook-aryasri-pdf/
3. https://nptel.ac.in/courses/122/102/122102007/
4. https://nptel.ac.in/courses/122/108/122108038/
5. http://www.universityofcalicut.info/SDE/Management_science_corrected_on13Apr il2016.pdf

B. Tech III Year I Semester **Course Structure**

L	T	P	C
4	0	0	2

DESIGN THINKING FOR INNOVATION

ELECTIV-I

Internal Marks: ----

Subject Code: P18MCT08 **External Marks: 100**

Course objectives:

1. To bring awareness on design thinking
2. To build creative confidence and equip them for innovation
3. To understand and empathize human need
4. To generate the ideas for the human need
5. To evaluate business viability, human desirability and technological feasibility by making prototype

Course outcome:

1. Explain and define the design thinking definition, basic concepts and process
2. Understand abilities that need for innovation
3. Analyze the barriers of the innovation
4. Analyze the human need and the problems of mankind
5. Demonstrate the idea generation process
6. Generate and Evaluate deferent ideas
7. Select best ideas and make prototypes

Outcome indicates:

1. Assignments
2. Prototype report
3. Prototype
4. Charts by students
5. Store boards

Week		Total hours	Topics
1.	1	1.	What Is Design, What Is Design Thinking, Design Thinking– Importance, and Impact
	2	2.	Historical Perspective of Design Thinking,
	3	3.	Evolution of Design Thinking Definitions and Perspectives
	4	4.	Thinking Definitions and Perspectives & Three Space of Innovation In Design Thinking,
2.	1	5.	Divergent and Convergent Thinking & Design Thinking Process
	2	6.	Design thinking vs Traditional thinking (problem solving)
	3	7.	Myths of Innovation
	4	8.	Myths of Creativity
3.	1	9.	Creative Confidence
	2	10.	Innovators DNA
	3	11.	Concept of flow and purpose
	4	12.	Building Design Team
4.	1	13.	Initial Problem Description - 5why, beginner's mindset
	2	14.	Research –persona development
	3	15.	Empathy mapping
	4	16.	interview with empathy and stories collection
5.	1	17.	Question the critical assumptions
	2	18.	Reframe Problem Definition – (PoV) point of view &power of ten,
	3	19.	how might we
	4	20.	Nine window tool and daisy map
6.	1	21.	Ideation and Visualization- Brainstorming
	2	22.	SCAMPER
	3	23.	Mind mapping
	4	24.	sketch –structure idea
7.	1	25.	Storyboard
	2	26.	Customer Co-Creation
	3	27.	Provocation
	4	28.	Role-play
8.	1	29.	step-by-step prototyping & low fidelity prototyping
	2	30.	Testing Prototyping -feedback capturing grid, conduct A/B testing
	3	31.	Experiment grid, user retrospective board
	4	32.	Create a Pitch of the prototype

Text Book(s)

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, “Exploring Engineering: An Introduction to Engineering and Design”, 4th edition, Elsevier, 2016.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010
3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.

Reference Books:

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007.
2. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006.
3.Liedtka, Jeanne and Ogilvie, Timothy, Ten Tools for Design Thinking.
4.The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems By : Michael Lewrick
5.The Myths of Innovation by Scott Berkun ,Publisher(s): O'Reilly Media, Inc.ISBN: 9781449389628
6.The Myths of Creativity: The Truth About How Innovative Companies and People Generate Great Ideas, D. Burkus. Jossey-Bass, San Francisco, CA (2014), 214 pp., ISBN: 978-1-118-61114-2
7.Creative Confidence: Unleashing the Creative Potential Within Us All by Tom Kelley (Author), David Kelley (Author)
8.The innovator's DNA: mastering the five skills of disruptive innovators
Author: Dyer, Jeff Gregersen, Hal B., 1958-Christensen, Clayton M.Published:Boston, Mass. : Harvard Business Press, [2011].
9.Csikszentmihalyi, M. (1990). *Flow: The psychology of optimal experience*. New York: Harper & Row.
10. The Power of Purpose: Find Meaning, Live Longer, by Richard J. Leider
11.Collective Genius: The Art and Practice of Leading Innovation, Authors: Linda A. Hill, Greg Brandeau, Emily Truelove, Kent Lineback
12. Change by Design, by Tim Brown

Online Resources: www.interaction-design.org

ASSESSMENT

Assessment	Internal -100 marks
Assignments	1*5= 25
Report of the prototype	1*5=25
Prototype and presentation	50*1=50

Note: Encourage multidisciplinary approach for forming team and prototyping

Prototype Making and Evaluation Methods:

Prototypes can be made by individuals or teams.
4 is Maximum member for the team
HOD of the department and 3 exports evaluating the prototype
HOD act as chairperson for the evaluation team

Prototype Report:

It can be printed or handwritten

Topics in the report

1. Title of the problem
2. Research work
3. How you redefining the problem
4. Methods used for generation idea
5. Ideas (here multiple ideas can be written)
6. Prototyping process

Assignments:

5 assignments will be given and each assignment carries 5 marks

Assignment topics (tentatively): faculty has the right to change the topics

- collect 50 different design that you think it is wonderful
- Introspection (confidence, creativity)
- User interview (video file submission) or story collection
- Book review
- HBR articles reading and writing opinion
- Your thinking on design thinking

B. Tech III Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

LINEAR AND DIGITAL IC APPLICATIONS LAB

Internal Marks: 40

Course Code: P18ECL05 **External Marks:** 60

PART – A (minimum 6 experiments) Design and Verify the functionality of the following:

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
5. Mono-stable Multivibrator and AstableMultivibrator using IC 555.
6. Schmitt Trigger Circuits – using IC 741
7. Design of Frequency Multiplier using PLL IC 565
8. Voltage Regulator using IC 723.

PART – B (minimum 6 experiments using VHDL)

1. Simulation of logic gates – OR, AND, NOT, NAND, NOR, XOR, XNOR
2. Simulation of Half-Adder and Full-Adder
3. 3 to 8 Decoder -74138
4. 8 to 3 Encoder (with and without parity)
5. Simulation of 8x1 MUX and 1x8 DEMUX.
6. 4- Bit comparator-7485
7. D Flip-Flop-7474
8. Decade counter -7490

Additional Experiments:

1. OPAMP characteristics and parameter measurement
2. Weighted resistor 4-bit DAC using IC 741 3. Priority Encoder using 74XX Series.
3. Simulation of Synchronous up-down counter.

Equipment Required:

For Part - A

1. Regulated Power Supply (0-30V)
2. Cathode Ray Oscilloscope (20MHz)
3. Multimeters
4. Kits for the above experiments or the following components
    a) ICs- 741, 555, 723, 7805, 7809, 7912.
    b) Resistors, Capacitors.
    c) Breadboards

For Part – B

1. Computer with Xilinx software.

Note: Minimum 12 experiments are to be conducted (Minimum 6 experiments from each part are to be conducted)

B. Tech III Year I Semester

Course Structure

L	T	P	C
0	0	3	1.5

DIGITAL COMMUNICATIONS LAB

Internal Marks: 40

Course Code: P18ECL06

External Marks: 60

List of Experiments:

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

Equipment Required:

1. RPS – 0 – 30 V
2. CRO – 0 – 20 M Hz.
3. Function Generators – 0 – 1 M Hz
4. RF Generators – 0 – 1000 M Hz./0 – 100 M Hz.
5. Multimeters
6. Lab Experimental kits for Digital Communication
7. Components

B. Tech III Year I Semester **Course Structure**

L	T	P	C
2	0	0	0

BIOLOGY

(Common to all Branches)

Internal Marks: 100

Course Code: P18MCT09

Course Prerequisite: The purpose of this is to provide a basic understanding of biological mechanisms of living organisms from the perspective of engineers. In addition, the course is expected to encourage engineering students to think about solving biological problems with engineering tools.

Course Objectives:

1. To understand relation between science and engineering.
2. To provide a foundation in basic biological principles.
3. To develop an understanding of the scientific methods and its implications.
4. To familiarize the students with the basic organization of organisms and subsequent building to a living being.
5. To understand about the machinery of the cell functions that is ultimately responsible for various daily activities.
6. To provide knowledge about biological problems that require engineering expertise to solve them.
7. To understand the various industrial applications of single celled organisms.
8. To understand history of the origin of universe.

Course Outcomes:

1. Describe how biological observations of 18th Century that lead to major discoveries.
2. Convey that classification involvement is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
3. Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
4. Identify DNA as a genetic material in the molecular basis of information transfer.
5. Identify and classify microorganisms.
6. Understanding of the human health and awareness diseases symptoms and prevention.
7. Gain the knowledge of stem cells and monoclonal antibodies.
8. Students able to understanding the history of the origin of universe and theories on the evolution of life forms.

UNIT I **(5 Lectures)**

HISTORY OF BIOLOGY: Science and Engineering; Applications of biology; Biological classification of organisms: History of biological classification, Systematic Hierarchy, Classification of the five kingdoms: Monera, Protista, Fungi, Plantae and animalia. Classification of Invertebrates and Vertebrates. Major contributions of prominent scientists: Aristotle, Antonie van Leeuwenhoek, Linnaeus, William Harvey, Louis Pasteur, Sir Ronald Ross, Watson & Crick, Salim Moizuddin Abdul Ali, Charles Darwin, M.S. Swaminathan and Yellapragada Subbarao.

UNIT II **(10 Lectures)**

STRUCTURAL ORGANIZATION & CELL BIOLOGY: Animal organization: Cellular grade of organization, Tissue grade of organization (Diploblastic organization), Organ-system grade of organization (triploblastic organization). Animal tissues: epithelial tissue, connective tissue, cells of connective tissue, fluid tissue-blood, Muscle tissue, nervous tissue-structure of neurons.

Ultra structure of animal cell: Plasma membrane, Golgi complex, Endoplasmic reticulum, Mitochondria, Kreb's cycle Lysosomes, Ribosomes, chromosomes, and Nucleus. Cell divisions: Cell cycle stages, Mitotic phase, meiosis.

UNIT III **(10 Lectures)**

BIOMOLECULES: Introduction, properties of biomolecules, Carbohydrates:- structure, classifications and functions of carbohydrates. Proteins:-structure, classification and functions of proteins. Lipids- characteristic features of lipids, important functions in biological systems, classification of lipids.

Nucleic acids- structure and properties of DNA & RNA. Enzymes- Mode of action of enzymes, properties of enzymes, classification and nomenclature of enzymes, importance of enzymes.

UNIT IV **(10 Lectures)**

GENETICS AND EVOLUTION: Introduction, reasons for Mendel's success, characters selected by Mendel, Mandel's laws- 1. Law of dominance, 2. Law of segregation or Law of purity of gametes, 3. Law of independent assortment. Monohybrid cross, Dihybrid cross, Test cross, Back cross. Sex determination in human. Chromosomal disorders in human-

Klinefelter's syndrome, Turner's syndrome and Down's syndrome. Transfer of genetic information- Replication, Transcription and Translation.

Evolution:- Evolutionary concepts: Theory of special creation, Cosmozoic theory, Theory of spontaneous generation or abiogenesis, Biogenesis theory, Theory of catastrophism, Theory of organic evolution. Origin of life: Primitive atmosphere and molecules, Biological evolution, Experimental chemical origin of life. Theories of evolution: Lamarckism and Darwinism.

UNIT V **(10 Lectures)**

HUMAN HEALTH & DISEASES AND APPLIED BIOLOGY: Common diseases in humans: Health, Disease, Pathogens, Transmission, Bacterial diseases-Cholera, Typhoid, Diphtheria, Pertussis, Tetanus, Tuberculosis, Leprosy, Plague, Anthrax; Viral diseases- Common cold, Flu, Measles, Rubella, Chickenpox, Smallpox, Poliomyelitis, Chikungunya, AIDS, Dengue fever; Fungal diseases- Ringworm, Athlete's foot; Protozoan diseases- Malaria, Amoebic dysentery, Sleeping sickness and Helminth diseases- Filarial, Ascariasis.

Immunity: Innate immunity, Acquired immunity, Antibodies-structure, Immune disorder-HIV and Hepatitis. Applied Biology- rDNA technology; Industrial use of microorganisms- alcohols, acids and vitamins; enzymes, pollution control, vaccines, hormones. Monoclonal antibodies and stem cells.

Text Books:

1. A Text book of Biotechnology, R.C.Dubey, S. Chand Higher Academic Publications, 2013
2. Diseases of the Human Body, Carol D. Tamparo and Marcia A. Lewis, F.A. Davis Company, 2011.
3. Biomedical instrumentation, Technology and applications, R. Khandpur, McGraw Hill Professional, 2004

Reference Books:

1. Biology for Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2011
2. Cell Biology and Genetics (Biology: The unity and diversity of life Volume I), Cecie Starr, Ralph Taggart, Christine Evers and Lisa Starr, Cengage Learning, 2008
3. Biotechnology Expanding horizon, B.D. Singh, Kalyani Publishers, 2012

Web References:

1. Human health and diseases https://www.emedicalprep.com/study-material/biology/ biology-in-human- lefare/human-health-and-disease/
2. Aristotle's biology **https://en.wikipedia.org/wiki/Aristotle%27s_biology.**
3. Sir Ronald Ross; https://en.wikipedia.org/wiki/Ronald_Ross.
4. Recombinant DNA Technology- Steps, Applications and Limitations; https://microbenotes.com/recombinant-dna-technology-steps-applications-and-limitations/
5. Nucleic acids https://www.khanacademy.org/ science/ap-biology/gene-expression-and-regulation/dna-and-rna-structure/a/nucleic-acids.

B. Tech III Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

DIGITAL SIGNAL PROCESSING

Internal Marks: 40

Course Code: P18ECT12 **External Marks:** 60

Course Prerequisite: Signals and Systems

Course Objectives: The student will be able to

1. Analyze the Discrete Time Signals and Systems
2. Know the importance of FFT algorithm for computation of Discrete Fourier Transform
3. Understand the various implementations of digital filter structures, FIR and IIR Filter design procedures
4. Know the need of Multirate Processing
5. Learn the concepts of DSP Processors

Course Outcomes: After going through this course the student will be able to

1. Apply the difference equations concept in the anayziation of discrete time systems
2. Use the FFT algorithm for solving the DFT of a given signal
3. Design a Digital filter (FIR&IIR) from the given specifications
4. Use the Multirate Processing concepts in various applications
5. Apply the signal processing concepts on DSP Processor.

UNIT I **(9 Lectures)**

Introduction: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems , stability, causality of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations. Frequency domain representation of discrete time signals and systems.

UNIT II **(9 Lectures)**

Discrete Fourier Series & Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, computation of DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

UNIT III **(9 Lectures)**

REALIZATION OF DIGITAL FILTERS: Review of Z-transforms, Applications of Z – transforms, solution of difference equations, Block diagram representation of linear constant- coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function

UNIT IV **(9 Lectures)**

Design Of IIR& FIR Digital Filters& Realizations: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Analog and Digital frequency transformations, Design of FIR Digital Filters using Window Techniques, Comparison of IIR & FIR filters

UNIT V **(9 Lectures)**

Multirate Digital Signal Processing: Introduction, Decimation, Interpolation Sampling rate conversion, Implementation of sampling rate converters, Applications – Sub-band Coding of Speech Signals, Implementation of Digital Filter Banks.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, DimitrisG.Manolakis,Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI
3. Digital Signal Processors – Architecture, Programming and Applications,, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002
4. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House

Reference Books:

1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
2. Digital Signal Processing: MH Hayes, Schaum's Outlines, TATA Mc-Graw Hill, 2007.
3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
4. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris,Thomson, 2007.
5. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006
6. Digital Signal Processing – Ramesh babu, Sci Tech publications

Web References:

1. https://nptel.ac.in/courses/117/102/117102060/
2. https://www.tutorialspoint.com/digital_signal_processing/digital_signal_processing_pdf_version.htm

B. Tech III Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

VLSI DESIGN

Internal Marks: 40

Course Code: P18ECT13 **External Marks:** 60

Course Prerequisite: Semiconductor Devices and Circuits, Switching Theory and Logic Design, Linear and Digital IC Applications.

Course Objectives: The student will be able to

1. Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
2. Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
3. Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.
4. CMOS combinational and sequential logic circuit design explained.
5. FPGA architectures and various structures explained.

Course Outcomes: After going through this course the student will be able to

1. Explain various MOS transistor characteristics and fabrication process techniques.
2. Develop stick diagrams for various MOS circuits and distinguish design rules.
3. Design basic MOS circuits with circuit concepts along with scaling concepts.
4. Explain CMOS combinational and sequential logic circuit design.
5. Distinguish various FPGA architectures.

UNIT I **(9 Lectures)**

Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.

UNIT II **(9 Lectures)**

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, 2μm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2μm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.

UNIT III **(7 Lectures)**

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, Some area Capacitance Calculations, The Delay Unit, Inverter Delays, Driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers.

Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Switch logic, Gate logic.

UNIT IV **(11 Lectures)**

CMOS COMBINATIONAL AND SEQUENTIAL LOGIC CIRCUIT DESIGN:

Static CMOS Design: Complementary CMOS, Rationed Logic, Pass-Transistor Logic.

Dynamic CMOS Design: Dynamic Logic-Basic Principles, Speed and Power Dissipation of Dynamic Logic, Issues in Dynamic Design, Cascading Dynamic Gates, Choosing a Logic Style, Gate Design in the Ultra Deep-Submicron Era, Latch Versus Register, Latch based design, timing decimation, positive feedback, instability,Metastability, multiplexer based latches, Master-Slave Based Edge Triggered Register, clock to q delay, setup time, hold time, reduced clock load master slave registers, Clocked CMOS register. Cross coupled NAND and NOR, SR Master Slave register, Storage mechanism, pipelining

UNIT V **(9 Lectures)**

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, FPGA families- Altera Flex 8000FPGA, Altera Flex 10FPGA, Xilinx XC4000 series FPGA, Xilinx Spartan XL FPGA, Xilinx Spartan II FPGAs, Xilinx Vertex FPGA. Case studies: FPGA Implementation of Half adder and full adder.

Text Books:

1. Essentials of VLSI Circuits and Systems - Kamran Eshraghian, Douglas and A. Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.
2. CMOS Digital Integrated Circuits Analysis and Design- Sung-Mo Kang, Yusuf Leblebici, Tata McGraw-Hill Education, 2003.

Reference Books:

1. Advanced Digital Design with the Verilog HDL, Michael D.Ciletti, Xilinx Design Series, Pearson Education
2. Analysis and Design of Digital Integrated Circuits in Deep submicron Technology, 3’rd edition, David Hodges.

Web References:

1. https://nptel.ac.in/courses/117/101/117101058/
2. https://www.tutorialspoint.com/vlsi_design/index.htm

B. Tech III Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

MICROPROCESSORS AND MICROCONTROLLERS

Internal Marks: 40

Course Code: P18ECT14 **External Marks:** 60

Course Prerequisite: Semiconductor Devices and Circuits, Switching Theory and Logic Design

Course Objectives: The student will be able to

1. To acquire knowledge on microprocessors and microcontrollers.
2. Understand Interfacing of 8086, With memory and other peripherals
3. Understand Interfacing of 8086, With memory and other peripherals
4. Study the features 8051 microcontroller and programming.
5. Study the hardware features of ARM and its families.

Course Outcomes: After going through this course the student will be able to

1. Describe the microprocessor capability in general and explore the evaluation of microprocessors.
2. Demonstrate programming skills in assembly language for processors.
3. Describe 8086 interfacing with different peripherals and implement programs.
4. Describe hardware concepts, development of programs for 8051 microcontroller and interfacing.
5. Describe hardware features of ARM and its families.

UNIT-I **(10 Lectures)**

Introduction: Basic Microprocessor architecture, Harvard and Von Neumann architectures with examples, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures.

8086 ARCHITECTURE: Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, interrupts and interrupt responses, 8086 system timing, minimum mode and maximum mode configuration and advanced microprocessors.

UNIT-II **(10 Lectures)**

8086 PROGRAMMING: Instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III **(7Lectures)**

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 Programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers

UNIT-IV **(9 Lectures)**

Intel 8051 MICROCONTROLLER: Architecture, hardware concepts, input/output ports and circuits, external memory, counters/timers, serial data input/output, interrupts.Assembly language programming: Instructions, addressing modes, simple programs.Interfacing: keyboard, displays (LED, 7-segment display unit), A/D and D/A converters.

UNIT-V **(9 Lectures)**

ARM Architectures and Processors: ARM Architecture, ARM Processors Families, ARM Cortex-M Series Family, ARM Cortex-M3 Processor Functional Description, functions and interfaces. Programmers Model – Modes of operation and execution, Instruction set summary, System address map, write buffer, bit-banding, processor core register summary, exceptions.

Text Books:

1. Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.
2. The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J.Ayala, DhananjayV.Gadre,CengageLearninbg , India Edition.
3. The Definitive Guide to ARM Cortex-M3 and Cortex-M4 Processors by JosephYou.

ReferenceBooks:

1. The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B.Brey, Pearson, Eighth Edition-2012.
2. Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.
3. Microprocessors and Microcontrollers by N.Senthil Kumar, M.Saravanan and S.Jeevananthan, Oxford University Press, Seventh Impression 2013

Web References:

1. https://nptel.ac.in/courses/106108100/
2. https://www.sanfoundry.com/best-reference-books-microprocessors-microcontrollers/

B. Tech III Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

MICROWAVE ENGINEERING

Internal Marks: 40

Course Code: P18ECT15 **External Marks:** 60

Course Prerequisite: Electromagnetic Waves and Transmission Lines, Antenna and Wave Propagation

Course Objectives: The student will be able to

1. Understand fundamental characteristics of waveguides through electromagnetic field analysis.
2. Understand the basic properties of waveguide components and Ferrite materials composition
3. Understand the different types of microwave sources and their applications
4. Understand the function, design, and integration of the major microwave components oscillators, power amplifier.
5. Understand a Microwave test bench setup for measurements.

Course Outcomes: After going through this course the student will be able to

1. Gain knowledge of transmission lines and waveguide structures and verify the different modes of propagation.
2. Apply analysis methods to determine circuit properties of passive or active microwave devices.
3. Analyze and Distinguish between M-type and O-type tubes.
4. Gain Knowledge and understanding of microwave analysis methods.
5. Apply the different methods to measure various parameters at microwave frequencies.

UNIT I **(9 Lectures)**

MICROWAVE TRANSMISSION LINES: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Dominant and Degenerate Modes, Characteristic Equation andCut-off Frequencies, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations; Power Transmission and Power Losses in Rectangular Guide, Impossibility of TEM mode, related problems.

UNIT II **(9 Lectures)**

IIMICROWAVE COMPONENTS: Introduction to S-parameters, Significance and Properties of S parameters. S-Matrix Calculations for – 2 Port Junction, E-planeand H-plane Tees, Magic Tee, Directional Coupler. Propagation in ferrites, Ferrite Devices, Faraday Rotation Isolator, Gyrator, Circulator.Waveguide Discontinuities – Waveguide irises, Waveguide Attenuators – Resistive Card, Rotary Vane types, Related Problems.

UNIT III **(9 Lectures)**

MICROWAVE TUBES: Limitations and Losses of conventional tubes at microwave frequencies, Microwave tubes – O type and M type classifications.

O-Type Tubes :2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory –Expressions for o/p Power and Efficiency, Applications, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and o/pCharacteristics, Applications.

UNIT IV **(9 Lectures)**

HELIX TWTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations.

M-Type Tubes: Introduction to Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron –Hull Cut-off Condition, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT V **(9 Lectures)**

MICROWAVE SOLID STATE DEVICES: Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes. AvalancheTransit Time Devices – Introduction, IMPATT and TRAPATT Diodes – Principle of Operation and Characteristics.

MICROWAVE MEASUREMENTS: Description of Microwave Bench – Different Blocks and their Features,Precautions; Microwave Power Measurement – Bolometer Method, Measurement of Attenuation, Frequency, VSWR, Impedance Measurement.

Text Books:

1. Microwave Devices and Circuits – Samuel Y. Liao, PHI, 3rd Edition,1994.
2. Microwave and Radar Engineering-M.Kulkarni, Umesh Publications, 3rd Edition.

Reference Books:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004

Web References:

3. http://technology.niagarac.on.ca/courses/elnc1730/microsolid.ppt
4. http://www.intechopen.com//passive_microwave_components_ana_antenna
5. http://home.sandiego.edu/~ekim/e194rfs01/
6. http://www.slideshare.net/sarahkrystelle/lecture-notes

B. Tech III Year II Semester **Course Structure**

L	T	P	C
2	0	0	2

OPEN ELECTIV-II

INRODUCTION TO MACHINE LEARNING

Internal Marks: 40

Course Code: P18CSO05 **External Marks:** 60

Course Prerequisite: Data Mining Basics

Course Objectives:

- Familiarity with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- The ability to implement some basic machine learning algorithms
- Understanding of how machine learning algorithms are evaluated
- Understanding of Artificial Neural Networks

Course Outcomes:

- Recognize the characteristics of machine learning that make it useful to real-world Problems.
- Characterize machine learning algorithms as supervised, semi-supervised, and Unsupervised.
- Have heard of a few machine learning Models
- Be able to use Linear and Distance based Models.
- Be able to use Artificial Neural Networks

UNIT I: **(6 Lectures)**

Well-posed learning problems, designing a learning system,The ingredients of machine learning, **Tasks:** the problems that can be solved with machine learning, **Models:** the output of machine learning, Features, the workhorses of machine learning.

UNIT II: **(6 Lectures)**

Concept learning: Introduction, a concept learning task, Concept learning as search, Find- S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm

UNIT III: **(6 Lectures)**

Tree models: Decision trees, Ranking and probability estimation trees, Tree learning as variance reduction. **Rule models:** Learning ordered rule lists, Learning unordered rule sets, Descriptive rule learning, First-order rule learning.

UNIT IV: **(6 Lectures)**

Linear models: The least-squares method, The perceptron: a heuristic learning algorithm for linear classifiers, Support vector machines, obtaining probabilities from linear classifiers,. **Distance Based Models:** Introduction, Neighbours and exemplars, Nearest Neighbours classification, Distance Based Clustering, Hierarchical Clustering.

UNIT V: **(6 Lectures)**

Artificial Neural Networks: Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks.

TEXT BOOKS:

1. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach, Cambridge.
2. Machine Learning, Tom M. Mitchell, MGH.

REFERENCE BOOKS:

1. Understanding Machine Learning: From Theory to Algorithms, Shai Shalev-Shwartz, Shai Ben David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

WEB REFERENCES:

1. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
2. https://www.geeksforgeeks.org/machine-learning/
3. https://www.javatpoint.com/machine-learning
4. https://www.guru99.com/machine-learning-tutorial.html

B. Tech III Year II Semester **Course Structure**

L	T	P	C
2	0	0	2

INTRODUCTION TO DATABASE MANAGEMENT SYSTEMS

OPEN ELECTIV-II

Internal Marks: 40

Course Code: P18CSO03 **External Marks:** 60

Course Prerequisite: NIL

Course Objectives:

- Provides students with theoretical knowledge
- Practical skills in the design use of databases and database management systems in information technology applications.

Course Outcomes:

1. Acquire knowledge in fundamentals of DBMS and identify the differences between traditional file system and DB systems.
2. Understand various DBMS models and how queries are being processed and executed in RDBMS.
3. Understand of database, tables and key constraints.
4. Analyze DB design methodology and normalization process.
5. Discuss various files indexing techniques.

UNIT I **(6 Lectures)**

INTRODUCTION: Database system, Characteristics (Database Vs File System), Database Users, Advantages of Data base systems, Database applications. Brief introduction of different Data Models; Concepts of Schema, Instance and Data independence; Three tier schema architecture for data independence; Database system structure.

UNIT II **(6 Lectures)**

ENTITY RELATIONSHIP MODEL: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

RELATIONAL MODEL: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values, constraints and their importance.

UNIT III **(6 Lectures)**

BASIC SQL : Simple Database schema, data types, table definitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, Creating tables with relationship, implementation of key and integrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views.

UNIT IV **(6 Lectures)**

SCHEMA REFINEMENT (NORMALIZATION): Problems Caused by Redundancy, Decompositions, Problems Related to Decomposition, Functional dependency, Properties of Functional dependency, Properties of Decompositions - Lossless join decomposition and dependency preserving decomposition, Normal forms based on functional dependency - 1NF, 2NF and 3NF, Boyce-Codd normal form(BCNF).

UNIT V **(6 Lectures)**

OVERVIEW OF STORAGES AND INDEXING: Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures.

Text Books:

1. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH,2002.
2. Database Management System, 6/e Ramez Elmasri, Shamkant B. Navathe, PEA,2010.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning,2012.
4. Database Management Systems,Rajesh Narang,Second Edition,2018.

References:

1. Database System Concepts. 5/e Silberschatz, Korth, TMH,2002.
2. Introduction to Database Systems, 8/e C J Date, PEA,2000.
3. The Database book principles & practice using Oracle/MySql Narain Gehani, University Press,2008.

Web References:

1. www.academy.vertabelo.com
2. www.w3schools.com
3. www.codecademy.com

B. Tech III Year II Semester **Course Structure**

L	T	P	C
2	0	0	2

INTRODUCTION TO COMPUTER NETWORKS
ELECTIV-II

Internal Marks: 40

Course Code: P18CSO04 **External Marks:** 60

Course Prerequisite: NIL

Course Objectives:

1. Understand state-of-the-art in network protocols, architectures, and applications.
2. To demonstrate the TCP/IP & OSI model merits & demerits.
3. Constraints and thought processes for networking research.
4. Problem Formulation- Approach- Analysis.
5. To know the role of various protocols in Networking.

Course Outcomes:

1. Students to visualize the different aspects of networks, protocols and network design models.
2. Students should be understand and explore the basics of Computer Networks and apply Various Protocols to design a network.
3. Student will be in a position to apply the World Wide Web concepts.
4. Students will be in a position to administrate a network and flow of information further.
5. Enables the students to compare and select appropriate routing algorithms for a network.

UNIT I **(6 Lectures)**

INTRODUCTION: Network, Uses of Networks, Types of Networks, Reference Models: TCP/IP Model, The OSI Model, Comparison of the OSI and TCP/IP reference model. Architecture of Internet.

PHYSICAL LAYER: Guided transmission media, Wireless transmission media, Switching Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing.

UNIT II **(6 Lectures)**

DATA LINK LAYER - Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, Sliding window protocols.

MULTIPLE ACCESS PROTOCOLS - ALOHA, CSMA,CSMA/CD, CSMA/CA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, Data link layer switching: Use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT III **(6 Lectures)**

NETWORK LAYER: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, IP addresses, IPv4, IPv6 Protocol, Transition from IPv4 to IPv6.

UNIT IV **(6 Lectures)**

TRANSPORT LAYER: Services provided to the upper layers elements of transport protocol addressing connection establishment, Connection release, Error Control & Flow Control, Crash Recovery.

THE INTERNET TRANSPORT PROTOCOLS: UDP, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window.

UNIT V **(6 Lectures)**

APPLICATION LAYER- Introduction, providing services.

APPLICATIONS LAYER PARADIGMS: Client server model, HTTP, E-mail, WWW, TELNET, DNS;

Text Books:

1. Tanenbaum and David J Wetherall, Computer Networks, 5th Edition, Pearson Edu,2010.
2. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH,2013.

References:

1. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, FirouzMosharraf, McGraw Hill Education**.**
2. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Education.
3. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
4. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education.

Web References:

1. en.wikipedia.org/wiki/
2. www.w3schools.com/
3. www.w3.org/
4. http://computing.dcu.ie/~humphrys/ca651/index.html
5. http://www.cs.ccsu.edu/~stan/classes/CS490/Slides/Networks4-Ch4-4.pdf
6. http://ecourses.vtu.ac.in/nptel/courses/Webcourse-contents/IIT-MADRAS/ComputerNetworks/pdf/
7. http://www.solarwinds.com/support/tutorials.aspx

B. Tech III Year II Semester **Course Structure**

L	T	P	C
2	0	0	2

ELECTRICAL TECHNOLOGY

OPEN ELECTIV-II

Internal Marks: 40

COURSE CODE: P18EEO08 **External Marks:** 60

COURSE PREREQUISITE: Network Analysis

COURSE OBJECTIVES:

1. Understand the concepts of AC fundamentals and Transformers.
2. Study the network theorems and transformers functionality.
3. Understand the working and types DC generators.
4. Understand the working and types DC motors.
5. Study about alternators and AC motors.

COURSE OUTCOMES:

On completion of this course, students shall be able to

1. Understand about AC fundamentals and the need for earthing and protection of equipments.
2. Understand the network theorems and the operations and uses of transformers.
3. Acquire the knowledge on DC generators and types of DC generators.
4. Understand about DC motors and types of DC motors.
5. Acquire the knowledge on alternators and AC motors.

UNIT I **(9 Lectures)**

AC FUNDAMENTALS & TRANSFORMERS

Concept of alternating voltage and current - complex waveforms - representation of alternating quantities - defining the terms cycle, time period, frequency, amplitude, phase, rms value, form factor - AC through resistance, inductance, and capacitance (Solve simple problems) - power factor definition - calculation of power in an RLC circuit - series and parallel AC circuits (simple problems) - earthing of equipments and lightning protection of installation - megger

UNIT II **(9 Lectures)**

NETWORK THEOREMS AND TRANSFORMERS

Ohm’s law - Kirchoff’s law- Superposition theorem - Thevenin's theorem - Maximum power transfer theorem (Solve simple problems) - working principle of transformer - construction of transformer - elementary theory of an ideal transformer - voltage transformation ratio and rating

of a transformer - emf equation derivation - losses in transformer - types, applications of transformers.

UNIT III **(9 Lectures)**

D.C. GENERATORS

Construction of D.C. Machines, Types of D.C. Machines, Working principle of D.C. Generators, EMF Equation of DC Generator, Lap and Wave Windings, Armature Reaction in D.C. Generators, Commutation and Methods of Improving Commutation, Characteristics of D.C. Generators, Separately Excited DC Generator, Voltage Build-up in Self-Excited Generator, D.C. Shunt, D.C. Series and D.C. Compound Generator Characteristics, Power Flow in D.C. Generator, Losses and Efficiency in D.C. Generator and Their Examples.

UNIT IV **(9 Lectures)**

D.C. MOTORS

Overview of Construction, Working principle of Motor, Back E.M.F. and its equations, Types of DC Motors, Torque of DC Motor, Armature Reaction in DC Motor, Characteristics of a DC Shunt Motor, Characteristics of a DC Series Motor, Characteristics of a DC Compound Motor, Need of DC Motor Starter, Starting of DC Motors, Three Point and Four Point Starter with its advantages and disadvantages, Speed of a DC Machine, Speed Control of DC Motors.

UNIT V **(9 Lectures)**

ALTERNATORS AND AC MOTORS

Working principle of an alternator- emf equation of an alternator - synchronous speed and frequency - the open circuit characteristics of an alternator - AC motors - working principle and classification of AC motors - working principle and applications of stepper motor, universal motor, servo motor - working principle and applications of single phase and three phase induction motor.

TEXT BOOKS.

1. B L Theraja- Electrical Technology (Vol 1 and 2). S. Chand
2. D C Kulshreshtha- Basic Electrical Engineering.- TMH.

REFERENCE BOOKS.

1. J B Gupta- Electrical Machines .- S K katareia
2. V K Metha- Objective Electrical Engineering - S Chand and company

B. Tech III Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

MICROPROCESSOR AND MICROCONTROLLERS LAB

Internal Marks: 40

Course Code: P18ECL07 **External Marks:** 60

List of the Experiments / Programs

PART – A: 8086 ASSEMBLY LANGUAGE PROGRAMMING

1. Introduction to MASM/TASM, KEIL
2. Multi byte addition/subtraction
3. Multi byte Multiplication/division operations
4. Find sum of squares/cubes of a given n-numbers
5. Find factorial of given n-numbers
6. Sorting of given string in Ascending and Descending order

PART – B: 8086 INTERFACING

7. Interrupt Controller-Generate an interrupt using 8259 timer
8. Generation of counting clock pulse using Intel 8253/8254

PART – C: 8051 ASSEMBLY LANGUAGE PROGRAMS

9. Finding number of 1's and number of 0's
10. Arrange numbers in ascending/descending order
11. Find average of n-numbers

PART – D: 8051 INTERFACING

12. Switches and LEDs
13. 7-Segment display (multiplexed)

ADDITIONAL EXPERIMENTS

1. Arithmetic and Logical operations by using 8086 trainer kit
2. Arithmetic and Logical operations by using 8051 trainer kit

Equipment Required:

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. 8086 Microprocessor kits
4. 8051 microcontroller kits
5. ADC module

6. DAC module
7. Stepper motor module
8. Keyboard module
9. LED, 7-Segemt Units
10. Digital Multimeters
11. ROM/RAM Interface module
12. Bread Board etc.

B. Tech III Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

DIGITAL SIGNAL PROCESSING LAB

Internal Marks: 40

Course Code: P18ECL08 **External Marks:** 60

Minimum TEN Experiments to be conducted

List of the Experiments / Programs **SOFTWARE:MATLAB**

1. Generation of basic discrete time signals: unit step,unit impulse ,unit ramp and exponential signals
2. To verify the Linear Convolution Using MATLAB
3. To verify the Circular Convolution for discrete signals Using MATLAB
4. To Find the addition of Sinusoidal Signals
5. To verify Discrete Fourier Transform(DFT) and Inverse Discrete Fourier Transform(IDFT)
6. N-point FFT algorithm.
7. To find the FFT of given 1-D signal and plot.
8. To compute power density spectrum of a sequence
9. To Implement Frequency Response of IIR low pass and high pass Butterworth Filter
10. To Implement Frequency Response of IIR low pass and high pass Chebyshev Filter
11. To Design FIR low pass and high pass Filter using Rectangular Window
12. To Design FIR low pass and high pass Filter using Triangular Window

B. Tech III Year II Semester **Course Structure**

L	T	P	C
0	0	3	1.5

VLSI DESIGN LAB

Internal Marks: 40

Course Code: P18ECL09 **External Marks: 60**

Note: The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the following experiments using 130nm technology with the Industry standard EDA Tools.

List of Experiments:

1. Design and Implementation of an Universal Gates
2. Design and Implementation of an Inverter
3. Design and Implementation of Full Adder
4. Design and Implementation of Full Subtractor
5. Design and Implementation of Decoder
6. Design and Implementation of RS-Latch
7. Design and Implementation of D-Latch
8. Design and Implementation asynchronous counter
9. Design and Implementation of static RAM cell
10. Design and Implementation of 8 bit DAC using R-2R latter network

Software Required:

i. Mentor Graphics Software / Equivalent Industry Standard Software.

ii. Personal computer system with necessary software to run the programs and to implement.

B. Tech III Year II Semester **Course Structure**

L	T	P	C
2	0	0	2

ENTREPRENEURSHIP

(Common to all Branches)

Internal Marks: --

Course Code: P18MCT13 **External Marks:100**

Course Prerequisite: NIL

Course Objectives:

1.The objective is to expose the students to the concepts of entrepreneurship and role of entrepreneurship in economic development.

2.Further the student will be given enough exposure to idea generation and business model development.

3.Introducing National and state level Institution and agencies who are working for developing entrepreneurship in the country to increase the overall productivity.

Course Outcomes:

1. Understand the importance of entrepreneur in economic development
2. Apply idea generation techniques
3. Analyses , empathies and develop business model
4. Awareness on National and state level institution of entrepreneurship concern

Unit-I **(6 Lectures)**

Entrepreneurship: Entrepreneur characteristics, Classification of Entrepreneurships, Role of Entrepreneurship in economic development, women entrepreneurs, Entrepreneurial Failures

Unit-II **(6 Lectures)**

Entrepreneurial Opportunities, Design Thinking tools (Visualization, Journey mapping (or experience mapping), Value chain analysis, Mind mapping,Rapid concept development, Assumption testing,Prototyping, Customer co-creation, Learning launches Storytelling

Unit-III **(8 Lectures)**

Introduction to lean start-up's,Introduction to business models; Creating value propositions building and analysing business models; Business model canvas,Pitching

Unit-IV **(6 Lectures)**

Institutions Supporting Entrepreneurship: NABARD; SIDBI, NIC, KVIC; SIDO; NSIC, DICs,SFC, SSIDC, NIESBUD,Angel investors, Crowdfunding. EDII,venture capital.

Unit-V **(4 Lectures)**

MSME, Government Policy and Taxation Benefits: Government Policy for SSIs tax Incentives and Concessions-Non-tax Concessions-Rehabilitation and Investment Allowances. MSME INSIDER

Text Books :

1. Arya Kumar, Entrepreneurship, Pearson, Delhi, 2012.
2. Poornima M. Ch Entrepreneurship Development--Small Business Enterprises, Pearson, 2009
3. Michael H. Morris, et. Al., Entrepreneurship and Innovation, Cengage Learning, New Delhi,2011
4. KanishkaBedi , Management and Entrepreneurship, Oxford University Press, Delhi, 2009

References:

1.Ries, E. (2011). The lean startup: How today's entrepreneurs use continuous innovation to create radically successful businesses. Crown Business.

2.Osterwalder, A., Pigneur, Y., In Clark, T., & Smith, A. (2010). Business model generation: A handbook for visionaries, game changers, and challengers.

3.Designing for Growth: A Design Thinking Tool Kit for Managers Book by Jeanne Liedtka and Tim Ogilvie

Web References:

Download Latest Edition | Ministry of Micro, Small & Medium Enterprises (msme.gov.in)

What is Design Thinking and Why Is It So Popular? | Interaction Design Foundation (IxDF) (interaction-design.org)

The Lean Startup | The Movement That Is Transforming How New Products Are Built And Launched

Business Model Canvas – Download the Official Template (strategyzer.com)

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

RADAR SYSTEMS

Internal Marks: 40

COURSE CODE: P18ECT17 **External Marks:** 60

COURSE PREREQUISITE: Electromagnetic Theory and Transmission Lines, Microwave Engineering, Antennas and Wave Propagation.

COURSE OBJECTIVES:

1. Recognise the basic principle of radar and radar range equation.
2. Impart knowledge on different types of radars like CW, FM-CW, MTI and pulse Doppler radars.
3. Understand different tracking techniques for radar.
4. Discuss the characteristics of a matched filter receiver and its performance.
5. Differentiate the types of displays, duplexers and antennas used in radar systems.

Course Outcomes: On completion of this course, students shall be able to

1. Explain the fundamentals of RADAR operation and Radar Range equation.
2. Examine the significance of Doppler Effect in range, Amplitude velocity measurement for CW & FM-CW Radars.
3. Describe the Detection of moving targets by the use of Doppler Effect and performance of simple tracking RADAR.
4. Outline the concepts of matched filter and radar signals.
5. Demonstrate the functionality of Radar receivers.

UNIT I **(9 Lectures)**

BASICS OF RADAR: Introduction, Maximum Unambiguous Range, simple Radar Range Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Illustrative Problems.

RADAR EQUATION: Modified Radar Range Equation, SNR, probability of detection, probability of FalseAlarm, Integration of Radar Pulses, Radar Cross Section of Targets

(simpletargets -sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT II **(9 Lectures)**

CW AND FREQUENCY MODULATED RADAR: Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems.

FM-CW RADAR: Range and Doppler Measurement, Block Diagram and characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

UNIT III **(9 Lectures)**

MTI AND PULSE DOPPLER RADAR: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Nth Cancellation, Staggered PRFs. Range Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

UNIT IV **(9 Lectures)**

TRACKING RADAR: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar-Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT V **(9 Lectures)**

DETECTION OF RADAR SIGNALS IN NOISE: Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection and Cross-correlation Receiver, Efficiency of Non-Matched Filters, Matched Filter with Non-white Noise, Noise Figure and Noise Temperature.

RADAR RECEIVERS: Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus parallel feeds, Applications, Advantages and Limitations.

Text Books:

1. "Introduction to Radar Systems", 2nd Edition, Merrill I. Skolnik, TMH Special Indian Edition.

Reference Books:

1. "Radar: Principles, Technology, Applications", Byron Edde, Pearson Education.
2. "Radar Principles", Jr., P.Z., Wiley,– Peebles, Jr., P.Z., Wiley, New York.
3. "Fundamentals of Radar Signal Processing", M.A.Richards, TMH.
4. "Radar Systems Analysis and Design using MATLAB", 3rd Edition, B.R.Mahafza, CRC Press.
5. "Microwave and Radar Engineering", 1st Edition, G.SasibhushanaRao, Pearson Publications.

Web Source References:

1. https://onlinecourses.nptel.ac.in/noc19_ee58
2. https://www.radartutorial.eu/
3. https://www.jlab.org/ir/MITSeries/V1-1.pdf
4. https://ocw.mit.edu/resources/res-ll-001-introduction-to-radar-systems-spring-007/
5. www.explainthatstuff.com/radar.html

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

DIGITAL IMAGE PROCESSING

Internal Marks: 40

Course Code: P18ECT16 **External Marks:** 60

Course Prerequisite: Signals and Systems, Digital Signal Processing

COURSE OBJECTIVES:

1. Develop a theoretical foundation of fundamental Digital Image Processing concepts.
2. Study the mathematical foundations for digital manipulation of images.
3. Describe a theoretical/mathematical foundation for image restoration techniques.
4. Develop a theoretical foundation on image compression techniques with various coding methods.
5. Gain experience on color image processing techniques with various applications.

COURSE OUTCOMES:

On completion of this course, students shall be able to

1. Demonstrate knowledge of a broad range of fundamental image processing and image analysis techniques.
2. Analyze image processing problems to recognize and employ effective solutions.
3. Design the practical solutions to a range of common image processing problems
4. Analyze various coding techniques for compression problems
5. Describe the image information with transformation methods.

UNIT I (9 lectures)

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 (9 lectures)

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 **(9 lectures)**

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.

UNIT IV **(9 lectures)**

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.

UNIT – V **(9 lectures)**

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.

Applications: Transform/Subspace Methods for Image Processing I: PCA, SVD and Laplacian Eigen Map, Super resolution,

TEXT BOOKS:

1. R. C. Gonzalez, R. E. Woods, Digital Image Processing 3rd Edition, Pearson Education Publishers,2009.
2. A.K.Jain," Fundamentals of Digital Image Processing", PHI,1995.

REFERENCE BOOKS:

1. S Jayaraman, S Esakkirajan, T Veerakumar, Digital Image Processing, MC-GRAW 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.

WEB SOURCE REFERENCES:

1. https://www.coursera.org/learn/digital
2. https://www.udemy.com/topic/digital-image-processing/
3. https://onlinecourses.nptel.ac.in/noc20_ee75/preview
4. https://www.classcentral.com/course/swayam-digital-image-processing-14005
5. https://online.stanford.edu/courses/ee368-digital-image-processing

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

INTERNET OF THINGS

Internal Marks: 40

Course Code: P18ECT20 **External Marks:** 60

COURSE PREREQUISITES: Computer Architecture & Organization, Microprocessors & Microcontrollers, Python programming.

COURSE OBJECTIVES:

The course should enable the students to:

1. Learn the basic design of Internet of Things
2. Understand the Programming concepts with Arduino
3. Describe the IoT and Machine –to – Machine similarity.
4. Understand the design and development concepts of Internet of things.
5. Learn about connecting IoT physical devices and end points

COURSE OUTCOMES:

The student will be able to:

1.Analyse basic design and applications of Internet of Things.
2. Design some Arduino based prototypes.
3. Desciminate the similarity between IoT and M2M.
4. Develop design methodology for IoT system design .
5. Illustrate how to connect IoT physical devices and end points.

UNIT I (9 Lectures)

Introduction to IoT: Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Levels. Domain Specific IOTs: Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

UNIT II **(9 Lectures)**

Programming with Arduino:Introduction to Arduino, Arduino UNO-Architecture, Arduino IDE, Fundamentals of Arduino Programming, Ardiuno Interfacing - LED, Displays and sensors.

UNIT III **(10 Lectures)**

IoT AND M2M: Introduction to M2M, difference between IoT and M2M, software defined networking (SDN) and network function virtualization (NFV) for IoT.

IoT system management with NETCONF-YANG: Need for IOT Systems Management, Simple Network Management Protocol (SNMP), Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

UNIT IV **(10 Lectures)**

Developing Internet of Things: Introduction, IOT Design Methodology, case study on IoT system for weather monitoring.

Logical Design using Python: Introduction ,Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages for IoT.

UNIT V **(10 Lectures)**

IOT Physical Devices & Endpoints: What is an IOT Device, Exemplary Device: Raspberry Pi- About the Board, Interfaces-serial, SPI, I2C, and Programming Raspberry Pi, Other IOT Devices.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things: A Hands-on-Approach‖, VPT, 1st Edition, 2014.

2. Matt Richardson, Shawn Wallace, —Getting Started with Raspberry Pi, O'Reilly (SPD), 3rd Edition, 2014.

3. Simon Monk - Programming Arduino: Getting Started with Sketches, Second Edition (ELECTRONICS),2016.

Reference Books:

1. Adrian McEwen, Hakim Cassimally, —Designing the Internet of Things, John Wiley and Sons 2014.

2. Pethuru Raj and Anupama C. Raman, "The Internet of Things: EnablingTechnologies, Platforms, and Use Cases", CRC Press,2017.3."Beginning Arduino", Michal Mc Roberts, Second Edition

Web References:

1.https://www.coursera.org/specializations/iot

2. https://spoken-tutorial.org/tutorial-search/?search_foss=Arduino&search_language=English

3. https://onlinecourses.swayam2.ac.in/aic20_sp04/preview

4.https://onlinecourses.nptel.ac.in/noc20_cs66/preview

5.https://online.stanford.edu/courses/ee284a-introduction-internet-things

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

(PROFESSIONAL ELECTIVE-I)

EMBEDDED & REAL TIME OPERATING SYSTEMS

Internal Marks: 40

COURSE CODE: P18ECE01 **External Marks: 60**

COURSE PREREQUISITE: Microprocessors and Microcontrollers, Computer Organization

COURSE OBJECTIVE:

1. Understand the basic concepts of an embedded system.
2. Recognise various elements of embedded hardware and their design principles.
3. Discuss the different steps involved in the design and development of firmware for embedded systems.
4. Intrepret internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware.
5. Explain fundamental issues in hardware software co design.

COURSE OUTCOMES:

On completion of this course, students shall be able to

1. Demonistrate the basic concepts of an embedded system.
2. Analyse the hardware components required for an embedded system
3. Explain various embedded firmware design approaches on embedded environment.
4. Understand how to integrate hardware and firmware of an embedded system using real time operating system and evaluate the task synchronization
5. Examine the Hardware software codesign

UNIT-I **(9 Lectures)**

INTRODUCTION: Embedded system-Definition, history of embedded systems, classification of embedded systems, major application areas of embedded systems, purpose of embedded systems, the typical embedded system-core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT-II **(9 Lectures)**

EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

UNIT-III **(9 Lectures)**

EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versusCross-compiler.

UNIT-IV **(9 Lectures)**

REAL TIME OPERATING SYSTEM: Operating system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.

UNIT-V: **(9 Lectures)**

HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software CoDesign, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware andFirmware.

Text Books:

1. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications,2013.

2. Embedded Systems-By Shibu. K.V-Tata McGraw Hill Education Private Limited,2013.

References:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications,2013.

2. Embedded Systems-Lyla B.Das-Pearson Publications,2013.

Web Source References:

1. https://onlinecourses.nptel.ac.in/noc20_cs14/preview
2. https://www.coursera.org/specializations/embedding-sensors-motors
3. https://www.udemy.com/course/unit-testing-and-other-embedded-software-catalysts/

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

ANALOG IC DESIGN

(PROFESSIONAL ELECTIVE-I)

Internal Marks: 40

Course Code: P18ECE02 **External Marks:** 60

Course Prerequisite: Electronic devices & Circuits, STLD and VLSI Design

Course Objectives:

1. Study the small signal and large signal models of various active devices
2. Discuss the analog cmos sub-circuits.
3. Describe high concepts of single stage amplifiers.
4. Explain the various Characterization of Comparators
5. Recognise the different types of operational amplifiers.

Course Outcomes:

On completion of this course, students shall be able to

1. Understand the bias circuit concepts of different models..
2. Explain the operation of dfferent current mirrors.
3. Analyze stability of CMOS amplifiers.
4. Apply frequency compensation techniques for Amplifiers.
5. Demonstrate different models of active devices

UNIT -I: **(9 Lectures)**

MOS Devices and Modelling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modelling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOSModel.

UNIT -II: **(9 Lectures)**

Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage References, Band gap Reference.

UNIT -III: **(9 Lectures)**

CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

UNIT -IV: **(9 Lectures)**

Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators

UNIT V **(9 Lectures)**

OPERATIONAL AMPLIFIERS: Analysis of operational amplifiers circuit, slew rate model and high frequency analysis, Frequency response of integrated circuits: Single stage and multistage amplifiers, Operational amplifier noise.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition,SecondEdition.

2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition,2010.

Reference Books:

1. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and
R. G. Meyer, Wiley India, Fifth Edition,2010.
2. Analog Integrated Circuit Design- David A.Johns, Ken Martin, Wiley Student Edn,2013.
3. Phillip E.Allen Douglas R. Holberg, "CMOS Analog Circuit Design", Second Edition- Oxford
University Press-2003

Web References:

1. https://www.allaboutcircuits.com › Articles
2. https://aicdesign.org
3. http://people.ece.umn.edu › ~harjani › courses
4. https://www.wiley.com

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

BIO-MEDICAL ENGINEERING
(PROFESSIONAL ELECTIVE-I)

Internal Marks: 40

COURSE CODE: P18ECE03 **External Marks:** 60

COURSE PREREQUISITE: Engineering Physics, Biological sciences and Electronic devices & Circuits

COURSE OBJECTIVES:

1. Study the principles of electronics used in designing various diagnostic equipment and recordings of ECG, EEG and EMG.
2. Learn the principles of bio-electrodes and transducers.
3. Explain the activities and measurement of Cardiovascular and Respiratory system.
4. Gain the Knowledge on health care equipment and advanced technologies.
5. Explore different patient care and monitoring equipments and the technical details with exposure to the hospitals and health care industry.

Course Outcomes:

On completion of this course, students shall be able to

1. Demonstrate the principles of electronics used in designing various diagnostic equipment and analyze ECG, EEG and EMG recordings for disorder identification.
2. Understand principles of bio-electrodes and transducers.
3. Acquire the knowledge on activities and measurement of Cardiovascular and Respiratory system.
4. Understand about different streams in Biomedical Engineering with greater emphasis on health care equipments and the advanced technologies such as Telemedicine, Telemetry, Medical Imaging, etc.
5. Examine different patient care and monitoring equipment and provide a better technical support & usage with exposure to the hospitals and health care industry.

UNIT I **(9 Lectures)**

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION: Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Evoked Responses.

UNIT II **(9 Lectures)**

ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

UNIT III **(9 Lectures)**

CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of the Respiratory System, Tests and Instrumentation for the Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT IV **(9 Lectures)**

DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring.

UNIT V **(9 Lectures)**

PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Pacemakers, Defibrillators, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring.

MONITORS, RECORDERS AND SHOCK HAZARDS: Biopotential Amplifiers, Monitors, Recorders, Shock Hazards and Prevention, Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System.

Text Books:

1. "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
2. "Bio-Medical Instrumentation", Cromewell, Wiebell, Pfeiffer.

Reference Books:

1. "Introduction to Bio-Medical Equipment Technology", 4th Edition, Joseph J. Carr, John M.Brown, Pearson Publications.
2. "Hand Book of Bio-Medical Instrumentation", Khandapur. McGrawHill.

Web Source References:

1. www.embs.org/about-biomedical-engineering/
2. www.biomedicaltechnology.eu/
3. https://biomedical-engineering-online.biomedcentral.com/
4. https://bmes.org/ biomedical engineering society

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

ELECTRONIC SWITCHING SYSTEMS
(PROFESSIONAL ELECTIVE-I)

Internal Marks:40

Course Code:P18ECE04 **External Marks: 60**

Course Prerequisites: Digital Communication fundamentals and Computer networks.

Course Objectives:

Students will be able to

1. Learn about basic functionality of switching systems.
2. Understant the digital switching technologies and applications including wireless communications.
3. Estimate traffic congestion in any telecommunication network.
4. Discuss about call processing functions and various signal-ling schemes.
5. Gain the knowledge of packet switching, ATM and Banyan network switch.

Course Outcomes:

At the end of this course students will demonstrate the ability to:

1. Describe the fundamentals of circuit switching and distinguish complex telephone systems.
2. Differentiate the fundamentals of Space division switching and time division switching.
3. Evaluate the telecom traffic to meet defined specifications and needs.
4. Examine the control of switching networks and signalling concepts.
5. Classify the engineering concepts of packet switching and routing.

UNIT I **(9 Lectures)**

Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register translator-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.

UNIT II **(9 Lectures)**

Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems, Digital Switching in an Analog Environment.

UNIT III **(9 Lectures)**

Telecom Engineering: Network Traffic Load and Parameters, Grade of Service andBlocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems

UNIT IV **(9 Lectures)**

IV Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signaling: Introduction, Customer line signaling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Interregister signalling, Common-channel signaling principles, CCITT signaling system no. 6 and 7, Digital customer line signaling.

UNIT V **(9 Lectures)**

Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space Memory switch, Banyan Network Switch, Close Networks).

Text Book:

1. T. Viswanathan and M. Bhatnagar, Telecommunication Switching Systems and Networks, 2nd Ed., Prentice-Hall, 2018
2. J.E. Flood, “Telecommunication Switching, Traffic and Networks”, Pearson Education2016.

Reference Books:

1. John C. Bellamy, “Digital Telephony”, John Wiley, 3rd Edition, 2006

2. Roger L. Freeman, Telecommunication System Engineering, 4th Edition, John Wiley & Sons, Inc., 2004.

Web References:

1. http://www.ie.itcr.ac.cr/
2. http://www.neduet.edu.pk/
3. http://www.researchgate.net
4. http://www.mitpress.mit.edu

B.Tech. IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

(PROFESSIONAL ELECTIVE-II)
OPTICAL COMMUNICATIONS

Internal Marks: 40

Course Code:P18ECE07 **External Marks: 60**

Course Prerequisites: Applied Physics, Analog and Digital Communication.

Course Objectives:

1. Learn the properties of optical fiber that affect the performance of a communication link.
2. Study the principles of single and multi-mode optical fibers and their characteristics.
3. Explain the operation of optical sources and optical detectors.
4. Elaborate the knowledge of optical signal sources and power launching.
5. Discuss the models of analog and digital receivers.

Course Outcomes:

After completion of this course, the student is able to:

1. Analyze the working of optical fiber link and the propagation of light in optical fiber.
2. Understand the principles governing signal dispersion and optical connectors.
3. Describe the principle of optical Sources and optical detectors.
4. Analyze the characteristics of fiber optical receiver, computing probability of error.
5. Examine fiber optic link based on budgets and to assess the different losses in fibers.

UNIT I **(9 Lectures)**

Optical fiber communication: 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 fibers- Modes, V number, Mode coupling, Step Index fibers, Graded Index fibers. Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index. Fiber materials-Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers.

UNIT II **(9 Lectures)**

Types of Dispersion and Connectors: Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Types of Dispersion:- Material dispersion, Wave-guide dispersion, olarization mode dispersion, Intermodal dispersion. Pulse broadening in Graded index fiber, related problems. Optical fiber Connectors- Connector

types, Single mode fiber connectors, Connector return loss. Fiber Splicing- Splicing techniques, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.

UNIT –III **(9 Lectures)**

Optical sources and detectors: . Optical sources- LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED&ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors, Related problems

UNIT- IV **(9 Lectures)**

Source to fiber power launching: Source to fiber power launching, Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling, Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of Error, Quantum limit, Analog receivers.

UNIT – V **(9 Lectures)**

Optical system design: Optical system design - Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM, Necessity, Principles, Measurement of Attenuation and Dispersion, Eye pattern.

Textbooks:

1. Optical Fiber Communications – Gerd Keiser, MC GRAW HILL EDUCATION, 4thEdition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition,2009.

Reference Books:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson .Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

Web Source References:

1. http://nptel.iitm.ac.in/courses/
2. www.photonics.cusat.edu/links_optical_communications.html

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

ELECTRONIC MEASUREMENTS & INSTRUMENTATION

(PROFESSIONAL ELECTIVE-II)

Internal Marks: 40

Course Code: P18ECE06 **External Marks:** 60

Course Prerequisites: Electronic devices & Circuits and Network analysis

COURSE OBJECTIVES:

1. Study the concepts of different measurement systems.
2. Understand the waveform analyzers.
3. Explain the working procedure of Oscilloscopes.
4. Describe the bridge configurations and their applications.
5. Discuss the physical parameter measurements through transducers.

COURSE OUTCOMES:

1. On completion of this course, students will able to
2. Understand meters to measure various electrical parameters.
3. Apply their knowledge to differntiate various signals.
4. Analyze CRO functionality and to measure frequency.
5. Estimate the electrical parameters measurement using bridges.
6. Interpret a transducer for a specific measurement application.

UNIT I (9 Lectures)

ELECTRONIC MEASUREMENT AND INSTRUMENTATIONS: Performance characteristics of instruments, Static characteristics, Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error. DC Voltmeters- Multi-range, AC voltmeters- multi range, range extension, Aryton shunt. Thermocouple type RF ammeter.

UNIT II (9 Lectures)

SIGNAL GENERATOR: Fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Wave Analyzers, Harmonic Distortion Analyzers, and Spectrum Analyzers.

UNIT III **(9 Lectures)**

OSCILLOSCOPES : CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, simple CRO, Dual beam CRO, Dual trace oscilloscope, storage oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type.

UNIT IV **(9 Lectures)**

BRIDGES: AC Bridges Measurement of inductance- Maxwell's bridge, Anderson

Bridge.
Measurement of capacitance -Schering Bridge. Wheat stone bridge. Wien Bridge, Errors and
precautions in using bridges. Q-
meter.

UNIT V **(9 Lectures)**

TRANSDUCERS: Active & Passive transducers: Resistance, Capacitance, inductance; Strain gauges, LVDT, Thermocouples.

MEASUREMENT: Measurement of physical parameters force, pressure, velocity, speed, humidity, Data acquisition systems.

Text Books:

1. H.S.Kalsi, **Electronic Instrumentation**, 2nd Edition, McGraw Hill, 2004.
2. A.D. Helfrick and W.D. Cooper, **Modern Electronic Instrumentation and Measurement**
Techniques, PHI, 5thEdition,
2002.

Reference Books:

1. David A. Bell, **Electronic Instrumentation& Measurements**, PHI, 2ndEdition, 2003.
2. Robert A.Witte, **Electronic Test Instruments**, **Analog and Digital Measurements**, Pearson Education, 2nd Edition, 2004.
3. K. Lal Kishore, **Electronic Measurements& Instrumentations**, Pearson Education, 2005.

Web Source References:

1. www.ocw.mit.edu
2. www.home.agilent.com

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

ARTIFICIAL NEURAL NETWORKS

(PROFESSIONAL ELECTIVE-II)

Internal Marks: 40

Course Code:P18ECE05 **External Marks:** 60

Course Prerequisite: Mathematical fundamentals and Digital Signal Processing.

Course Objectives:

1. Learn the Basic concepts of Neural Network.
2. Discuss fundamental concepts different network structures of artificial neural networks.
3. Study the single and multi layer perceptron.
4. Impart knowledge about the fundamentals of feed forward and back propagation algorithm.
5. Comprehend the concepts in advanced artificial neural network.

Course Outcomes:

By completing this course the student will be able to:

1. Explain the basic concepts in Neural Networks and applications.
2. Describe the appropriate learning rules for each of the architectures and its neural network paradigms.
3. Apply different neural networks of various architectures both feed forward and feed backward.
4. Evaluate the testing of neural networks for various pattern recognition applications.
5. Analyze different applications of advanced neural networks.

UNIT I **(9 Lectures)**

INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS: Introduction, history, structure and function of single neuron, neural net architectures, neural learning, use of neural networks.

UNIT II **(9 Lectures)**

FUNDAMENTAL CONCEPTS OF ARTIFICIAL NEURAL NETWORKS: McCulloch-Pitts model, different network structures, Feedforward & feedback networks, Learning rules; Hebbian learning rule, Perception learning rule, Delta learning rule, MCP error correction-based learning.

UNIT III **(9 Lectures)**

SINGLE LAYER PERCEPTRON: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment.

MULTILAYER PERCEPTRON: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

UNIT IV **(9 Lectures)**

PERCEPTRON LEARNING ALGORITHMS: learning algorithm types (supervised vs. unsupervised), vector notation, algorithmic learning, Markov Decision Processes and Dynamic Programming.

BACK-PROPAGATION LEARNING ALGORITHM: Activation functions, back propagation learning algorithm theory, implementation of back propagation on Feed Forward Nets.

UNIT V **(9 Lectures)**

ADVANCED NEURAL NETWORK TOPICS OVERVIEW: Clustering, k-means and k-nearest neighbours, PCA, one vs. two-layer networks, overfitting vs. underfitting, gradient descent, momentum, initial weight selection, data decorrelation, complexity theory, associative memories.

Text Books:

1. Laurene Fausett, "Fundamentals of Neural Networks" , Pearson Education, 2004.

2. Simon Haykin, "Neural Networks- A comprehensive foundation", Pearson Education, 2003.

Reference Books:

1. S.N.Sivanandam, S.Sumathi,S. N. Deepa "Introduction to Neural Networks using MATLAB 6.0", TATA Mc Graw Hill, 2006.

2. S. Rajasekharan and G. A. Vijayalakshmi pai, "Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications", PHI Publication, 2004.

Web Source References:

1. https://nptel.ac.in/courses/117/105/117105084/
2. http://neuralnetworksanddeeplearning.com/
3.https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_neural_networks.htm

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

NANO ELECTRONICS

(PROFESSIONAL ELECTIVE-II)

Internal Marks: 40

Course Code: P18ECE08 **External Marks: 60**

Course Prerequisite: Engineering Physics, Electronic devices & Circuits.

Course Objectives:

Students undergoing this course are exposed to:

1. Study the types of nanotechnology, atomic structure, molecular technology and preparation of nano materials.
2. Understand the fundamentals of nano electronics and its properties.
3. Demonstrate the quantum transport devices.
4. Familiarize the students with the concepts of carbon nano tubes.
5. Gain knowledge for studying molecular electronics and fundamentals.

Course Outcomes: The students will be able to

1. Obtain the skills in nanotechnology, molecular technology and the preparation of nano materials.
2. Understand the fundamental concepts of Nanoelectronics.
3. Analyze the principles of silicon MOSFET and Quantum Transport Devices.
4. Demonstrate the working priciple of carbon nano tubes.
5. Explore the knowledge of molecular electronics.

UNIT I **(9 Lectures)**

INTRODUCTION TO NANOTECHNOLOGY: Discussion of the International Technology Roadmap characteristics: Need for new concepts in electronics from microelectronics towards bio-molecule electronics.

MOLECULAR NANOTECHNOLOGY: Electron Microscope – Scanning Electron Microscope – Atomic Force Microscope –Scanning Tunneling Microscope.
Nanomaterials:Preparation –Plasma Arcing – Chemical Vapor Deposition – Sol-Gels – Electrode Position – Ball Milling –Applications of Nanomaterials.

UNIT II **(9 Lectures)**

FUNDAMENTALS OF NANOELECTRONICS: Fundamentals of logic devices:- Requirements – dynamic properties – threshold gates; physical limits to computations; concepts of logic devices:- classifications – two terminal devices – field effect devices – coulomb blockade devices – spintronics – quantum cellular automata – quantum computing – DNA computer; performance of information processing systems;- basic binary operations, measure of performance processing capability of biological neurons – performance estimation for the human brain. Ultimate computation:- power dissipation limit – dissipation in reversible computation – the ultimate computer.

UNIT III **(9 Lectures)**

SILICON MOSFETs & QUANTUM TRANSPORT DEVICES: Silicon MOSFETS - Novel materials and alternate concepts:- fundamentals of MOSFET Devices- scaling rules – silicon-dioxide based gate dielectrics – metal gates – junctions & contacts – advanced MOSFET concepts.

QUANTUM TRANSPORT DEVICES BASED ON RESONANT TUNNELING: Electron tunneling – resonant tunneling diodes – resonant tunneling devices; Single electron devices for logic applications- Single electron devices – applications of single electron devices to logic circuits.

UNIT IV **(9 Lectures)**

CARBON NANOTUBES: Fullerenes - types of nanotubes – formation of nanotubes – assemblies – purification of carbon nanotubes – electronic properties – synthesis of carbon nanotubes – carbon nanotube interconnects – carbon nanotube FETs – Nanotube for memory applications – prospects of all carbon nanotube nanoelectronics.

UNIT V **(9 Lectures)**

MOLECULAR ELECTRONICS: Electrodes & contacts – functions – molecular electronic devices – first test systems – simulation and circuit design – fabrication; Future applications: MEMS – robots – random access memory – mass storage devices.

Text Books:

1. Michael Wilson, KamaliKannangara, Geoff Smith, Michelle Simmons and Burkhard

2. Raguse, Nanotechnology: Basic Science and Emerging Technologies, Chapman & Hall / CRC, 2002.

3. Rainer Waser (Ed.), Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices, Wiley-VCH, 2003.

4. T. Pradeep, NANO: The Essentials – Understanding Nanoscience and Nanotechnology, TMH, 2007.

Reference Books:

1. M.Ziese and M.J Thornton(Eds.)"Spin Electronics ", Springer-verlag 2001.

2. M.Dutta and M.A Stroscio Edited by "Quantum Based Electronic Devices and systems", world Scientific, 2000.

WEB SOURCE REFERENCES:

1. https://www.edx.org/course/fundamentals-nanoelectronics-part-b-purduex-nano521x.

B.Tech. IV Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

(OPEN ELECTIVE-III)

FUNDAMENTALS OF BIG DATA

Internal Marks: 40

COURSE CODE: P18CSO08 **External Marks: 60**

COURSE PREREQUISITE: Should have knowledge of one Programming Language (Java preferably), Practice of SQL (queries and sub queries), exposure to Linux Environment.

COURSE OBJECTIVES :

- Understand the Big Data Platform and its Use cases
- Provide an overview of Apache Hadoop
- Provide HDFS Concepts and Interfacing with HDFS
- Understand Map Reduce Jobs
- Provide hands on Hodoop Eco System
- Apply analytics on Structured, Unstructured Data.
- Exposure to Data Analytics with R.

COURSE OUTCOMES:

The students will be able to:

- Identify Big Data and its Business Implications.
- List the components of Hadoop and Hadoop Eco-System
- Access and Process Data on Distributed File System
- Manage Job Execution in Hadoop Environment
- Develop Big Data Solutions using Hadoop Eco System
- Analyze Infosphere BigInsights Big Data Recommendations.
- Apply Machine Learning Techniques using R.

Pre- requisites :

UNIT I : **(9 Lectures)**

INTRODUCTION TO BIG DATA AND HADOOP

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

UNIT II : **(9 Lectures)**

HDFS(Hadoop Distributed File System)

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives,
Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III : **(9 Lectures)**

Map Reduce

Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV : **(9 Lectures)**

Hadoop Eco System

Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined
Functions, Data Processing operators.

Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.

Hbase : HBasics, Concepts, Clients, Example, Hbase Versus RDBMS.

Big SQL : Introduction

UNIT V :

Data Analytics with R

Machine Learning : Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR

Text Books :

- Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
- Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015.

References :

- Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
- Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
- Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
- Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.
- Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012.
- Glen J. Myat, "Making Sense of Data", John Wiley & Sons, 2007
- Pete Warden, "Big Data Glossary", O'Reily, 2011.
- Michael Mineli, Michele Chambers, Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley Publications, 2013.
- ArvindSathi, "BigDataAnalytics: Disruptive Technologies for Changing the Game", MC Press, 2012
- Paul Zikopoulos ,Dirk DeRoos , Krishnan Parasuraman , Thomas Deutsch , James Giles , David Corigan , "Harness the Power of Big Data The IBM Big Data Platform ", Tata McGraw Hill Publications, 2012.

B.Tech. IV Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

INTRODUCTION TO DATA SCIENCE

(OPEN ELECTIVE-III)

Internal Marks: 40

COURSE CODE: P18CSO08 **External Marks: 60**

COURSE PREREQUISITE : : Should have knowledge of one Programming Language (Java preferably).

COURSE OBJECTIVES :

Students undergoing this course are exposed to:

1. Study Roles of Data science and applications.
2. Understand the fundamentals of Data collection and Data Pre-Processing.
3. Learn about the Exploratory Data Analytics.
4. Familiarize the students with the concepts of Models development using Data Science.
5. Gain knowledge about Model evaluation.

Course Outcomes: The students will be able to

1. Obtain the skills in Data science and applications
2. Analyze the concepts of Data collection and Data Pre-Processing.
3. Understand the concepts on Exploratory Data Analytics .
4. Apply the concepts for model development in data science.
5. Understand the concept of Model Evaluation.

Unit – I: **(9 Lectures)**

Introduction

Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

Unit – II: **(9 Lectures)**

Data Collection and Data Pre-Processing

Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

Unit – III: **(9 Lectures)**

Exploratory Data Analytics

Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots – Pivot Table – Heat Map – Correlation Statistics – ANOVA.

Unit – IV: **(9 Lectures)**

Model Development

Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

Unit – V: **(9 Lectures)**

Model Evaluation

Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search.

TEXTBOOKS:

1. Jojo Moolayil, “Smarter Decisions : The Intersection of IoT and Data Science”, PACKT, 2016.
2. Cathy O’Neil and Rachel Schutt , “Doing Data Science”, O'Reilly, 2015.
3. David Dietrich, Barry Heller, Beibei Yang, “Data Science and Big data Analytics”, EMC 2013
4. Raj, Pethuru, “Handbook of Research on Cloud Infrastructures for Big Data Analytics”, IGI Global.

B.Tech. IV Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

POWER ELECTRONICS

(OPEN ELECTIVE-III)

Internal Marks: 40

COURSE CODE: P18EEO11 **External Marks: 60**

COURSE PREREQUISITE: Semi Conductor Devices, Mathematics, Control Systems

COURSE OBJECTIVES:

1. To study the characteristics of various power semiconductor devices and to design firing circuits for SCR.
2. To understand the operation of single phase and three phase converters.
3. To understand the operation of different types of DC-DC converters.
4. To understand the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
5. To analyze the operation of AC-AC regulators.

COURSE OUTCOMES:

After completion of this course, the student is able to:

1. Explain the characteristics of various power semiconductor devices and analyze the static and dynamic characteristics of SCR's. Design firing circuits for SCR.
2. Explain the operation of single phase and three phase converters.
3. Analyze the operation of different types of DC-DC converters.
4. Explain the operation of inverters and application of PWM techniques for voltage control and harmonic mitigation.
5. Analyze the operation of AC-AC regulators.

UNIT – I **(10 Lectures)**

Power Semi-Conductor Devices : Thyristors–Silicon controlled rectifiers (SCR's) – Characteristics of power MOSFET and power IGBT– Basic operation of SCR–Static characteristics– Turn on and turn off methods–Dynamic characteristics of SCR– SCR- R and RC firing circuits. Snubber circuit design.

UNIT – II **(12 Lectures)**

AC-DC Converters: Single-phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode, single-phase full wave controlled rectifiers – center tapped configuration and bridge configuration- R load and RL load with and without freewheeling diode, Effect of source inductance in single-phase fully controlled bridge rectifier with continuous conduction. Three -phase half wave controlled rectifier with R and RL load, three -phase fully controlled rectifier with R and RL load (operation).

UNIT –III **(8 Lectures)**

DC–DC Converters : Analysis of Buck, boost, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM output voltage ripple & inductor current, ripple for CCM only.

UNIT- IV **(10 Lectures)**

DC–AC Converters : Single - phase half bridge and full bridge inverters with R and RL loads, Three-phase square wave inverters – 1200 conduction and 1800 conduction modes of operation – PWM inverters – Sinusoidal pulse width modulation – Prevention of shoot through fault in Voltage Source Inverter (VSI) and Current Source Inverter (CSI).

UNIT – V **(10 Lectures)**

AC Voltage Regulators : Static V-I characteristics of TRIAC and modes of operation – single-phase AC-AC regulator phase angle control and integrated cycle control with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R load only – Transformer tap changing using anti parallel thyristors.

Textbooks:

1. Power Electronics – by P.S.Bhimbra, Khanna Publishers.

2. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998

Reference Books:

1. Elements of Power Electronics–Philip T.Krein.oxford.

2. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M.

3. Power Electronics handbook by Muhammad H.Rashid, Elsevier.

4. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009.

Web References:

8. https://www.niehs.nih.gov/health/topics/agents/emf/index.cfm

9. https://www.electrical4u.com

10. https:indiabix.com

11. http://www.ece.uah.edu

B.Tech. IV Year I Semester **Course Structure**

L	T	P	C
2	0	0	2

FUNDAMENTALS OF CLOUD COMPUTING

(OPEN ELECTIVE-III)

Internal Marks: 40

COURSE CODE: P18CSO07 **External Marks: 60**

COURSE PREREQUISITES: NIL

COURSE OBJECTIVES:

1. The cloud environment, building software systems and components that scale to millions of users in modern internet.
2. Cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and Virtualizations.
3. Developing cloud based software applications on top of cloud platforms.
4. Programming and Software Environments on different cloud platforms.
5. Understanding of cloud resource management scheduling algorithms and file systems.

COURSE OUTCOMES:

1. Apply the key dimensions of the challenge on Cloud Computing
2. Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization
3. Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
4. Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas.
5. Accessing the data from different file systems on different cloud flat forms.

UNIT I: **(8 Lectures)**

Systems modeling, Clustering: Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency.

UNIT II: **(7 Lectures)**

Virtual Machines and Virtualization: Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices.

UNIT III: **(8 Lectures)**

Cloud Platform Architecture: Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture.

UNIT IV: **(7 Lectures)**

Cloud Programming and Software Environments: Parallel & Distributed Programming Paradigms, Programming on Amazon AWS- Simple Storage Service(S3) Architecture and Microsoft Azure, Emerging Cloud Software Environments.

UNIT V: **(6 Lectures)**

Cloud Resource Management and Scheduling and Storage Systems:
Policies and Mechanisms for Resource Management, Two level Resource Allocation
Architect
ure.

Storage models: Distributed Vs parallel file systems: Google file system. Apache Hadoop, BigTable.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.\
3. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti,University

References:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert
   Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar
   Buyya, Christen vecctiola, S Tammaraiselvi, TMH.

Web References:

1. https://pdfs.semanticscholar.org/0c79/1585b91e80320e9cbff9edefcdd834bd2791.pdf
2. http://www.ijircce.com/upload/2017/january/49_2_NEW.pdf
3. https://www.ripublication.com/irph/ijict_spl/ijictv4n1spl_07.pdf
4. http://aircconline.com/ijist/V6N2/6216ijist01.pdf
5. www.javatpoint.com

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS LAB

Internal Marks: 40

COURSE CODE: P18ECL12 **External Marks:** 60

COURSE OBJECTIVES:

1. Learn detailed practical study on microwave equipments.
2. Study optical devices and to use in the appropriate applications.

COURSE OUTCOME: on completion of this course, students shall be able to

1. Understand how communication is being established at microwave frequencies.
2. Examine how communication is being established using fiber optical communication.

MINIMUM TWELVE EXPERIMENTS TO BE CONDUCTED:

Part – A (Any 7 Experiments)

1. Reflex klystron characteristics
2. Gun diode VI characteristics
3. Attenuation measurement
4. Directional coupler characteristics
5. VSWR measurement
6. Impedance and frequency measurement
7. Scattering parameters of Circulator
8. Scattering parameters of Magic Tee
9. Radiation pattern of Horn Antenna

PART – B (Any 5 Experiments)

10. Characterization of LED
11. Characterization of Laser diode
12. Intensity modulation of laser output through an optical fiber
13. Design of fiber optic digital link for transmission of digital signals
14. Measurement of numerical aperture
15. Measurement of losses of analog optical link

EQUIPMENT REQUIRED:

For Part - A

1. Regulated Klystron Power Supply
2. VSWR Meter
3. Multimeter
4. CRO
5. GUNN Power Supply, Pin Modulator
6. Reflex Klystron
7. Microwave components
8. Pyramidal Horn Antennas
9. Directional Coupler

For Part-B

10. Fiber Optic Analog Trainer based LED
11. Fiber Optic Analog Trainer based Laser
12. Fiber Optic Digital Trainer
13. Fiber Cables – (Plastic, Glass)

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
0	0	3	1.5

INTERNET OF THINGS LAB

Internal Marks: 40

Course Code: P18ECL10 **External Marks:** 60

Course Objectives:

1.Develop an IoT enabled technologies which are cost effective and socially relevant.
2.Study the field of IoT based application development.

Course Outcomes:

By the end of the lab students will be able to

1. Design the IoT simple projects for basic applications with sensors.
2. Understand the IoT testbed which is an open and developing ecosystem of edge devices, communication protocols, cloud-based platforms.

MINIMUM TWELVE EXPERIMENTS TO BE CONDUCTED:

PART – A (Any 6 Experiments)

ARDUINO BASED EXPERIMENTS:

1. LED Blink and Pattern
2. 7 Segment Display
3. LM35 Temperature Sensor
4. Night Light Controlled & Monitoring System
5. Fire Alarm Using Arduino
6. Ultrasonic Distance Measurement
7. IR Sensor Based Security System.

PART – B (Any 6 Experiments)

RASPBERRY Pi BASED EXPERIMENTS:

1. ThinkSpeak Based DHT Sensor Monitoring
2. Node Red Based IOT Configuration
3. AWS IOT Basic Configuration
4. Alexa based Home Automation System
5. MQTT Protocol Configuration Using Python
6.. A Heart Rate Monitoring System
7. AWS Based DHT Sensor

Equipment Required:

For Part - A

1. Arduino Uno
2. 9/12V Battery
3. Computer with Arduino IDE software
4. jumper cables
5. Center tapped transformer (230/6-0-6V) (As required).

For Part-B

1. Raspberri Pi
2. 9/12V Battery
3. Computer with Raspberry Pi supported IDE software
4. jumper cables
5. Center tapped transformer (230/6-0-6V) (As required).
6. 16 x 2 LCD display

B. Tech IV Year I Semester **Course Structure**

L	T	P	C
3	0	0	3

EMPLOYABILITY SKILLS

Internal Marks: 40

Course Code: P18MCT14 **External Marks:** 60

Course Prerequisite:

COURSE OBJECTIVES:

The main aim of this course is
To learn how to make effective teams, personality development and leadership skills.

- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self management skills for the work site

COURSE OUTCOMES:

By the end of this course, the student

- Recite the corporate etiquette.
- Make presentations effectively with appropriate body language
- Be composed with positive attitude
- Apply their core competencies to succeed in professional and personal life

A list of vital employability skills from the standpoint of engineering students with discussion how to potentially develop such skills through campus life.

UNIT-1 **(9 Lectures)**

Career Mapping: Inculcate workplace and professional etiquettes. Tips for Success. Etiquette and Manners – Social and Business. Time Management – Concept, Essentials, Tips.

UNIT-2 **(9 Lectures)**

Personality Development – Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills.
Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills, Case studies and discussions etc.

UNIT-3 **(9 Lectures)**

Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution.

Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress

UNIT-4 **(9 Lectures)**

Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills.
Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills.

UNIT-5 **(9 Lectures)**

Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to enhance Emotional Intelligence.

References Books:

1) Wallace, Personality Development, India Edition, CENGAGE Learning, 2008.
2) P.Subba Rao ,Personnel and Human Resource Management , Himalaya Publishing House; Fifth Edition,2015
3) Ramachandran and Karthik, From campus to Corporate, India, PEARSON Publication, 2016.
4) Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
5) S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
6) Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.

Related Activities

- Comparing company Work culture, Nature and Management styles - company information.
- Handling personnel matters – eg Time management, Communication at work.
- Role plays of chairing business meetings and negotiations.
- Conflicts resolution Games
- Team building and leadership skills Case studies and discussions
- Find out the leadership styles of various companies CEO’s.
- Tips for Enhancing Your Own Emotional Intelligence or Teams

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

(PROFESSIONAL ELECTIVE-III)
WIRELESS SENSOR NETWORKS

Internal Marks: 40

COURSE CODE:P18ECE09 **External Marks:** 60

COURSE PREREQUISITES: Computer Networks, Wireless Communication.

COURSE OBJECTIVES:

1. Understand the fundamentals of wireless sensor networks, energy consumption and its gateway concepts.
2. Study the various physical and MAC layers and devices in the layer with its traditional protocols.
3. Learn the various network and transport layers and devices in the layer with its traditional protocols.
4. Discuss the establishment of infrastructure with localization and synchronization.
5. Obtain WSN including hardware and software development.

COURSE OUTCOMES:

On completion of this course, students shall be able to

1. Analyse ad-hoc and sensor networks and energy consumption methods.
2. Examine the functionality of physical layer transceiver and appropriate MAC protocol.
3. Analyze the routing and congestion entities for transport of data.
4. Apply appropriate protocols for synchronization and localization.
5. Describe technical knowledge in building a WSN with hardware and software skills.

UNIT I: **(9 Lectures)**

Introduction: Introduction to adhoc/sensor networks: Key definitions of adhoc/ sensor networks, Issues and challenges in design of sensor network, sensor network architecture, data dissemination and gathering, Energy consumption of Sensor nodes, Sensor network scenarios, Optimization goals and figures of merit, Gateway concepts.

UNIT II **(9 Lectures)**

Physical and MAC Layers: Physical layer and transceiver design considerations in WSNs,

Fundamentals of MAC Protocols for wireless sensor networks, SMAC, IEEE 802.15.4.

UNIT III **(9 Lectures)**

Network and Transport Layers:

Routing protocols, Energy-efficient unicast, Broadcast and multicast, Geographic routing, Mobile nodes, Data-centric and content-based networking, Transport layer and quality of service in wireless sensor network, Coverage and deployment, Reliable data transport, Single packet delivery, Block delivery, Congestion control and rate control.

UNIT IV **(9 Lectures)**

Infrastructure Establishment: Time Synchronization, Introduction to time synchronization problem, Protocols based on sender receiver synchronization, Protocols based on receiver synchronization, Localization and positioning, Single hop localization and Positioning in multichip environment.

UNIT V **(9 Lectures)**

Sensor Network Platforms And Applications: Sensor node Hardware, Node level software platforms, Node level simulators, Advanced application support, Advanced in-network processing, Application-specific support.

Text Books:

1.Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.

2.Feng Zhao and Leonides Guibas, "Wireless sensor networks ", Elsevier publication - 2004.

Reference Books:

1.C. Siva Ram Murthy, and B. S. Manoj, "AdHoc Wireless networks ", Pearson Education - 2008.

2.Wireless Sensor Networks – C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.

WEB SOURCE REFERENCES:

1. http://profsite.um.ac.ir/~hyaghmae/ACN/WSNbook.pdf

2. https://people.eecs.berkeley.edu/~prabal/teaching/cs294-11-f05/slides/day21.pdf

3. http://vlab.amrita.edu/index.php?sub=78

4. http://jips.jatsxml.org/Article/11/2/205

5. ttp://rad.ihu.edu.gr/fileadmin/labsfiles/wireless_communications/DOCUMENTATION/doc_vlab4.pdf

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

SPEECH PROCESSING

(PROFESSIONAL ELECTIVE-III)

Internal Marks:40

Course Code: P18ECE10 **External Marks:60**

Course Prerequisite: Signals and Systems, Digital Signal Processing

Course Objectives: This course enables students to:

1. Study the models for speech production.
2. Develop time and frequency domain techniques for estimating speech parameters.
3. Impart the knowledge on a predictive technique for speech compression.
4. Understand speech recognition, synthesis and speaker identification systems.
5. Recognize a Linear Predictive Analysis for speech signals.

Course outcomes:

Upon completion of the course, students will be able to:

1. Understand model speech production system and describe the fundamentals of speech.
2. Compare and extract different speech parameters.
3. Choose an appropriate speech model for a given application.
4. Analyse speech recognition, synthesis and speaker identification systems.
5. Apply Linear Predictive Parameters to illustrate speech signals.

UNIT-I **(9 Lectures)**

Fundamentals of Human Speech Production: The Process of Speech Production, Short-Time Fourier Representation of Speech, The Acoustic Theory of Speech Production, Lossless Tube Models of the Vocal Tract, Digital Models for Sampled Speech Signals.

UNIT-II **(9 Lectures)**

Time-Domain Methods for Speech Processing: Introduction to Short-Time Analysis of Speech, Short-Time Energy and Short-Time Magnitude, Short-Time Zero-Crossing Rate, The Short-Time Autocorrelation Function, The Modified Short-Time Autocorrelation Function, The Short-Time Average Magnitude Difference Function.

UNIT-III **(9 Lectures)**

Frequency Domain Methods for Speech Processing: Discrete-Time Fourier Analysis, Short- Time Fourier Analysis, Spectrographic Displays, Overlap Addition(OLA),Method of Synthesis, Filter Bank Summation(FBS) Method of Synthesis, Time-Decimated Filter Banks, Two-Channel Filter Banks, Implementation of the FBS Method Using the FFT, OLA Revisited, Modifications of the STFT.

UNIT-IV **(9 Lectures)**

The Cepstrum and Homomorphic Speech Processing: Homomorphic Systems for Convolution, Homomorphic Analysis of the Speech Model, Computing the Short-Time Cepstrum and Complex Cepstrum of Speech, Homomorphic Filtering of Natural Speech, Cepstrum Analysis of All-Pole Models, Cepstrum Distance Measures.

UNIT-V **(9 Lectures)**

Linear Predictive Analysis of Speech Signals: Basic Principles of Linear Predictive Analysis, Computation of the Gain for the Model, Frequency Domain Interpretations of Linear Predictive Analysis, Solution of the LPC Equations, The Prediction Error Signal, Some Properties of the LPC Polynomial A(z), Relation of Linear Predictive Analysis to Lossless Tube Models.

Text Book:

Theory and Applications of Digital Speech Processing-Rabiner and Schafer, Pearson Education 2011.

Reference Books:

1. **Fundamentals of Speech Recognition-** Lawrence Rabiner and Biing-Hwang Juang, Pearson Education, 2003.

2. Speech and Language Processing–An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition- Daniel Jurafsky and James H Martin, Pearson Prentice Hall 2009.

Web References:

1.https://web.stanford.edu/~jurafsky/slp3/26.pdf

2.https://research.iaun.ac.ir/pd/mahmoodian/pdfs/UploadFile_2643.pdf

3.https://web.ece.ucsb.edu/Faculty/Rabiner/ece259/digital%20speech%20processing%20cours e/final_speech_paper_1_2008.pdf

4.https://nptel.ac.in/courses/117/105/117105145/

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	4

AD-HOC NETWORKS
(PROFESSIONAL ELECTIVE-III)

Internal Marks: 40

COURSE CODE:P18ECE11 **External Marks:** 60

COURSE PREREQUISITE: Computer Networks, Wireless Communications.

COURSE OBJECTIVES:

1. Study about the basics of Ad-hoc networks.
2. Understand the challenges in Medium Access Control.
3. Recognize the challenges in routing protocols in Network layer.
4. Describe the challenges in Transport layer and security issues for Adhoc networks.
5. Learn the various design concepts of Energy consumption in Adhoc Networks

COURSE OUTCOMES:

On completion of this course, students shall be able to

1. Identify the basic characteristics of Ad-hoc networks.
2. Analyze deficiencies in existing wireless protocols for MAC layer.
3. Compare types of routing protocols used for unicast and multicast routing.
4. Examine the Transport mechanisms and network security solution.
5. Evaluate the energy management schemes and Quality of service solution in ad hoc networks

UNIT I **(9 Lectures)**

Ad-hoc Networks: Introduction to Adhoc Networks, Modelling Ad-hoc Networks, Degree in Ad-hoc Networks, Hop-count in Adhoc Networks, Issues in Ad Hoc Wireless Networks.

UNIT II **(9 Lectures)**

MAC Protocols for Wireless Networks: Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention – Based Protocols, Contention – Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms.

UNIT III **(9 Lectures)**

ROUTING PROTOCOLS: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On

– Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT IV **(9 Lectures)**

TRANSPORT LAYER AND SECURITY PROTOCOLS: Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks. Security in Ad hoc Wireless network.

UNIT V **(9 Lectures)**

Energy Management in Adhoc Networks: Need for Energy management in Adhoc Networks, Classification of Energy management schemes, Battery Management schemes, Transmission power management schemes.

Text Books:

1. C. S. Ram Murthy, B. S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Prentice Hall of India , 2nd Edition, 2005

2. Ramin Hekmat, Ad-hoc Networks: Fundamental Properties and Network Topologies, Springer , 1st Edition, 2006

Reference Books:

1. Xiuzhen Cheng, Xiao Huang ,Ding Zhu DU ,"Ad hoc wireless networking", Kluwer Academic Publishers,2004.
2. B. Tavli and W. Heinzelman, Mobile Ad Hoc Networks: Energy-Efficient Real-Time Data Communications, Springer , 1st Edition, 2006.

Web Source References:

1. **http://vlabs.iitkgp.ac.in/ant/7/theory/.**
2. **https://research.ece.ncsu.edu/netwis/multihop_networks.php**
3. **http://vlabs.iitb.ac.in/vlabs-dev/labs_local/computer-networks/labs/explist.php**

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	4

DIGITAL IC DESIGN

(PROFESSIONAL ELECTIVE-III)

Internal Marks: 40

COURSE CODE:P18ECE12 **External Marks:** 60

COURSE PREREQUISITES: Digital Logic Design, VLSI Design

COURSE OBJECTIVES:

1. The student will be able to understand theMOSDesign
2. Design the CMOS complex logic gates and its properties.
3. Study the CMOS Circuit characterization and performance estimation
4. The concepts of Semiconductor Memories, Flash Memory, RAMarrayorganization
5. Learn about various Array logics

COURSE OUTCOMES:

On completion of this course, students shall be able to

1. Understand the concepts ofMOS Design.
2. Design the combinational and seqential logic circuits.
3. Estimate the performance and charecteristics of CMOS circuits.
4. Understand the Concepts of Semiconductor Memories, Flash Memory, RAM
5. Analyze diferrent FPGA and CPLD architectures.

UNIT I **(9 Lectures)**

CMOS : Pseudo NMOS Logic – Inverter, Inverter threshold voltage, output high voltage, Output Low voltage, gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

UNIT II **(9 Lectures)**

DESIGN OF COMBINATIONAL AND SEQENTIAL CIRCUITS

Static CMOS design, Different styles of logic circuits, Logical effort of complex gates, Static and dynamic properties of complex gates, Dynamic CMOS Logic. Timing metrics of sequential circuits, Dynamic latches and Registers, Pipelining.

UNIT III **(9 Lectures)**

INTERCONNECT AND TIMING ISSUSES: Circuit characterization and performance estimation - Resistance, Capacitance estimation - Switching characteristics - Delay models – Timing issues in Digital circuits, Power dissipation. Impact of Clock Skew and Jitter.

UNIT IV **(9 Lectures)**

SEMICONDUCTOR MEMORIES: Memory Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory- NOR flash and NANDflash..

UNIT V **(9 Lectures)**

PROGRAMBLE LOGIC DEVISES:
Introduction to PLA, PAL, PLD/CPLD, PGA/ FPGA, ASIC their applications and Architecture.

Text Books:

1. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2011.
2. Digital design by John-Wakerley, 4th edition.
3. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.

Reference Books:

1. Ming-BO Lin, "Introduction to VLSI Systems: A Logic, Circuit and System Perspective", CRC Press, 2011
2. Digital Integrated Circuits: A design perspective" by Rabaey
3. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, 2nd Ed., PHI.

Web Source References:

1. https://onlinecourses.nptel.ac.in/noc20_ee05/preview
2. https://www.master-micro.com/mastering-microelectronics/courses/digital-ic-design/
3. http://www.ee.iitm.ac.in/vlsi/courses/ee5311_2017#ee5311digital_ic_design

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

(PROFESSIONAL ELECTIVE-IV)

SATELLITE COMMUNICATIONS

Internal Marks: 40

Course Code: P18ECE13 **External Marks:** 60

Course Prerequisites: Analog communications and digital communications

Course Objectives:

1. Understand the basic concepts of satellite communications.
2. Study the concept of orbital mechnism and orbital effects in satellite communications.
3. Explore the various satellite subsystems and its functionality.
4. Learn the concept of Satellite links and multiaccess techniques.
5. Discuss about earth station technolgy,satellite navigation and GPS.

Course Outcomes:

On completion of this course, students shall be able to

1. Explain the concepts, applications and subsystems of Satellite communications.
2. Understand the concepts of orbital mechnism of satellite communication.
3. Demonstrate all satellite sub systems design and functionality of each subsystem.
4. Describe the functinality of multiple access techniques on satellite links.
5. Estimate the navigation of the satellite and its positioning using GPS.

UNIT I **(9 Lectures)**

INTRODUCTION: Origin of Satellite Communications, Historical Background, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

UNIT II **(9 Lectures)**

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles

UNIT III **(9 Lectures)**

SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems.

UNIT IV **(9 Lectures)**

SATELLITE LINK DESIGN: Basic transmission theory, system noise temperature and G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N.

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermediation, Time division Multiple Access (TDMA) Frame structure. Satellite Switched TDMA, DAMA, Code Division multiple access (CDMA), Spread spectrum transmission and reception.

UNIT V **(9 Lectures)**

EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.

SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM: GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS receiver operation.

Text Books:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

Reference Books:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication – D.C Agarwal
3. Fundamentals of Satellite Communications – K.N. Raja Rao

Web Source References:

1. https://www.tutorialspoint.com/satellite_communication/satellite_communication_introduction.htm
2. https://www.youtube.com/watch?v=dUTPcBT2XUM
3. https://www.youtube.com/watch?v=RDNwtZQ3GaY

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

CELLULAR AND MOBILE COMMUNICATIONS (PROFESSIONAL ELECTIVE-IV)

Internal Marks: 40

Course Code:P18ECE14 **External Marks: 60**

Course Prerequisite: Digitalcommunications, Computer networks. Course Objective:

1. Identify the basic cellular concepts like frequency reuse, cell splitting, cellsectoring etc, and various cellular systems.
2. Analyze the different types of interferences influencing cellular and mobile communications.
3. Distinguish the frequency management, channel assignment and various propagation effects in cellular environment.
4. Differentiate the types of antennas used at cell site and mobile.
5. Describe the concepts of handoff and architectures of GSM.

Course Outcomes:

On completion of this course, students shall be able to

1. Understand the limitations of conventional mobile telephone systems; understand the concepts of cellular systems.
2. Interpret the frequency management, channel assignment strategies and antennas in cellular systems.
3. Explain the concepts of Antenna patterns and architectures of various cellular systems.
4. Demonstrate the concept of various types Handoff and their evolution.
5. Describe the concepts of GSM and multiple access schemes.

UNIT-I **(9 Lectures) CELLULAR CONCEPTS:** Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trunking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.

UNIT II **(9 Lectures) INTERFERENCE** :Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Reduction Factor, desired C/I from a normal case in a omni directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-co channel interference-different types.

UNIT III **(9 Lectures)**

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells.

CELL COVERAGE FOR SIGNAL AND TRAFFIC: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, straight line path loss slope, and general formula for mobile propagation over water and flat open area, near and long distance propagation, antenna height gain, form of a point to point model.

UNIT-IV **(9 Lectures)**

CELL SITE AND MOBILE ANTENNAS :Sum and difference patterns and their synthesis, omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas

UNIT-V **(9 Lectures)**

HANDOFF STRATEGIES: Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, mobile assigned handoff, intersystem handoff, vehicle locating methods, droppedcall rates and their evaluation.

DIGITAL CELLULAR NETWORKS: GSM architecture, GSM channels, multiple access schemes; TDMA,CDMA, OFDMA; architecture of 3G cellular systems.

TEXTBOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Principles of Mobile Communications – Gordon L. Stuber, Springer International 2nd Edition, 2007.

REFERENCES:

1. Wireless Communications – Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
2. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
3. Mobile Cellular Communication – G Sasibhushana Rao Pearson
4. Wireless Communication and Networking – Jon W. Mark and Weihua Zhqung, PHI,2005.

WEB SOURCE REFERENCES:

1.. https://www.cse.wustl.edu/~jain/refs/wir_refs.htm.

2. http://www.wirelesscommunication.nl/reference/about.htm.

3. https://link.springer.com/10.1007%2F978-1-4614-6170-8_68.

4. https://www.eolss.net/sample-chapters/C05/E6-108-08-00.pdf.

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

LOW POWER VLSI DESIGN
(PROFESSIONAL ELECTIVE-IV)

Internal Marks: 40

Course Code:P18ECE15 **External Marks:** 60

Course Prerequisite: Electronic devices and circuits, VLSI design.

Course Objectives:

The student will be able to

1. Understand the fundamentals of Low Power VLSI Design.
2. Study low-power design approaches, power estimation and analysis.
3. Analyze the functionality of the low-voltage low-power adders.
4. Discuss about low-voltage and low power multipliers.
5. Learn the concepts of low-voltage, low-power memories and DRAM.

Course Outcomes:

After going through this course the student will be able to

1. Explain the concepts of low-power design approaches.
2. Analyze the low-voltage low-power circuits.
3. Demonstrate the low power design techniques to different applications.
4. Illustrate the power estimation at logic and circuit level.
5. Design of low-voltage low-power memories and basics of DRAM.

UNIT I **(9 Lectures)**

FUNDAMENTALS OF LOW POWER VLSI DESIGN: need for low power circuit design, sources of power dissipation – switching power dissipation, short circuit power dissipation, leakage power dissipation, glitching power dissipation, short channel effects –drain induced barrier lowering and punch through, surface scattering, velocity saturation, impact ionization, hot electron effect.

UNIT II **(9 Lectures)**

LOW-POWER DESIGN APPROACHES: Low-power design through voltage scaling: VTCMOS circuits, MTCMOS circuits, architectural level approach –pipelining and parallel processing approaches. switched capacitance minimization approaches: system level measures, circuit level measures, mask level measures.

UNIT III **(10 Lectures)**

LOW-VOLTAGE LOW-POWER ADDERS: Introduction, standard adder cells, CMOS adder's architectures – ripple carry adders, carry look-ahead adders, carry select adders, carry save adders, low-voltage low-power design techniques –trends of technology and power supply voltage, low- voltage low-power logic styles.

UNIT IV **(8 Lectures)**

LOW-VOLTAGE LOW-POWER MULTIPLIERS: Introduction, overview of multiplication, types of multiplier architectures, braun multiplier, baugh- wooley multiplier, booth multiplier, introduction to wallace tree multiplier.

UNIT V **(9 Lectures)**

LOW-VOLTAGE LOW-POWER MEMORIES: Basics of ROM, low-power ROM technology, future trend and development of ROMS, basics of SRAM, memory cell, precharge and equalization circuit, low-power SRAM technologies, basics of DRAM, self-refresh circuit, future trend and development of DRAM.

Text Books:

1.Kaushik Roy and S.C.Prasad, "Low power CMOS VLSI circuit design", Wiley, 2000

2.Sung-Mo Kang, Yusuf Leblebici, "CMOS Digital Integrated Circuits – Analysis and Design", TMH, 2011.

3. Low-voltage, low-power vlsi subsystems – kiat-seng yeo, kaushik roy, tmh professional engineering.

Reference Books:

1. Practical low power digital vlsi design – gary k. yeap, kluwer academic press, 2002.
2. J.B.Kulo and J.H Lou, "Low voltage CMOS VLSI Circuits", Wiley 1999
3. AbdelatifBelaouar, Mohamed.I.Elmasry, "Low power digital VLSI design", Kluwer, 1995

Web Reference:

1.http://nptel.ac.in/syllabus/106105034/

2. https://www.youtube.com/watch?v=LjDb6VQlOeQ

3. http://freevideolectures.com/Course/3059/Low-Power-VLSI-Circuits-and-Systems

4. http://www.springer.com/us/book/9788132219361

B. Tech IV Year II Semester **Course Structure**

L	T	P	C
3	0	0	3

Machine Learning For Signal Processing
(PROFESSIONAL ELECTIVE-IV)

Internal Marks: 40

Course Code: P18ECE16 **External Marks:** 60

Course Prerequisite: Machine Learning, Speech Processing, Image Processing & Biomedical engineering

Course Objectives:

1. To understand the basic concepts of AI & ML techniques.
2. To understand a wide variety of supervised and unsupervised learning methods.
3. To study the speech processing applications using machine learning algorithms.
4. To study the Image processing applications using machine learning algorithms.
5. To study the Bio-medical applications using machine learning algorithms.

Course Outcomes: By completing this course the student will be able to:

6. Demonstrate the fundamentals of AI & ML and their applications
7. Analyze supervised and unsupervised machine learning algorithms for classification
8. Analyze the pre-processing techniques and machine learning applications in the areas of Speech processing
9. Analyze the pre-processing techniques and machine learning applications in the areas of Image processing.
10. Analyze the pre-processing techniques and machine learning applications in the areas of Bio-Medical Signal processing.

UNIT I **(9 Lectures)**

Introduction to AI & ML : Introduction to AI , Definition, Types of AI, Subsets of AI., Future of Artificial Intelligence, Introduction to Machine Learning , Types of Learning , Examples of Machine Learning applications - Learning associations, Training versus Testing, Data Analytics for processing.

UNIT II **(9 Lectures)**

Machine Learning Algorithms: Supervised Learning - Regression analysis , Classification – K-NN classifier, , Naïve Bayes, Support Vector Machines , Unsupervised Learning - K-means Clustering, Hierarchical Clustering, Dimensionality reduction, Ensemble Learning, Reinforcement Learning.

UNIT III **(9 Lectures)**

ML in Speech Processing Applications: Process of Speech Production, Fundamental features of Speech, Time & Frequency domain analysis, A case study approach on Real time Analysis of speech Processing: - Pre-processing, Feature extraction and Implementation of Classification based on Machine learning methods.

UNIT IV **(9 Lectures)**

ML in Image Processing Applications: Elements of Digital Image Processing system, Fundamentals features of Image, A case study approach on Real time Analysis of Image Processing : Pre-processing, Feature extraction and Implementation of Classification based on Machine learning methods.

UNIT V **(9 Lectures)**

ML in Bio-medical Signal Analysis: Origin of Biomedical Signals; Types of Bio signals,A case study approach on Real time Analysis of any Biomedical signals: Pre-processing, feature extraction and Implementation of Classification based on Machine learning methods.

Text Books:

1. Christopher M. Bishop, " Pattern Recognition and Machine Learning ", Springer, 2006.
2. R. O. Duda, P. E. Hart , " Pattern Classification ", WILEY, (2001).

Reference Books:

1. George Kuddrayvtsev , " Fundamentals of Computer Vision ", 2020
2. John G. Proakis,Dimitris G. Manolakis, " Digital Signal Processing " , 4Th edition , Pearson Education, 2016.
3. R.C. Gonzalez and R.E. Woods, " Digital Image processing ", Pearson Education, 2nd ed. New Delhi. 2004
4. RangaRaj. M. Rangayyan, "Biomedical Signal Analysis: A Case,study pproach", John Wiley & sons Inc., 1/e, 2002.

WEB SOURCE REFERENCES:

1. https://www.coursera.org/learn/advanced-machine-learning-signal-processing
2. http://web.stanford.edu/class/ee269/