Academic Regulations

Program structure & Detailed Syllabus

2017

For

Under Graduate Programme (B.Tech)

ELECTRONICS AND COMPUTER ENGINEERING

(Applicable For Batches Admitted From 2017 – 2018)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY
(AUTONOMOUS)

DUVVADA - VISAKHAPATNAM – 530 049

(An Autonomous Institute, Accredited by NAAC, Affiliated to JNTUK, Kakinada, AP)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY

(AUTONOMOUS)

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ACADEMIC REGULATIONS

(VR 17)

VIGNAN'S INSTITUTE OF INFORMATION TECHNOLOGY (AUTONOMOUS)
VISAKHAPATNAM

ACADEMIC REGULATIONS for B. Tech. (Regular)
(Applicable for the batches admitted 2017-18 onwards)

The Admission of students into B. Tech. course shall be as per the Govt. of Andhra Pradesh rules.

1. Award of B. Tech. Degree

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

- **a.** Pursue a program of study for not less than four academic years and not more than eight academic years.
- **b.** For lateral entry scheme admission: Pursue a program of study for not less than three academic years and not more than six academic years.
- **c.** For the award of a degree, regular candidate has to register for 189 credits and shall secure 189 credits.
- **d.** Lateral entry candidate has to register for all the courses from second year onwards and secure all the credits registered for.

2. Courses of Study

The following courses of study are offered at present for specialization in the B. Tech. Course.

S. No.	Course Code	Programme & Abbreviation
01	01	Civil Engineering (CE)
02	02	Electrical and Electronics Engineering (EEE)
03	03	Mechanical Engineering (ME)
04	04	Electronics and Communication Engineering (ECE)
05	05	Computer Science and Engineering (CSE)
06	12	Information Technology (IT)
07	19	Electronics and Computer Engineering (E.Com E)

And any other Course as approved by the authorities of the Institute from time to time.

3. Registration: A student shall register for courses in each semester as per the courses offered by the concerned department.

4. Curricular Program

The Curriculum of the four-year B. Tech Course has been designed to achieve a healthy balance between theory & lab hours, industry experience and to develop technical skills required for a career in the industry or a career in research.

5. Distribution and Weightage of Marks

i. The performance of a student in each semester shall be evaluated Subject-wise with a maximum of 100 marks for theory courses and 100 marks for practical course. The project work shall be evaluated for 200 marks.

ii. For theory course the distribution shall be 40 marks for Internal Evaluation and 60 marks for the End Semester Examinations.

Distribution of marks for theory course, practical course and Design/Drawing is detailed below:

5.1. Internal 40 marks for theory course shall be awarded as follows:

i) 25 marks for MID exams
ii) 10 marks for continuous assessment
iii) 5 marks for Attendance

MID marks shall be calculated with 80% weightage for best of the two MIDs and 20% weightage for other MID exam.

5.2. For practical courses (Laboratory): There shall be continuous evaluation during the semester. Each Lab exam is evaluated for 100 marks. 50 marks shall be awarded for internal examination and 50 marks shall be awarded for external examinations.

5.2.1. Internal marks shall be awarded as follows

i) Day to day assessment– 20 Marks
ii) Record – 10 Marks
iii) Internal laboratory exam– 20 Marks

5.2.2.The semester end examinations shall be conducted by the teacher concerned and external examiner

5.3. For the courses having design and/or drawing, (Such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 40 marks for internal evaluation.

5.3.1. Internal marks shall be awarded as follows:

i) 20 marks for Day-to-day assessment
ii) 15 marks for internal exam
iii) 5 marks for Attendance

There shall be two internal examinations in a semester and the internal marks shall be calculated with 80% weightage for best of the two internals and 20% weightage for other internal exam.
5.3.2. External examination shall be conducted for 60 marks.

5.4. Industrial Visit: The industrial visit shall be carried out in their domain during the summer vacation after the second year second semester. A student has to submit a report which will be evaluated for 100 marks and will be submitted to an internal evaluation committee comprising Head of the Department or his / her nominee and two senior faculty of the department including the industrial visits coordinator/ supervisor.

5.5. Industry- Oriented Mini Project: The Industry oriented mini project is carried out during the third year second semester vacation. The students have an option to choose their own area of

interest which may be related to the course work. Mini project report is evaluated for 100 marks in fourth year first semester before the first mid-term exam. Assessment is done by the supervisor /guide for 40 marks based on the work and mini project report. The remaining 60 marks are allocated for presentation by the student to a committee comprising of the project supervisor and senior faculties members nominated by Head of the Department.

5.6. MOOCs: It is an online course (Minimum of 12 weeks) to promote advanced knowledge suitable for placement and research.

To award credits, the student should get certificate after they have registered for written exam and successfully passed

(Or)

College will conduct the written examination/Viva-voce and award the credits and grades.

In case a student fails in any online course, he/she may be permitted to register for the same course or an alternate course decided by the department committee. The internal marks secured earlier will be nullified if the course is changed. The assessment procedure of MOOCs course remains same as general theory course.

Note: The registered course must not be same as any of the courses listed in the program structure of their regulation till final year including electives.

5.7. Technical Seminar: For Technical seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his/her understanding over the topic, and submit to the department, which shall be evaluated by the Departmental Committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.

5.8. Comprehensive Viva: The Comprehensive Viva aims to assess the students' understanding in various subjects he / she studied during the B.Tech course of study. Comprehensive Viva is conducted for a total of 50 marks. It shall be conducted in IV Year II Semester. The Comprehensive Viva–Voce will be conducted by a Committee consisting of Head of the Department, two senior faculty members of the Department and External Expert.

5.9. Internship: Internships help students to acquire in depth knowledge about a particular topic related to the program of study. Such extensive work is expected to create a platform for a job or further research in the chosen area. Interested students may opt for a full semester Internship during the fourth year second semester. Such students shall be exempted for equivalent theory course credits during that semester and the corresponding credits are awarded through the Internship. A self-study report, duly authorized by the industry supervisor / guide, shall be submitted at the end of the fourth year second semester. Internship report is evaluated for 400 marks in total. Internal assessment is done by the academic supervisor/guide for 100 marks based on the work and presentation of the internship report. The assessment for 300 marks is evaluated and awarded by a panel of members consisting of Head of the Department, Senior Faculty and Industry Expert.

5.10. Main Project: Out of total 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the external assessment. The Internal Evaluation shall be on the basis of two mid-term project reviews conducted during the progress of the project. The End Semester Examination (Viva-Voce) shall be conducted by the committee consists of an External

Examiner, Head of the Department (internal examiner) and a senior faculty of the Department. The evaluation of project work shall be conducted at the end of the IV year.

5.11. Audit courses: All audit courses will be "Pass/Fail" type with no credit points allotted. The result of the student in the audit course will be notified in the marks memo. A student must pass all the audit courses registered to be eligible for the award of B. Tech. degree.

List of audit courses will be notified from time to time. An indicative list of courses is as shown below.

a) Professional Ethics & Human Values b) Any Foreign Language c) Journalism d) Finance e) Legal Sciences f) Social Sciences g) English for Special Purposes h) Fine Arts i) Clinical Psychology j) Intellectual Property Rights & Patents etc.

6. Attendance Requirements:

6.1. It is desirable for a candidate to have 100% attendance in the class in all the courses. However, a candidate shall be permitted to appear for the end semester examination if he/she has a minimum of 75% aggregate attendance in the semester. Student will not be permitted to write Mid examination if the attendance percentage is less than 75 % during the stipulated instruction duration. However, Academic Monitoring Committee shall review the situation and take appropriate decision.
Note: Special cases for students having extraordinary performance at National and International level will be considered by the Academic monitoring committee.

6.2. Condonation of shortage of attendance may be considered on Medical grounds maximum up to 10%, if the student provides the medical certificate to the HOD immediately after he / she recovers from the illness. Medical Certificate submitted afterwards shall not be permitted. Shortage of attendance equal to or above 65% and below 75%will be condoned on payment of fee as fixed by the competent authority and the student concerned will be permitted to take the end semester examination. ***This privilege is given only three times for regular student and only two times for lateral entry student during the entire program of study***.

6.3. Shortage of attendance may be considered for the students who participate in prestigious sports, co and extra-curricular activities if their attendance is in the minimum prescribed limit.

6.4. A student will be promoted to the next semester if satisfies attendance and credits requirement.

7. Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements.

For any course, student is considered to be passed upon securing minimum 35% marks in the external examination alone and minimum 50% marks from both internal and external examination put together

8. Promotion Policy:

To promote to III year, a student has to secure minimum 50% of total credits from I & II-year courses
To promote to IV year, a student has to secure minimum 50% of total credits from I, II & III-year courses

In case of Lateral entry students, to promote to IV year, a student has to secure minimum 50% of total credits from II & III-year courses

9. Supplementary examinations: Supplementary examinations for the odd Semester shall be conducted with the regular examinations of even semester and vice versa. In case a student fails in online courses/ industrial lecture(s), he/she may be permitted to register for another course/lecture(s).

10. Examinations and Evaluation

10.1. General guidelines

i. All the semester end examinations are conducted for duration of three hours
ii. External examination shall be conducted for 60 marks consist of five questions of internal choice carrying 12 marks each.
iii. For laboratory examinations, the evaluation is done by internal examiner and one external examiner.

10.2. Revaluation

There is a provision for revaluation of theory courses if student fulfils the following norms.

The request for revaluation must be made in the prescribed format duly recommended by the Chief Superintendent of Examinations through Additional Controller along with the prescribed revaluation fee.

11. Grading System:

CGPA

Marks Range (in %)	Letter Grade	Level	Grade Point
≥ 90	O	Outstanding	10
≥80 to <90	A	Excellent	9
≥70 to <80	B	Very Good	8
≥60 to <70	C	Good	7
≥50 to <60	D	Satisfactory	6
<50	F	Fail	0
		Absent	-1
		Withheld	-2
		Malpractice	-3

Computation of SGPA

The following procedure is to be adopted to compute the Semester Grade Point Average. (SGPA) and Cumulative Grade Point Average (CGPA):

The SGPA is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.

SGPA (Si) = $\Sigma(Ci \times Gi) / \Sigma Ci$

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

Computation of CGPA

- The CGPA is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$CGPA = \Sigma(Ci \times Si) / \Sigma Ci$$

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

- Equivalent Percentage = (CGPA – 0.75) X 10

12. Award of Class

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree, he/she shall be placed in one of the following three classes:

Class Awarded	CGPA to be secured	
First Class with Distinction	≥ 7.75 without course failures during entire duration of study	**CGPA secured from 189 Credits.**
First Class	≥ 6.75 to <7.75	
Second Class	≥ 5.75 to < 6.75	

13. General Instructions

i. Where the words 'he', 'him', 'his', occur, they imply 'she', 'her', 'hers', also.

ii. The academic regulations should be read as a whole for the purpose of any interpretation.

iii. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Chairman, Academic Council is final.

iv. The college may change or amend the academic regulations or syllabi from time to time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institution.

14. Transitory Regulations

i. The student has to continue the course work along with the regular students of the respective semester in which the student gets re-admission.

ii. The student has to register for Substitute / Compulsory courses offered in place of courses studied earlier.

iii. The mode of internal evaluation and end-semester examinations shall be on par with the regular students, i.e., the student has to follow the mode of internal evaluation and the then question paper model for the end-semester examinations along with the regular students of the respective semester in which the student gets re-admission. The marks secured in the internal and end-semester examinations will be pro-rated in accordance with the regulations under which the student was first admitted.

iv. For the courses studied under earlier regulations but failed, the student has to appear, pass and acquire credits from the supplementary examinations as and when conducted. The question paper model shall remain same as the one in which the student took examination during previous regulations.

v. The promotion criteria based on attendance as well as credits shall be in accordance with the regulations under which the student was first admitted.

vi. All other academic requirements shall be in accordance with the regulations under which the student was first admitted.

vii. The decision of the Principal is final on any other clarification in this regard.

viii. Transcripts: After successful completion of the entire program of study, a transcript containing performance of all academic years will be issued as a final record. Partial transcript will also be issued up to any point of study to a student on request, after payment of requisite fee.

15. Minimum Instruction Days

The minimum instruction days for each semester shall be 16 weeks

There shall be no branch transfers after the completion of the admission process.

16. Withholding of Results

If the student has not paid the dues, if any, to the Institute or in any case of indiscipline is pending against him, the result of the student will be withheld. His degree will be withheld in such cases.

Note: All other regulations including attendance requirements related to four year B. Tech Regular program will be applicable for B.Tech. Lateral Entry Scheme

17. Malpractices Rules

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/ Improper conduct	Punishment
1 (a)	If the candidate possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the course 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 course of the examination)	Expulsion from the examination hall and cancellation of the performance in that course only.
(b)	If the candidate gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that course only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the candidate has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical

	relevant to the course of the examination (theory or practical) in which the candidate is appearing.	examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester/year. The Hall Ticket of the candidate is to be cancelled.
3	If the candidate impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the courses of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all 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 registered against him.
4	If the candidate smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5	If the candidate 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 that course.
6	If the candidate refuses to obey the orders of the Chief Superintendent/Assistant - Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be

	examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	permitted to appear for the remaining examinations of the courses of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7	If the candidate leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the candidate possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of

		that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and. a police case will be registered against them.
10	If the candidate comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Academic committee of the Institute for further action to award suitable punishment.	

18. UGC RECOMMENDED PUNISHMENT FOR RAGGING

i. Suspension from attending classes and academic privileges
ii. Withholding/withdrawing scholarships/fellowship and other benefits.
iii. Debarring from appearing in any test/examination or other evaluation process
iv. Withholding results
v. Debarring from representing the institution in any regional, national or international meet, tournament, youth festival etc.
vi. Suspension/expulsion from the hostel
vii. Cancellation of admission
viii. Rustication from the institution for period ranging from 1 to 4 semesters.
ix. Expulsion from the institution and consequent debarring from admission to any other institution for a specified period.
x. Fine may extend up to Rs. 2.5 lakh.

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DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING
PROGRAM STRUCTURE (VR 17)

I B.Tech. **I Semester**

S. No	Course Code	Name of the Course	L	T	P	Credits
1	1000171101	English- I	3	1*	0	3
2	1000171102	Engineering Mathematics-I	3	1*	0	3
3	1000171103	Engineering Mathematics-II	3	1*	0	3
4	1000171105	Computer Programming using C	3	1*	0	3
5	1000171106	Engineering Drawing	3	1*	0	3
6	1000171111	Applied chemistry	3	1*	0	3
7	1000171121	English - Communication Skills Laboratory-I	0	0	3	2
8	1000171124	IT Workshop	0	0	3	2
9	1000171128	Computer Programming Laboratory	0	0	3	2
Total Credits						**24**

I B.Tech. **II Semester**

S. No	Course Code	Name of the Course	L	T	P	Credits
1	1000171201	English- II	3	1*	0	3
2	1000171203	Engineering Mathematics-III	3	1*	0	3
3	1000171207	Applied physics	3	1*	0	3
4	1000171209	Network Analysis	3	1*	0	3
5	1000171212	Environmental Studies	3	1*	0	3
6	1000171213	Data Structures	3	1*	0	3
7	1000171221	English Communication Skills Lab-2	0	0	3	2
8	1000171222	Engineering Physics Laboratory	0	0	3	2
9	1000171228	Data Structures Programming Lab	0	0	3	2
Total Credits						**24**

II B. Tech **I Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1004172101	Electronic Devices and Circuits	3	1*	0	3
2	1004172102	Switching Theory and Logic Design	3	1*	0	3
3	1004172103	Signals and Systems	3	1*	0	3
4	1012172104	Software Engineering	3	1*	0	3
5	1019172105	Object Oriented Programming	3	1*	0	3
6	1099172106	Managerial Economics & Financial Analysis	3	1*	0	3
7	1004172121	Electronic Devices and Circuits Lab	0	0	3	2
8	1019172122	OOPS Lab	0	0	3	2
9	1099172103	Professional Ethics & Human Values	3	0	0	0
Total Credits						**22**

II B.Tech **II Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019172201	Principles of Communications	3	1*	0	3
2	1004172202	Control Systems	3	1*	0	3
3	1099172203	Management Science	3	1*	0	3
4	1005172204	Computer Organization	3	1*	0	3
5	1004172205	Pulse and Digital Circuits	3	1*	0	3
6	1005172206	Operating Systems	3	1*	0	3
7	1019172221	Pulse & Digital Circuits & Communications Lab	0	0	3	2
8	1019172222	Operating Systems Lab	0	0	3	2
9	1019172231	Industrial Visit	0	0	0	2
Total Credits						**24**

III B.Tech **I Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1004173101	Linear IC Applications	3	1*	0	3
2	1004173104	Digital IC Applications	3	1*	0	3
3	1019173105	Micro Processors and Micro Controllers	3	1*	0	3
4	1012173103	Data Base Management Systems	3	1*	0	3
5	1005173102	Python Programming	3	1*	0	3
6	1019173121	IC Applications Lab	0	0	3	2
7	1019173122	Python Programming Lab	0	0	3	2
8	1019173123	Database Management Systems Lab	0	0	3	2
9	1099173101	IPR & Patents	2	0	0	0
Total Credits						**21**

III B.Tech **II Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019173201	Design and Analysis of Algorithms	3	1*	0	3
2	1019173202	Web Design	3	1*	0	3
3	1004173203	VLSI Design	3	1*	0	3
4	1004173204	Digital Signal Processing	3	1*	0	3
5	**Open Elective-I**					
	1019173203	1. Software Project Management	3	1*	0	3
	1019173204	2. Bio-Medical Engineering				
	1019173205	3. Unix Programming				
	1003173203	4. Robotics				
6	**Open Elective -II(CBCS)(MOOCS)**					
	1019173291	MOOCS Course *Any available online course approved by department committee at the time of semester commencement)	3	1*	0	3
7	1004173221	Micro Processors & Micro Controllers Lab	0	0	3	2
8	1004173222	VLSI Lab	0	0	3	2
9	1019173221	Web Design Lab	0	0	3	2
Total Credits						**24**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019173241	Industry Oriented Mini Project	0	0	0	2

IV B.Tech **I Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019174101	Data Communication and Computer Networks	3	1*	0	3
2	1004174105	IoT & its Applications	3	1*	0	3
3	1005174102	Machine Learning	3	1*	0	3
4	1004174102	Digital Image Processing	3	1*	0	3
5	**Elective-I**		3	1*	0	3
	1019174102	1. Advanced Computer Architecture				
	1004174201	2. Satellite Communications				
	1019174103	3. System Programming				
	1019174104	4. Fundamentals of Data Mining and Data Warehousing				
6	**Elective-II**		3	1*	0	3
	1019174105	Structural Digital Design				
	1012172205	Object Oriented Analysis and Design using UML				
	1005174103	Big Data Analytics				
	1019174106	Analog IC Design				
7	1019174121	Digital Signal Processing Lab	0	0	3	2
8	1019174122	IoT Lab	0	0	3	2
Total Credits						**22**

IV B.Tech **II Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019174201	Introduction to Embedded Systems	3	1*	0	3
2	1012173201	Software Testing Methodologies	3	1*	0	3
3	**Elective-III**		3	1*	0	3
	1019174202	Digital IC Design				
	1019174203	Automata Theory & Compiler Design				
	1019174204	Advanced Microcontrollers				
	1012173101	Human Computer Interaction				
4	**Elective –IV**		3	1*	0	3
	1019174205	Real Time Operating Systems				
	1005174101	Cryptography and Network Security				
	1019174206	Wireless Sensor Networks				
	1004174101	Cellular and Mobile Communications				
OR						
	1019174281	Internship	0	0	0	12
5	1019174251	Technical Seminar	0	3	0	2
6	1019174261	Comprehensive Viva	0	0	0	2
7	1019174231	Main Project	0	0	0	10
Total Credits						**26**

GRAND TOTAL CREDITS: 24+24+22+24+21+26+22+26=189

* Indicates tutorial without credit

PROGRAME STRUCTURE

FOR

I -B. Tech

I & II SEMESTERS

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING
PROGRAM STRUCTURE (VR 17)

I B.Tech **I Semester**

S. No	Course Code	Name of the Course	L	T	P	Credits
1	1000171101	English- I	3	1*	0	3
2	1000171102	Engineering Mathematics-I	3	1*	0	3
3	1000171103	Engineering Mathematics-II	3	1*	0	3
4	1000171105	Computer Programming using C	3	1*	0	3
5	1000171106	Engineering Drawing	3	1*	0	3
6	1000171111	Applied chemistry	3	1*	0	3
7	1000171121	English -Communication Skills Laboratory-I	0	0	3	2
8	1000171124	IT Workshop	0	0	3	2
9	1000171128	Computer Programming Laboratory	0	0	3	2
Total Credits						**24**

I B.Tech **II Semester**

S. No	Course Code	Name of the Course	L	T	P	Credits
1	1000171201	English- II	3	1*	0	3
2	1000171203	Engineering Mathematics-III	3	1*	0	3
3	1000171207	Applied physics	3	1*	0	3
4	1000171209	Network Analysis	3	1*	0	3
5	1000171212	Environmental Studies	3	1*	0	3
6	1000171213	Data Structures	3	1*	0	3
7	1000171221	English Communication Skills Lab-2	0	0	3	2
8	1000171222	Engineering Physics Laboratory	0	0	3	2
9	1000171228	Data Structures Programming Lab	0	0	3	2
Total Credits						**24**

DETAILED SYLLABUS
FOR
I B. TECH
I SEMESTER

Course Code		L	T	P	Credits
1000171101	ENGLISH-I	3	1	0	3

Course Objectives

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To enable the students to study and comprehend the prescribed lessons and subjects more effectively related to their theoretical and practical components.
- To develop the communication skills of the students in both formal and informal situations.
- Practice critical thinking to develop innovative and well-founded perspectives related to the students' emphases. Build and maintain healthy and effective relationships.
- To convey a credible message and create concise messages using a structured writing process.
- To develop effective interpersonal communication skills.

Course Outcomes

After completing this Course, the student should be able to:

- Use English language, both written and spoken, competently and correctly.
- Improve comprehension and fluency of speech.
- Gain confidence in using English in verbal situations.
- Display competence in oral, written, and visual communication.
- Communicate ethically.
- Demonstrate positive group communication exchanges.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Enhance English Language by relating the ideas of eminent personalities.	Understanding	PO6,PO9, PO10, PO12
CO2	Articulate the technological advancements fluently.	Applying	PO10, PO12
CO3	Inculcate the art of thinking and writing clearly and logically.	Applying	PO10, PO12
CO4	Enact various themes through team work and learn the usage of vocabulary through humourous texts.	Analyzing	PO10, PO12

Detailed Text: English Essentials

1. **In London**-M. K.Gandhi
2. **The Knowledge Society** - A. P. J. Abdul Kalam
3. **Principles of Good Writing -** L. A.Hill
4. **Man's Peril –** Bertrand Russell
5. **Luck –** Mark Twain

Non-Detailed Text: Panorama

1. **War** – Luigi Pirandello
2. **The Verger** – Somerset Maugham

PRESCRIBED TEXTBOOKS:

1. **English Essentials** by Ravindra Publishing House
2. **Panorama** by Oxford University Press

SUGGESTED TEXT BOOKS:

1. **You Can Win** by ShivKhera
2. **English for Engineers and Technologists** by Orient BlackSwan
3. **Objective English** by R. S. Agarwal,S.Chand.co

REFERENCE BOOKS:

1. "Practical English Usage" by Michael Swan, 3rd Edition,OUP.
2. "Intermediate English Grammar" by Raymond Murphy,CUP.
3. "Study: Reading" by Eric H .Glendinning, 2ndEditionCUP.
4. "Business Correspondence and Report writing" by R.C Sharma, Tata McGrawhill

Course Code		L	T	P	Credits
1000171102	**ENGINEERING MATHEMATICS-I**	3	1	0	3

Course Overview:

This course deals with differential equations and its application with more focus on advanced Engineering Mathematics. This course helps the students to learn relevant mathematical tools which are required in the analysis of problems in engineering and scientific professions. Topics included in this course are differential equations of first order and their applications, higher order linear differential equations and their applications, functions of single variable and their applications and multiple integrals, Laplace transforms and their applications. The mathematical skills derived from this course form a necessary base for analytical and design concepts encountered in theprogram.

Course Objectives:

1. To explain mathematical modeling with the knowledge of differential equations.
2. To discuss higher order differential equations and its applications to solve engineering problems.
3. To evaluate maxima and minima of function of several variables.

Course Outcomes:

1. Solve basic engineering problems described by first order differential equations.
2. Determine solutions to higher order linear homogeneous and non homogeneous differential equations with constant coefficients.
3. Apply the techniques of multivariable differential calculus to determine extrema and series expansions etc. of functions of several variables.
4. Extend the concept of integration to two and three dimensions and support it through applications in engineering mechanics.
5. Appraise the Laplace transform technique and use it to solve various engineering problems.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Solve linear differential equations of first and higher order.	Understanding	PO1,PO2, PO3, PO12
CO2	Determine extrema and series expansions of functions of several variables.	Applying	PO1, PO2,PO4, PO12
CO3	Determine double integral, triple integral to find area and volume.	Applying	PO1, PO2, PO3, PO12
CO4	Appraise Laplace transform to solve various engineering problems.	Analyzing	PO1, PO2, PO12

UNIT-I : MEAN VALUE THEOREMS:

Mean Value Theorems - Rolle's Theorem - Lagrange's mean value theorem – Cauchy's mean value theorem (without proofs)

ORDINARY DIFFERENTIAL EQUATIONS:

Exact equations and equations reducible to exact form- Linear equations- Bernoulli's equation.

Applications: Orthogonal trajectories ,Simple Electric Circuits

UNIT-II: LINEAR DIFFERENTIAL EQUATIONS OF HIGHERORDER:

Linear differential equations of second and higher order with constant coefficients, Non-homogeneous term of thetype $Q(x)=e^{ax}$,sinax,cosax,x^n,$e^{ax}V(x)$,$x^nV(x)$-Methodofvariationof parameters.

Applications: LCR Circuits

UNIT-III: FUNCTIONS OF SEVERAL VARIABLES:

Functions of several variables – Partial Differentiation –Euler's Theorem-Total Derivative –Change of variables - Jacobian -Functional dependence – Taylors theorem for functions of two variables.

Applications: Maxima and Minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT-IV: MULTIPLE INTEGRALS:

Introduction: Review of Coordinate Systems (Cartesian, Polar, Parametric, Spherical, Cylindrical) -multiple integrals - double and triple integrals – change of variables – Change of order of Integration.

Applications: Areas and Volumes of Simple curves (Cartesian)

UNIT-V : LAPLACE TRANSFORMS:

Introduction - Laplace transforms of standard functions – Shifting Theorems - Transforms of derivatives and integrals - multiplication by t^n- division by t – Unit step function –Dirac delta function. Laplace transform of Periodic functions. Introduction - Inverse Laplace transforms–Properties- Convolution theorem (without proof).

Applications: Solution of ordinary differential equation with constant coefficients (Initial Value Problems) using Laplace transforms.

TEXT BOOKS:

1. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, WileyStudent Edition.
2. Engineering Mathematics, Greenburg, 2nd Ed, Pearsoneducation.
3. A Text book of Engineering Mathematics, N.P.Bali, Laxmi Publications(P) Ltd.
4. Advanced Engineering Mathematics, B. V. Ramana,TataMcGrawHill Publishing Co.Ltd.
5. Engineering Mathematics, P. Sivaramakrishna Das, C. Vijayakumari , 2017Pearson Education Services Pvt.Ltd

Course Code		L	T	P	Credits
1000171103	**ENGINEERING MATHEMATICS-II**	3	1	0	3

Course Overview:

The entire course material is divided into 5 modules covering duly recognized areas of theory and study. This course includes the topics of advanced Engineering Mathematics with more focus on the mathematical tools required to analyze the problems of Engineering & Scientific Professions. Some important topics of this course are Solutions of Algebraic and Transcendental Equations, Interpolation, Numerical integration and Numerical solution of ordinary differential equations, Fourier series and Fourier transforms. The main aim of this course is to provide a platform to the students to think, design, formulate and derive any problem encountered in real life situation.

Course Objective:

1. To formulate and apply numerical techniques for root finding, interpolation.
2. To estimate definite integrals using Newton-Cotes quadrature formula.
3. To compute numerical solution of ordinary differential equations.
4. To determine the Fourier coefficients of a given function.
5. To analyze the characteristics and properties of Fourier transforms.

Course Outcomes:

Upon successful completion of this course, student will be able to:

1. Determine numerical solution of non Linear equation
2. Compute Interpolating polynomial for the given data
3. Explain Numerical Solution of ODE and Numerical Integration.
4. Construct Fourier series expansion of periodic functions
5. Determine Fourier transform, Fourier sine and cosine transform of function.

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Determine numerical solution of non Linear equation	Understanding	PO1,PO2, PO12
CO2	Compute Interpolating polynomial for the given data	Applying	PO1, PO2,PO12
CO3	Explain Numerical Solution of ODE and Numerical Integration.	Applying	PO1, PO2, PO4, PO12
CO4	Construct Fourier series and Fourier transforms for functions	Analyzing	PO1, PO2, PO3, PO5, PO6, PO12

UNIT-I: SOLUTIONS OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS & INTRODUCTION TO FINITEDIFFERENCES:

Bisection method - Regula-falsi method - Iteration method - Newton-Raphson method. Finite differences: Forward, Backward and Central differences - Other difference operators and relations between them - Differences of a polynomial – To find missing terms.

UNIT-II: INTERPOLATION

Newton's forward interpolation, Newton's backward interpolation, Gauss Forward and Backward interpolation, Interpolation with unequal intervals – Newton's divided difference - Lagrange's interpolation.

UNIT-III: **NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS AND NUMERICAL INTEGRATION**:

Single step methods: Taylor's series method –Picard's Method - Euler's and modified Euler's Methods - Fourth order Runge-Kutta method for solving first order equations. Numerical Integration: Trapezoidal Rule, Simpson's $1/3^{rd}$ Rule, Simpson's $3/8^{th}$ Rule

UNIT-IV: FOURIER SERIES:

Introduction- Determination of Fourier coefficients – Even and Odd functions – Change of interval– Half-range sine and cosine series-Practical Harmonic Analysis.

UNIT-V : FOURIER TRANSFORMS:

Fourier integral theorem (only statement) – Fourier sine and cosine integrals – Fourier transforms-Fourier Sine and Cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

TEXT BOOKS:

1. Higher Engineering Mathematics – 43^{rd} Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreszig, 8^{th}Ed, Wiley Student Edition.
2. Engineering Mathematics, B.V.Ramana, Tata McGrawHill.
3. Mathematical Methods –Dr. Ravindranath & Dr. P. Vijaya Lakshmi,Himalaya
4. Engineering Mathematics, P.Sivaramakrishna Das, C.Vijayakumari , 2017Pearson Education Services Pvt.Ltd

Course Code	COMPUTER PROGRAMMING	L	T	P	Credits
1000171105	USING C	3	1	0	3

Course Objectives:

- Understanding the basics of the computers and background.
- Drawing flowcharts and Formulating algorithmic solutions to problems and implementing in C language.
- Understanding branching, iteration and data representation using arrays.
- Modular programming and recursive solution formulation.
  Understanding pointers and dynamic memory allocation.

Course Prerequisites:

Students should have knowledge of

- Basics of Computer Components.
- Distinction between software and hardware.

Course Outcomes:

Students will be able to:

- Understand the fundamentals of computers, solving the problems using flow charts, algorithms and pseudo code.
- Write, compile and execute simple programs in C language.
- Use different data types and operators in C language.
- Design programs involving decision structures, loops, functions and passing parameters to functions.
- Develop programs using arrays, structures and pointers.
- Understand the dynamic memory allocation functions using pointers.
- Understand the basics of file operations, reading, and writing and updating the files.

	Course outcome	Skill	PO
CO1	Write compile and debug Programs in C language	Understand	PO1,PO2, PO3
CO2	Use operators, data types and write programs	Understand	PO1,PO2
CO3	Select the best loop construct for a given problem	Analyzing	PO3,PO5
CO4	Design and implement C programs	Analyzing	PO1,PO2 PO3,PO4, PO12

UNIT-I

Computer Basics – What is a computer, History of computers, Characteristics of computers, Classification of computers, Applications of computers, Components and functions of a Computer System: hardware and software concept, input/output devices, memory concept and secondary memories, Number System, Computer languages, Flow Charts, algorithms and pseudo code.

Introduction to C programming- Background and characteristics of C, Structure of a C Program, Input/Output Statements in C, writing C programs, compiling and executing C programs.

UNIT-II

Programming Style – Tokens of C, Keywords, Variables, Constants and rules to form variables and constants, Data Types, Declaration of Variables and initialization, Operators, Expression Types, Operator Precedence and Associativity. Implicit Type Conversions, Explicit Type Conversions (Casts), Assignment Variations, Mathematical Library Functions, Interactive Input, Formatted Output, Format Modifiers.

Flow of Control:

Selection: if and if-else Statements, if-else if statement and switch case, nested if, examples.

Repetition and Unconditional Control Statements: Pretest and Posttest Loops, Counter-Controlled and Condition-Controlled Loops, while Statement, do while statement, for Statement, Nested Loops. Break, continue and go to statements.

UNIT-III

Modular Programming:

Function and Parameter Declarations: Function definition, types of functions, declaration and definition of user defined functions, its prototypes and parameters, calling a function. Function stubs and Functions with and without Parameters. Variable Scope, Variable Storage Class, Local Variable Storage Classes, Global Variable StorageClasses.

Parameter passing Techniques: Pass by Value, recursive functions.

UNIT-IV

Arrays and Strings

Arrays: One-Dimensional Arrays, Declaration, Array Initialization, Input and Output of Array Values, Arrays as Function Arguments, Two-Dimensional Arrays, linear search, and bubble sort.

Strings: String Fundamentals, String Input and Output, String manipulation functions, String Processing, String manipulation operations without Library Functions.

UNIT-V

Pointers, Structures and Unions, Data Files

Pointers: Concept of a Pointer, Initialization of pointer variables, pointers as function arguments, Dangling memory, address arithmetic, character pointers and functions, pointers to pointers, Pointers and arrays, Pointers and strings, Array of Pointers, Dynamic memory management functions, parameter passing by address, command line arguments.

Structures and Unions: Derived types, Structures declaration, Initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit-fields.

Data Files: Declaring, Opening, and Closing File Streams, Reading from and Writing to Text Files, Random File Access.

Text Books:

- ANSI C Programming, Gary J. Bronson, Cengage Learning.
- Programming in C, Reema Thareja, and Oxford.
- Programming in C, Bl Juneja Anita Seth, Cengage Learning.

Reference Books:

- C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage. Pub.
- Programming with C, Bichkar, and Universities Press.
- The C Programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
- C by Example, Noel Kalicharan, Cambridge.

Course Code	ENGINEERING DRAWING	L	T	P	Credits
1000171106		3	1	0	3

Objective: Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO number mapped
CO1	Understand the use of drawing instruments to construct the polygons and curves	Understanding	PO1,PO2,PO3
CO2	Learn the principle of orthographic projections. Draw Orthographic projections of points, lines.	Analyzing	PO1,PO2,PO3,PO12
CO3	Draw the various types of planes and solids its views in different Positions	Analyzing	PO1,PO2,PO3,PO12
CO4	Draw isometric views of simple objects	Analyzing	PO1,PO2,PO3,PO12

Unit I

Objective: To introduce the students to use drawing instruments and to draw polygons, Engg. Curves.

Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles.

Curves: Parabola, Ellipse and Hyperbola by general methods, cycloids, involutes, tangents & normals for the curves.

Unit II

Objective: To introduce the students to use scales and orthographic projections, projections of points & simple lines.

Scales: Plain scales, diagonal scales and vernier scales

Orthographic Projections: Horizontal plane, vertical plane, profile plane, importance of reference lines, projections of points in various quadrants, projections of lines, lines parallel either to of the reference planes (HP,VP or PP)

Unit III

Objective: The objective is to make the students draw the projections of the lines inclined to both the planes.

Projections of straight lines inclined to both the planes, determination of true lengths, angle of inclination and traces- HT, VT

Unit IV

Objective: The objective is to make the students draw the projections of the plane inclined to both the planes.

Projections of planes: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

Unit V

Objective: The objective is to make the students draw the projections of the various types of solids in different positions inclined to one of the planes.

Projections of Solids – Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

Unit VI

Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa. Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications
2. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers

REFERENCE BOOKS:

1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers
2. Engineering Graphics for Degree by K.C. John, PHIPublishers
3. Engineering Graphics by PI Varghese, McGrawHillPublishers
4. Engineering Drawing + AutoCad – K Venugopal, V. Prabhu Raja, New Age.

Course Code		L	T	P	Credits
1000171111	APPLIED CHEMISTRY	3	1	0	3

Knowledge of basic concepts of Chemistry for Engineering students will help them as professional engineers later in design and material selection, as well as utilizing the available resources.

Objectives:

- Plastics are nowadays used in household appliances; also they are used as composites (FRP) in aerospace and automotive industries.
- Fuels as a source of energy are a basic need of any industry, particularly industries like thermal power stations, steel industry, fertilizer industry etc., and hence they are introduced.
- The basics for the construction of galvanic cells as well as some of the sensors used in instruments are introduced. Also if corrosion is to be controlled, one has to understand the mechanism of corrosion which itself is explained by electrochemical theory.
- Understanding of crystal structures will help to understand the conductivity, semiconductors and superconductors. Magnetic properties are alsostudied.
- With the increase in demand, a wide variety of materials are coming up; some of them have excellent engineering properties and a few of these materials are introduced.

Outcomes: The student

- Gains basic knowledge of polymer materials and their engineering applications.
- Understands fuels which are used commonly and their advantages and limitations.
- Extends the principles involved in corrosion to predict and prevent the corrosion in real life system
- The advantages and limitations of semiconducting materials and their use in design would be understood.
- Recalls the principles, working and design of energy storage devises and Acquires knowledge of advanced materials and their applications.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Identify various polymers like Polythene, PVC, Teflon, Bakelite and their Engineering applications.	Understanding	PO1,PO7, PO8
CO2	Desribe various renwable and non-renwable energy resources.	Applying	PO1, PO2, PO4, PO7, PO8
CO3	Aquire the knoweldge of principles and reaction mechanism Of corrosion.	Applying	PO1, PO7, PO8
CO4	Illustrate green Synthesis, semiconductors , advanced materials and their applications in industry .	Analyzing	PO1, PO2, PO12

UNIT I: POLYMER TECHNOLOGY

Polymerization: Introduction - Types of polymerization (Addition, Condensation & Co-polymerizstion) – Physical and mechanical properties – advantages and limitations – **Plastics**: Thermoplastics and Thermosetting plastics – Compounding, Moulding techniques (Compression, Injection & Blow moulding)

- Preparation, properties and applications of polyethene, PVC, Bakelite and Teflon. **Elastomers** – Natural rubber- compounding and vulcanization – Synthetic rubbers - Buna S, Buna N and Thiokol – Applications. Composite materials & Fiber reinforced plastics (CFRP & GFRP) – Biodegradable polymers – Conducting polymers.

UNIT II: FUEL TECHNOLOGY

Introduction – Classification – Calorific value - Bomb calorimeter – Numerical problems – Coal — Proximate and ultimate analysis and its Significance – Liquid fuels – Petroleum - Refining – Cracking – knocking - Octane and Cetane numbers

- Natural gas - LPG and CNG – Combustion – Flue gas analysis – Orsat apparatus – Numerical problems on combustion. Energy scenario in India – working of thermal power plant – Advantages and disadvantages – Non renewable energy – Solar energy – Harnessing of solar energy – solar heaters – photo voltaic cells – Bio energy – Biodiesel.

UNIT III: ELECTROCHEMICAL CELLS & CORROSION

Galvanic cells - Reversible and irreversible cells, Electrode potential – Standard electrodes (Hydrogen and Calomel electrodes) Electro chemical series and its applications,

Batteries-: Dry Cell, lead acid battery and Ni-Cd battery - H_2-O_2 fuel cell & H_3PO_4 fuel cells.

Corrosion: Introduction – Theories of Corrosion (dry and wet) – Types of corrosion – galvanic, pitting, stress, differential aeration and waterline corrosion

– Factors influencing corrosion – controlling methods – Design and material selection –

Cathodic protection - inhibitors - Protective coatings – Metallic coatings (cathodic and anodic) - Methods of application on metals (Galvanizing, Tinning &Electroplating).

UNIT IV: SOLID STATE CHEMISTRY

Types of solids - close packing of atoms and ions - BCC , FCC, structures of rock salt - cesium chloride- spinel - normal and inverse spinels, Non-elemental ***semiconducting Materials****:* Stoichiometric, controlled valency & Chalcogenphoto/semiconductors, Preparation of Semiconductors - Semiconductor Devices:- p-n junction diode as rectifier – junction transistor.

Insulators (electrical and thermal applications)
Magnetic materials: Ferro and ferri magnetism - Hall- Effect and its applications.

UNIT V: CHEMISTRY OF ADVANCED ENGINEERING MATERIALS

Nano materials: Introduction – Preparation, Properties and engineering applications of Carbon nano tubes and fullerenes.

Liquid crystals: Introduction – Types – Applications.
Superconductors: Type-I & Type-2, properties & applications.
Green Chemistry: Principles, any three methods of synthesis – engineering applications.
Sensors & Biosensors: Classification, working principle & applications.

Explosives & Propellants: Introduction, classification & applications.

Prescribed books:

1. Engineering Chemistry (16^{th} edn.) by Jain and Jain; Dhanpat Rai Publication Co.
2. A text book of Engineering Chemistry by S. S. Dara; S. Chand & CoLtd., Latest Edition

Reference Books:

1. Chemistry for Engineers by Teh Fu Yen, Imperial college press,London.
2. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others,2014 edition(second).
3. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2015edition.
4. Applied Chemistry by H.D. Gesser, SpringerPublishers
5. Text book of Nano-science and nanotechnology by B.S. Murthy,P. Shankar and others, University Press,IIM.

Course Code		L	T	P	Credits
1000171121	ENGLISH-COMMUNICATION SKILLS LABORATORY-I	0	0	3	2

Objectives: The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency in spoken English and neutralize mother tongue influence. To train students to use language appropriately to enhance Oratory Skills.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Demonstrate the usage of phonemes while referring to the dictionary	Understanding	PO5,PO9, PO10, PO12
CO2	Articulate with others by using proper functions.	Applying	PO5,PO9, PO10, PO12
CO3	Enact the roles with proper body language.	Applying	PO5,PO9, PO10, PO12
CO4	Communicate fluently with proper pronunciation	Analyzing	PO5,PO9, PO10, PO12

Unit -1: Letters and Sounds

Unit-2: Interaction 1

Unit-3: The Sounds of English

Unit-4: Interaction 2

PRESCRIBED LAB MANUAL:

Speak Well - Orient Black Swan Publishers

SUGGESTED BOOKS/ MANUALS AND SOFTWARES:

1. Interact - Orient Black Swan
2. Strengthen your Communication Skills by Maruthi Publishers
3. Personality Development and Soft Skills (Oxford University Press, New Delhi)
4. GRE-Barons-12thEdition
5. Objective English-R.S.Agarwal-S.Chand Publishers
6. The Rossettastone
7. English in Mind

Course Code		L	T	P	Credits
1000171124	**IT WORKSHOP**	0	0	3	2

OBJECTIVES:

- Understand the basic components and peripherals of a computer.
- To become familiar in configuring a system.
- Learn the usage of productivity tools.
- Acquire knowledge about the netiquette and cyber hygiene.
- Get hands on experience in trouble shooting a system?

1. **System Assembling, Disassembling and identification of Parts /Peripherals**
2. **Operating System Installation**-Install Operating Systems like Windows, Linux along with necessary Device Drivers.
3. **MS-Office / Open Office**
   a. **Word** - Formatting, Page Borders, Reviewing, Equations, symbols.
   b. **Spread Sheet** - organize data, usage of formula, graphs, charts.
   c. **Power point** - features of power point, guidelines for preparing an effective presentation.
   d. **Access**- creation of database, validate data.
4. **Network Configuration & Software Installation**-Configuring TCP/IP, proxy and firewall settings. Installing application software, system software &tools.
5. **Internet and World Wide Web**-Search Engines, Types of search engines, netiquette, cyber hygiene.
6. Trouble Shooting-Hardware trouble shooting, Software troubleshooting.
7. **MATLAB-** basic commands, subroutines, graph plotting.
8. **LATEX**-basic formatting, handling equations and images.

TEXT BOOKS:

1. Computer Hardware, Installation, Interfacing, Troubleshooting and Maintenance, K.L. James, Eastern Economy Edition.
2. Microsoft Office 2007: Introductory Concepts and Techniques, Windows XP Edition By Gary B. Shelly, Misty E. Vermaat and Thomas J. Cashman (2007, Paperback).
3. LATEX- User's Guide and Reference manual, Leslie Lamport, Pearson, LPE, 2/e.
4. Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, Rudraprathap, Oxford University Press,2002.
5. Scott Mueller's Upgrading and Repairing PCs, 18/e, Scott. Mueller, QUE, Pearson,2008
6. The Complete Computer upgrade and repair book, 3/e, Cheryl A Schmidt, Dreamtech.
7. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech.

Course Code	COMPUTER PROGRAMMING LABORATORY	L	T	P	Credits
1000171128		0	0	3	2

Learning Objectives:

- Understand the basic concept of C Programming, and its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Pointers, Structures and File programming.
- Acquire knowledge about the basic concepts of writing a program in C language
- Demonstrate Role of constants, variables, identifiers, operators, type conversion and other building blocks of C Language.
- Demonstrate Use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
- Demonstrate Role of Functions involving the idea of modularity.

Outcomes:

- Apply and practice logical ability to solve the problems.
- Understand C programming development environment, compiling, debugging, and linking and executing a program using the development environment
- Analyzing the complexity of problems, Modularize the problems into small modules and then convert them into programs
- Understand and apply the in-built functions and customized functions for solving the problems.
- Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems.

Exercise - 1 Basic

a) What is an OS Command, Familiarization of Editors - vi, Emacs.
b) Using commands like mkdir, ls, cp, mv, cat, pwd, andman.
c) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers From Command line.

Exercise - 2 Basic Math

a) Write a C Program to Simulate 3 Laws atMotion
b) Write a C Program to convert Celsius to Fahrenheit and viceversa

Exercise - 3 Control Flow - I

a) Write a C Program to Find Whether the Given Year is a Leap Year ornot.
b) Write a C Program to Add Digits & Multiplication of anumber

Exercise – 4 Control Flow - II

a) Write a C Program to Find Whether the Given Numberis
   i) Prime Number
   ii) Armstrong Number
   b) Write a C program to print Floyd Triangle
   c) Write a C Program to print Pascal Triangle

Exercise – 5 Functions

a) Write a C Program demonstrating of parameter passing in Functions and returning values.
b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 6 Control Flow - III

a) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using switch…case
b) Write a C Program to convert decimal to binary and hex (using switch call function the function)

Exercise – 7 Functions - Continued

Write a C Program to compute the values of sin x and cos x and e^x values using Series expansion. (use factorial function)

Exercise – 8 Arrays Demonstration
of arrays

a) Search-Linear.
b) Sorting-Bubble, Selection.
c) Operations on Matrix.

Exercises - 9 Structures

a) Write a C Program to Store Information of a Movie Using Structure
b) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation c) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function

Exercise - 10 Arrays and Pointers

a) Write a C Program to Access Elements of an Array Using Pointer
b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 11 Dynamic Memory Allocations

a) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
b) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function. Understand the difference between the above two programs

Exercise – 12 Strings

a) Implementation of string manipulation operations **with** library function.
    i) copy
    ii) concatenate
    iii) length
    iv) compare
b) Implementation of string manipulation operations **without** library function.
    i) copy
    ii) concatenate
    iii) length
    iv) compare

Exercise -13 Files

a) Write a C programming code to open a file and to print it contents onscreen.
b) Write a C program to copy files

Exercise - 14 Files (Continued)

a) Write a C program merges two files and stores their contents in another file.
b) Write a C program to delete a file

DETAILED SYLLABUS
FOR
I B. TECH
II SEMESTER

Course Code		L	T	P	Credits
1000171201	ENGLISH-II	3	1	0	3

Course Objectives

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To enable the students to study and comprehend the prescribed lessons and subjects more effectively related to their theoretical and practical components.
- To develop the communication skills of the students in both formal and informal situations.
- Practice critical thinking to develop innovative and well-founded perspectives related to the students' emphases. Build and maintain healthy and effective relationships.
- How to convey a credible message and create concise messages using a structured writing process.
- Develop effective interpersonal communication skills.

Course Outcomes

After completing this Course, the student should be able to:

- Use English language, both written and spoken, competently and correctly.
- Improve comprehension and fluency of speech.
- Gain confidence in using English in verbal situations.
- Display competence in oral, written, and visual communication.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Enhance English Language skills through the concept of Technological advancements.	Understanding	PO6,PO9, PO10, PO12
CO2	Illustrate the life of eminent personalities for developing the skills of vocabulary and grammar	Applying	PO10, PO12
CO3	Emphasize the relevance of cultures and traditions for enhancing writing skills through literature	Applying	PO10, PO12
CO4	Correlate the importance of Environment and sustainability with an emphasis on language skills	Analyzing	PO10, PO12

Detailed Text : English Encounters

1. **A Dilemma**- A Layman looks at Science
2. **Culture Shock**
3. **Lottery**
4. **Health Threats of Climate Change**
5. **A Chief Architect of Microsoft**

Non-Detailed Text: Panorama

1. **A Scarecrow** - Satyajit Ray
2. **A Village Lost to the Nation** - Krishna Chandra Pujari

Prescribed Books:

1. **English Encounters** by Maruthi Publications
2. **Panorama** by Oxford University Press

Course Code		L	T	P	Credits
1000171203	ENGINEERING MATHEMATICS-III	3	1	0	3

Course Overview:

This course focuses on basic theoretical concepts and advanced Engineering Mathematics. This course helps the students to understand mathematical tools required in the analysis of problems in Engineering and Scientific Professions. The topics included are Solution for linear systems, Eigen values & Eigen vectors, linear transformations, partial differential equations, Vector integral theorems(Green's, Stoke's and Gauss's divergence theorems). Thus mathematical skills derived from this course enable the students to design and solve the problems.

Course Objectives:

1. To explain the concepts of matrix algebra and methods of solving system of linear equations.
2. To compute Eigen values and Eigen vectors of real and complex matrices.
3. To apply properties of partial differential equations to obtain solution for science and engineering problems.
4. Classify and Solve partial differential equations
5. Generalize calculus to vector functions and to compute line, surface and volume integrals.

Course Outcomes:

Up on successful completion of this course, student will be able to:

1. Apply elementary transformations to reduce matrices to echelon form, normal form and hence find their rank.
2. Solve the system of linear equations and compute Eigen values and Eigen vectors of a square matrix.
3. Compute directional derivative and the gradient of functions of several variables.
4. Infer vector integral theorems to evaluate line, surface and volume integrals.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Solve simultaneous linear equations numerically using rank of a matrix and compute Eigen values and Eigen vectors of a square matrix.	Understanding	PO1,PO2, PO3, PO12

CO2	Identify/classify and solve partial differential equations.	Applying	PO1, PO2, PO3, PO6, PO8
CO3	Calculate gradient of a scalar function, divergence and curl of a vector function.	Applying	PO1, PO2, PO3, PO12
CO4	Determine line, surface and volume integrals using appropriate integral theorems.	Analyzing	PO1, PO2, PO6, PO12

UNIT-I: LINEAR SYSTEMS OFEQUATIONS:

Introduction- Rank-Echelon form-Normal form-Solution of Linear systems-Gauss elimination- Gauss Seidel methods-Applications of matrix methods to finding current in the circuits.

UNIT-II: EIGEN VALUES-EIGEN VECTORS AND QUADRATIC FORMS

Introduction-Eigen values-Eigen vectors-Properties(without proofs)-Cayley Hamilton theorem (without proof) - Inverse and power of a matrix by using Cayley Hamilton theorem, Diagonalisation of matrix-Quadratic forms- Reduction of Quadratic form to Canonical form-Rank-Index-Signature-Nature- Applications of Eigen value and Eigen vectors to Free Vibrations of two mass system.

UNIT-III: PARTIAL DIFFERENTIALEQUATIONS:

Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions- Solutions of first order linear (Lagrange's) equation and nonlinear (standard type) equations- Equations reducible to standard forms.

UNIT-IV: VECTORDIFFERENTIATION:

Differentiation of vectors-Scalar and Vector point functions- Gradient of a scalar field and directional derivatives- Divergence and Curl of a vector field and its physical interpretation- Solenoidal and Irrotational of a vector- Vector identities.

UNIT-V: VECTORINTEGRATION:

Line integral- Circulation, Work done, Surface and Volume integrals-Vector integral theorems: Green's, Stoke's and Gauss's Divergence theorems (without proofs) and related problems.

TEXT BOOKS:

1. Higher Engineering Mathematics – 43rd Edition by Dr. B. S. Grewal, Khanna Publishers, New Delhi.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Erwin Kreszig, 8thEd, Wiley Student Ed
2. Advanced Engineering Mathematics, Greenburg, 2nd Ed, Pearson education.
3. Engineering Mathematics, N.P.Bali, Laxmi Publications (P)Ltd.
4. Engineering Mathematics,B. V. Ramana, TataMcGrawHill PublishingCo. Ltd.
5. Engineering Mathematics, P.Sivaramakrishna Das, C.Vijayakumari ,2017 Pearson India Education ServicesPvt.Ltd
6. Advanced Engineering Mathematics, Cengage India , by Peter V O'Neil

Course Code	APPLIED PHYSICS	L	T	P	Credits
1000171207		3	1	0	3

Course Objective:

- To enhance the fundamental knowledge in Physics and its applications relevant to various Streams of Engineering and Technology.

Learning Objectives:

- Impart Knowledge of Physical Optics phenomena like Interference, Diffraction and Polarization involving required to design instruments with higher resolution.
- Teach Concepts of coherent sources, its realization and utility optical instrumentation.
- Study the concepts regarding the bulk response of materials to the EM fields and their analytically study in the back-drop of basic quantum mechanics.
- Understand the physics of Semiconductors and their working mechanism for their utility in sensors.

Outcome:

Construction and working details of instruments, ie., Interferometer, Diffractometer and Polarimeter are learnt. Study EM-fields and semiconductors under the concepts of Quantum mechanics paves way for their optimal utility.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Describe the wave phenomena and working principle of optical instruments.	Understanding	PO1,PO2, PO3, PO9, PO12
CO2	Apply the knowledge of basic quantum mechanics, to set up one-dimensional Schrodinger's wave equation.	Applying	PO1, PO2, PO9, PO12
CO3	Identify the importance of classical and quantum mechanical treatment of materials.	Applying	PO1, PO2, PO9, PO12
CO4	Make use of the basic concepts of energy bands in crystalline solids to understand semiconductor physics.	Analyzing	PO1, PO2, PO9, PO12

UNIT-I

INTERFERENCE: Principle of Superposition – Coherent Sources – Interference in thin films (reflection geometry) – Newton's rings – construction and basic principle of Interferometers.

UNIT-II

DIFFRACTION: Fraunhofer diffraction at single slit cases - Circular Aperture (Qualitative treatment only) - Grating equation - Resolving power of a grating, Telescope and Microscopes.

POLARIZATION: Types of Polarization – Double refraction - Quarter wave plate and Half Wave plate – Working principle of Polarimeter (Sacharimeter).

UNIT-III

ELECTROMAGNETIC FIELDS: Scalar and Vector Fields – Electric potential-Gradient, Divergence of fields – Gauss and Stokes theorems – Maxwell's equations in differential forms.

UNIT-IV

QUANTUM MECHANICS: Introduction – Matter waves – Schrodinger time independent and time dependent wave equations – Particle in abox.

FREE ELECTON THEORY: Defect of classical free electron theory – density of states – Quantum free electron theory – concept of Fermienergy.

UNIT-V

BAND THEORY OF SOLIDS: Kronig- Penney model – energy bands in crystalline solids – classification of crystalline solids- effective mass of electron and concept of hole.

SEMICONDUCTOR PHYSICS: Conduction – Density of carriers in Intrinsic and Extrinsic- Semiconductors – Fermi energy in intrinsic and extrinsic semiconductors-Drift & Diffusion –Einstein's equation- Hall effect in semiconductors.

Text Books:

1. A Text book of Engineering Physics – by Dr. M.N.Avadhanulu and Dr. P.G.Kshira sagar, S.Chand & Company Ltd.,(2014)
2. Physics by David Halliday and Robert Resnick – Part I and PartII

Reference Books:

1. Applied Physics by P.K.Palanisamy, Scitech publications(2014)
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Pub. (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication(2014)
4. Modern Engineering Physics by A.S.Vasudeva
5. University Physics by Young andFreedman
6. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)
7. Engineering Physics by R.K. Gaur and S.L.Gupta

Course Code		L	T	P	Credits
1000171209	NETWORK ANALYSIS	3	1	0	3

COURSE OBJECTIVES:

- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLC circuits.
- To know the basic Laplace transforms techniques in periods'wave forms.
- To understand the two port net work parameters.
- To understand the properties of LC networks and filters.

COUSE OUTCOMES:

The student will be able to:

- Gain the knowledge on basic net work elements.
- Will analyze the RLC circuit's behaviour in detailed.
- Analyze the performance of periodic waveforms.
- Gain the knowledge in characteristics of two port network parameters (Z, Y, ABCD, h &g).
- Analyze the filter design concepts in real world applications.

UNIT-1

Introduction to Electrical Circuits: Network elements classification, Electric charge and current, Electric energy and potential, Active and passive elements and their series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also.

A.C Fundamentals : Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

UNIT – II

Steady State Analysis Response to sinusoidal excitation - pure resistance, pure inductance, pure capacitance, impedance concept, phase angle, series R-L, R-C, R-L-C circuits problem solving. Complex impedance and phase of notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving.

Coupled Circuits: Coupled Circuits: Self-inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.

UNIT – III

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.

Network Theorems: Thevinin's, Norton's, Milliman's, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegens- problem solving using dependent sources also.

UNIT – IV

Two-port networks : 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, problem solving including dependent sources also.

UNIT – V

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, non- homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.

TEXT BOOKS:

1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition,2000.
2. Network Analysis by K.Satya Prasad and S Sivanagaraju, CengageLearning
3. Electric Circuit Analysis by Hayt and Kimmarle,TMH

REFERENCES:

1. Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house.
2. Basic Circuit Analysis by DR Cunninghan, JaicoPublishers.
3. Network Analysis and Filter Design by Chadha, UmeshPublications.

Course Code		L	T	P	Credits
1000171212	ENVIRONMENTAL STUDIES	3	1	0	3

Course Overview:

The course gives a broad view on the importance of environment and its conservation. It deals with distribution of biotic and abiotic components on the Earth, their over exploitation and its associated problems. It provides knowledge on different types of environmental pollutions and their control aspects. It develops practical orientation towards environmental concerns.

Course Objectives:

The objectives of the course are:

- Classify, describe and explains the concept of Ecosystems and Environmental Engineering.
- Overall understanding of different types of natural resources and its conservation.
- Acquaintance on various environmental challenges induced Due to unplanned anthropogenic activities.
- An understanding of the environmental impacts of developmental activities and the importance of Environmental Management.
- Awareness on the social issues, environmental legislations and global treaties.

Course Outcomes

- Give an outline of the natural resources and their importance for the sustenance of life and recognize the need to conserve the natural resources.
- Explain the concepts of the ecosystem and its function in the environment; explains the need for protecting the producers and consumers in various ecosystems and their role in the food web
- Elucidate the biodiversity of India and threats to biodiversity and conservation practices to protect the biodiversity
- Give a broad view on various attributes of pollution and their impacts and measures to reduce or control the pollution along with waste management practices.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Elucidate the natural resource & their importance for the sustenance of life and recognises the need to conserve natural resource	Understanding	PO2,PO5, PO6, PO7, PO12
CO2	Gives the broad view on the various attributes of pollution & and their impact & measure to reduce he pollution along with waste management	Applying	PO2,PO3, PO5, PO6, PO7, PO12
CO3	Debates on social issues both rural and urban environment possible means to combat the challenges and trace the legislation of India towards sustainability	Applying	PO1, PO2,PO5, PO6, PO7, PO12
CO4	Educates about Environmental Impact Assessment, Environmental Impact Statement & Environmental Audit	Analyzing	PO1, PO2, PO4, PO5, PO6, PO7, PO12

UNIT - I

Multidisciplinary nature of Environmental Studies & Natural Resource

Definition, Scope and Importance of Environmental Engineering – Sustainability: Stockholm and Rio Summit–Global

Forest resources– Use and over– exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people

Water resources– Use and over utilization of surface and ground water– Floods, drought, conflict over water, dams– benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - II

Environmental Pollution

Definition, Cause, effects and control measures of Air pollution,

Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.

Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.
Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

UNIT – III

Social Issues and the Environment

Urban problems related to energy -Water conservation, rain water harvesting- Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Environmental Protection Act - Air(Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act- Issues involved in enforcement of environmental legislation. –Public awareness.

UNIT - IV

Ecosystems, Biodiversity & Conservation

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem.

- Producers, consumers and decomposers. -Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

Biodiversity and its conservation

Definition: Levels of Biodiversity, Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega- diversity nation - Hot-spots of biodiversity -Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity.

UNIT - V

Environmental Management and Field Studies

Impact Assessment and its significance various stages of EIA, Preparation of EMP and EIS, Environmental audit. Eco-tourism, Environmental Economics & Study of a Ecotourism spot in a local area, Visit to some Polluted site. Environmental diary.

Text Books:

1. Environmental Studies by R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
2. A Textbook of Environmental Studies by ShaashiChawla, TMH, NewDelhi
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education,Chennai

References:

1. Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, NewDelhi
4. Environmental Studies by PiyushMalaviya, Pratibha Singh, Anoopsingh:Acme Learning, New Delhi

Course Code		L	T	P	Credits
1000171213	DATA STRUCTURES	3	1	0	3

Course Objectives:

1) To be familiar with basic techniques handling problems with Data structures.
2) Solve problems using data structures such as linear lists, stacks, queues, hash tables.

Course Prerequisites:

Students should have knowledge of

1) Basics of Computer Components
2) Distinction between software and hardware
3) Awareness regarding data availability and its usage

Course Outcome:

Students will be able to:

1) Apply advanced data structure strategies for exploring complex data structures.
2) Compare and contrast various data structures and design techniques in the area of performance
3) Implement all data structures like stacks, queues, trees, lists and graphs and compare their Performance and tradeoffs

UNIT-I : ARRAYS

Abstract Data Type, The Array as an Abstract Data Type, The Polynomial Abstract Data type- Polynomial Representation- Polynomial Addition. Spares Matrices, Introduction- Sparse Matrix Representation- Transposing a Matrix, Representation of Arrays.

UNIT-II: STACKS AND QUEUES

The Stack Abstract Data Type, The Queue Abstract Data Type, Evaluation of Expressions, Expression-Postfix Notation- Infix to Postfix.

UNIT-III: LINKED LISTS

Single Linked List, Circular Lists, Available Space Lists, Linked Stacks and Queues, Polynomials, Polynomial Representation- Adding Polynomials- Circular List

Representation of Polynomials, Sparse Matrices, Sparse Matrix Representation- Sparse Matrix Input-Deleting a Sparse Matrix, Doubly Linked Lists.

UNIT-IV: TREES

Representation of Trees, Binary Trees, The Abstract Data Type, Properties of Binary Tress, Binary Tree Representations, Binary Tree Traversal, Introduction, In-order Traversal Pre-order Traversal, Post-order Traversal, Binary Search Trees, Definition, Searching a Binary Search Tree

UNIT-V : SEARCHING, SORTING and GRAPHS

Searching: Linear and Binary search
Sorting: Bubble Sort, Insertion Sort, Quick Sort, Merge Sort
The Graph Abstract Data Type, Introduction, Definition, Graph Representation, Elementary Graph Operation, Depth First Search, Breadth First Search

Text Books:

Fundamentals of Data structures in C, Ellis Horowitz, S.Sahni, Andrews Freed, University Press (India). (Second Edition)

Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition.

Reference Books:

Classic Data Structures, Debasis Samantha, PHI. (Second Edition)

Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI. Data Structures using C, Reema Thareja, Oxford Home Publications, Second Edition.

Course Code		L	T	P	Credits
1000171221	**ENGLISH COMMUNICATION SKILLS LAB-2**	0	0	3	2

Objectives:

- This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:
- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts. They would be required to communicate their ideas relevantly and coherently in writing.

Course outcomes: The proposed course to enable students to use 'good' English and perform the following:

- Gather ideas and information, to organize ideas relevantly and coherently.
- Engage in debates. Participate in group discussions.
  Face interviews. Write project/research reports/technical reports.
- Make oral presentations.
- Writing formal letters and to take part in social and professional communication.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Demonstrate the usage of phonemes while referring to the dictionary	Understanding	PO5,PO9, PO10, PO12
CO2	Articulate with others by using proper functions.	Applying	PO5,PO9, PO10, PO12
CO3	Enact the roles with proper body language.	Applying	PO5,PO9, PO10, PO12
CO4	Communicate fluently with proper pronunciation	Analyzing	PO5,PO9, PO10, PO12

Unit-1: Pronouncing Words

Unit-2: Interaction 3

Unit-3: Stress & Intonation

Unit-4: Interaction 4

PRESCRIBED LAB MANUAL:

Speak Well-Orient Blackswan Publishers

SUGGESTED BOOKS/ MANUALS AND SOFTWARES:

1. Interact- Orient Blackswan
2. The Rosetta stone English Library
3. Language in Use
4. English in Mind

Course Code		L	T	P	Credits
1000171222	ENGINEERING PHYSICS LABORATORY	0	0	3	2

(Any 8 of the following listed experiments)

Course Objectives:

- The Objective of this course is to make the students gain practical knowledge to co-relate with the theoretical studies. To achieve perfectness in experimental skills and the study of practical applications will bring more confidence and ability to develop and fabricate engineering and technical equipments.
- Design of circuits using new technology and latest components and to develop practical applications of engineering materials and use of principle in the right way to implement the modern technology.

Outcome:

- Hands on experience for all the instruments and better understanding of theory.

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Experimentation of laws of vibrations in strenteched string	Understanding	PO1,PO2, PO9, PO12
CO2	Determination of velocity of sound, rigidity modulus of a wire, acceleration due to gravity, radius of gyration and Planck's constant.	Applying	PO1, PO2, PO9, PO12
CO3	Analyze the voltage vs. current characteristics of Zener diode and temperature vs. resistance characteristics of a thermistor	Applying	PO1, PO2, PO9
CO4	Demonstration of formation Newton's rings, diffraction pattern using grating and induced magnetic field in a cirucuclar coil.	Analyzing	PO1, PO2, PO9

List of Experiments

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.
2. Newton's rings –Radius of Curvature of Plano_Convex Lens.
3. Determination of Rigidity modulus of a material- Torsional Pendulum.
4. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
5. Melde's experiment – Transverse and Longitudinal modes.
6. Verification of laws of stretched string –Sonometer.
7. Determination of velocity of sound – Volume resonator.
8. L C R Senes Resonance Circuit.
9. Study of I/V Characteristics of Semi conductor diode.
10. I/V characteristics of Zenerdiode.
11. Thermistor characteristics – Temperature Coefficient.
12. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
13. Determination of wavelength of laser source using dirreraction grating
14. Determination of Planck's constant using photocell.

Course Code		L	T	P	Credits
1000171228	DATA STRUCTURES PROGRAMMING LAB	0	0	3	2

Exercise1:

a) Write a C program to representation the given sparse matrix using arrays.

b) Write a C program to store a polynomial expression in memory using Arrays.

Exercise 2:

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

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

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

Exercise 3:

a) Write a C program that uses functions to create a singly linkedlist

b) Write a C program that uses functions to perform insertion operation ona singly linkedlist

c) Write a C program that uses functions to perform deletion operation ona singly linkedlist

Exercise 4:

a) Write C program that implement Queue (its operations) using linkedlists

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

Exercise 5:

a) Write C program that use both recursive and non recursive functionsto perform Binary search for a Key value in a givenlist.

b) Write a C program to reverse elements of a single linkedlist.

c) Write a C program to store a polynomial expression in memory using linked list

Exercise 6:

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

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

Exercise 7:

Write a C program to create a Binary Tree of integers

Exercise 8:

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

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

Exercise 9:

a) Write a C program to Create a BST

b) Write a C program to insert a node into a BST.

c) Write a C program to delete a node from a BST.

PROGRAM STRUCTURE

FOR

II-B.TECH

I & II SEMESTERS

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING
PROGRAM STRUCTURE (VR 17)

II B.Tech **I Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1004172101	Electronic Devices and Circuits	3	1*	0	3
2	1004172102	Switching Theory and Logic Design	3	1*	0	3
3	1004172103	Signals and Systems	3	1*	0	3
4	1012172104	Software Engineering	3	1*	0	3
5	1019172105	Object Oriented Programming	3	1*	0	3
6	1099172106	Managerial Economics & Financial Analysis	3	1*	0	3
7	1004172121	Electronic Devices and Circuits Lab	0	0	3	2
8	1019172122	OOPS Lab	0	0	3	2
9	1099172103	Professional Ethics & Human Values	3	0	0	0
Total Credits						22

II B.Tech **II Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019172201	Principles of Communications	3	1*	0	3
2	1004172202	Control Systems	3	1*	0	3
3	1099172203	Management Science	3	1*	0	3
4	1005172204	Computer Organization	3	1*	0	3
5	1004172205	Pulse and Digital Circuits	3	1*	0	3
6	1005172206	Operating Systems	3	1*	0	3
7	1019172221	Pulse & Digital Circuits & Communications Lab	0	0	3	2
8	1019172222	Operating Systems Lab	0	0	3	2
9	1019172231	Industrial Visit	0	0	0	2
Total Credits						24

DETAILED SYLLABUS

FOR

II B. TECH

I SEMESTER

Course Code		L	T	P	Credits
1004172101	ELECTRONIC DEVICES AND CIRCUITS	3	1	0	3

Course Overview: The *course* provides a comprehensive understanding of *electronic circuits* and *devices.*

Course Objectives:

- To provide an overview of the principles, operation and application of the analog building blocks like diodes, BJT, FET etc for performing various functions.
- To provide the student with the basic knowledge about design, functionality and fabrication of semiconductor devices.
- Understanding of complex devices such as semiconductor diodes and field-effect transistors are modeled and how the models are used in the design and analysis of useful circuits.
- Capability to design circuits, take measurements of circuit behavior and their performance, compare with predicted circuit models and explain discrepancies.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Explain the basic concepts of semiconductor physics and summarize the characteristics of PN junction diode in different modes of operation.	Understand	PO-1, PO-2, PO-12
CO2	Compare the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.	Understand	PO-1, PO-2, PO-3
CO3	Summarize the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations and understand the various biasing techniques for BJT and FET.	Understand	PO-1, PO-2, PO-3
CO4	Explain the stabilization concepts with expressions and perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.	Understand	PO-1, PO-2, PO-3, PO-4, PO-10

Unit-I:

Semi Conductor Physics : Insulators, Semi conductors and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors

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, Diode capacitance, energy band diagram of PN junction Diode.

Outcome:

Explain the basic concepts of semiconductor physics and summarize the characteristics of PN junction diode in different modes of operation

Activity:

Identification of Components

Unit-II:

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, SCR, UJT.
Rectifiers and Filters: Half wave rectifier, full wave rectifier, bridge rectifier, rectifier circuits-operation, filters; Inductor filter, Capacitor filter, L- section filter, π- section filter, comparison of various filter circuits in terms of ripple factors.

Outcome:

Compare the construction, working principle of rectifiers with and without filters with relevant expressions and necessary comparisons.

Activity:

Design various circuits using diodes

Unit-III:

Transistor Characteristics:

BJT: Junction transistor, transistor current components, transistor configurations, transistor as an amplifier, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through, Photo transistor, FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

Outcome:

Summarize the construction, principle of operation of transistors, BJT and FET with their V-I characteristics in different configurations and understand the various biasing techniques for BJT and FET.

Activity:

Build a circuit used for impedance matching circuit

Unit-IV:

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 V_{BE}, I, and Stability factors, (S,S,S), compensation, Thermal runaway, Thermal stability, FET Biasing- methods and stabilization

Outcome:

Explain the stabilization concepts with expressions

Activity:

Design an amplifier

Unit-V:

Small Signal Low Frequency Transistor Amplifier Models: BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.
FET: Generalized analysis of small signal model, Analysis of CG,CS and CD amplifiers, and comparison of FET amplifiers.

Outcome:

Explain the stabilization concepts with expressions and perform the analysis of small signal low frequency transistor amplifier circuits using BJT and FET in different configurations.

Activity:

Design a low frequency amplifier

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Electronic Devices and Circuits-David A. Bell, Oxford University Press, Fifth Edition.

Reference Books:

1. Electronic Devices and Circuits- K. Satya Prasad.
2. Electronic Devices and Circuits-B.P. Singh, Rekha Singh, Pearson Publications,
3. Second Edition.
4. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition
5. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.
6. Electronic Devices and Circuits -B V Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, Pearson, 2nd edition.
7. Integrated Electronics- Jacob Millman, C. Halkies, C. D. Parikh, Tata Mc-Graw Hill, 2009.

Course Code	SWITCHING THEORY AND LOGIC DESIGN	L	T	P	Credits
1004172102		3	1	0	3

Course Overview:

Able to derive Boolean expressions, minimization techniques, design combinational and sequential digital circuits.

Course Objectives:

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

- To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Convert numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.	Understand, Apply	PO-1, PO-2, PO-3
CO2	Convert simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.	Understand, Apply	PO-1, PO-2, PO-3
CO3	Design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.	Analyze	PO-1, PO-2, PO-3
CO4	Design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.	Analyze	PO-1, PO-2, PO-3

Unit-I:

Number system and Boolean algebra and Switching functions:

Number system:

Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Alphanumeric Codes, Error detecting and correcting methods

Boolean Algebra:

Basic Theorems and Properties, principle of complementation & duality, De-morgan theorems, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

Outcome:

To manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD**.**

Activity :

Verification of logic gates with 74 MSI series ICs on bread board.

Unit-II:

Minimization and Combinational Logic Circuits Design-I:

Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method.

Combinational logic Circuits:

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.

Outcome:

To manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.

Activity :

Design and Implement Logic functions using Full Adder and full substractor

Unit-III:

Combinational Logic Circuits Design-II:

Design of decoder, demultiplexer, 7 segment decoder, encoder, multiplexer, multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, Magnitude comparator.

Introduction of PLD'S:

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison.

Outcome:

To design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.

Activity :

Design and Implement Logic functions using Multiplexers

Unit-IV:

Sequential Circuits –I:

Classification of sequential circuits, Latches, basic flip-flops, truth tables and excitation tables (NAND RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). Master-Slave Flip-flops, Conversion from one flip-flop to another type flip-flop. Counters, Design of asynchronous counters, Design of Synchronous Counters, Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register.

Outcome:

To design and analyze small sequential circuits & devices and to use standard sequential functions/building blocks to build larger more complex circuits.

Activity :

Design and Implement Logic function using Sequential Circuits.

Unit-V:

Sequential Circuits-II:

Finite state machine-capabilities and limitations, Mealy and Moore models, conversion of Melay to Moore model and vice-versa, analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures, Partition techniques.

Outcome:

To impart the concepts of sequential circuits enabling them to analyze sequential systems in terms state machines.

Activity:

With examples Convert a Mealy machine into a corresponding Moore machine.S

Text Books:

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMHedition.
2. Digital Design by Morris ManoPHI.

Reference Books:

1. Modern Digital Electronics by RP Jain,TMH
2. Switching Theory and Logic Design by A. AnandKumar
3. Fundamentals of Logic Design by Charles H. Roth Jr, JaicoPublishers
4. Micro electronics by Milliman MHedition

Course Code	SIGNALS AND SYSTEMS	L	T	P	Credits
1004172103		3	1	0	3

Course Overview:

Signals and Systems is an introduction to analog and digital signal processing, a topic that forms an integral part of engineering systems in many diverse areas, including communications, speech processing, image processing, defense electronics, consumer electronics, seismic data processing, and consumer products.

Course Objectives:

- Understanding the fundamental characteristics of signals and systems.
- Understanding the concepts of vector space and orthogonal series.
- Understanding signals and systems in terms of both the time and transform domains, taking advantage of the complementary insights and tools that these different perspectives provide.
- Developing the mathematical skills to solve problems involving filtering, modulation and sampling.
- Applying convolution both in time domain and frequency domain.
- Developing mathematical skills to solve differential and difference equation using Laplace transform and Z-transform

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Apply the knowledge of linear algebra topics like vector space and orthogonal basis to signals, Analyze the spectral characteristics of continuous-time periodic and aperiodic signals using Fourier analysis.	Understand, Apply	PO-1, PO-2, PO-3
CO2	Understand the process of sampling and the effects of under sampling, Analyze system properties based on impulse response and Fourier analysis	Understand, Apply	PO-1, PO-2, PO-3
CO3	Apply convolution both in time domain and frequency domain.	Apply	PO-1, PO-2, PO-3
CO4	Apply the Laplace transform and Z-transform for analysis of continuous-time and discrete-time signals and systems.	Apply	PO-1, PO-2, PO-3

Unit-I:

Signal Analysis:

Definition and classification of Signals and Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Complex exponential and sinusoidal signals, Singularity function and related functions: impulse function, unit step, 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.

Outcome:

Apply the knowledge of linear algebra topics like vector space and orthogonal basis to signals.

Activity:

Generation and Operation of different standard signals(step, ramp, impulse, exponential etc..) using MATLAB

Unit-II:

Fourier Series & Fourier Transforms:

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

Outcome:

Analyze the spectral characteristics of continuous-time periodic and aperiodic signals using Fourier analysis.

Activity:

Observe Signal spectrum in frequency domain by using Fourier Analysis.

Unit-III:

Concept of Sampling & Signal Transmission Through:

Linear Systems:

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.

Linear system, Impulse response, Linear time invariant (LTI) system, Transfer functions 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.

Outcome:

- Understand the process of sampling and the effects of under sampling.
- Analyze system properties based on impulse response and Fourier analysis.

Activity:

- Reconstruction of a signal from it's samples using MATLAB.
- Designing of LPF, HPF and BPF using MATLAB.

Unit-IV:

Convolution and Correlation of Signals:

Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property, Cross correlation and auto correlation functions, properties of cross correlation and auto correlation of functions, 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,

Outcome:

Apply convolution both in time domain and frequency domain.

Activity:

- Perform signal filtering using convolution.
- Magnitude identification of a single frequency and a band of frequency.
- Obtain convolution result (both linear and circular) of two different sequence by using MATLAB Software

Unit-V:

Laplace Transforms & Z–Transforms:

Laplace Transforms:

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

Z–Transforms:

Fundamental difference between continuous-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

Outcome:
Apply the Laplace transform and Z- transform for analysis of continuous-time and discrete-time signals and systems.

Activity:

Finding system response from characteristic equation by using L.T and Z.T (Using MATLAB AND LABVIEW Software).

Text Books:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals & Systems- Narayan Iyer and K SatyaPrasad ,Cenage Pub.

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2nd Edition.
2. Signals and Systems – K R Rajeswari
3. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition, 2008.

Course Code	SOFTWARE ENGINEERING	L	T	P	Credits
1012172104		3	1	0	3

Course Overview:

Software engineering is an engineering branch associated with development of software product using well-defined scientific principles, methods and procedures. The outcome of software engineering is an efficient and reliable software product. Software project management has wider scope than software engineering process as it involves communication, pre and post delivery support etc.

Course Objectives:

- Able to explain software life cycle models.
- Able to draft & apply software requirements and SRS document.
- Able to describe importance of modeling and modeling languages.
- Able to design and develop correct and robust software products, quality control and how to ensure good quality software.
- Able to plan and estimate software projects & maintain the software.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Apply the appropriate process models for the application development of SDLC.	Applying	PO1, PO2, PO3, PO5
CO2	Understand the phases of SDLC from requirement gathering phase to design phase via Analysis Phase.	Understanding	PO1, PO2
CO3	Analyzing the strategies for coding and testing phase in Software product development.	Analyzing	PO1, PO2, PO3
CO4	Apply the knowledge about estimation and maintenance of software systems and modeling the software project by using CASE tools.	Applying	PO1, PO2, PO3, PO5

Unit-I:

Software and Software Engineering:

The Nature of Software, The Unique Nature of Web Apps, Software Engineering, Software Process, Software Engineering Practice, Software Myths.

Process Models:

A Generic Process Model like Waterfall Models, Agile Model. Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Terminology, Product and Process.

Outcome:

Define and develop a software project from requirement gathering to implementation.

Activity:

Seminar on Waterfall model

Unit-II:

Requirements Analysis and Specification:

Requirements Gathering and Analysis, Software Requirement Specification (SRS), Formal System Specification.

Software Design:

Overview of the Design Process, How to Characterize of a Design?, Cohesionand Coupling, Layered Arrangement of Modules, Approaches to Software Design

Outcome:

Define and develop a software project from requirement gathering to implementation.

Activity:

Role-Play on requirement analysis

Unit-III:

Function-Oriented Software Design:

Overview of SA/SD Methodology, Structured Analysis, Developing the DFD Model of a System, Structured Design, Detailed Design, Design Review, over view of Object Oriented design.

User Interface Design:

Characteristics of Good User Interface, Basic Concepts, Types of UserInterfaces, Fundamentals of Component-based GUI Development, A User Interface Design Methodology.

Coding And Testing:

Coding, Code Review, Software Documentation, Testing, Unit Testing,Black-Box Testing, White-Box Testing, Debugging, Program Analysis Tool, Integration Testing, Testing Object-Oriented Programs, System Testing, Some General Issues Associated with Testing

Outcome:

Obtain knowledge about principles and practices of software engineering.

Activity: Case Study on Graphical User Interface

Unit-IV:

Software Reliability And Quality Management:

Software Reliability, Statistical Testing,Software Quality, Software Quality Management System, ISO 9000, SEI Capability Maturity Model.

Computer Aided Software Engineering:

Case and its Scope, Case Environment, Case Supportin Software Life Cycle, Other Characteristics of Case Tools, Towards Second Generation CASE Tool, Architecture of a Case Environment

Outcome:

Focus on the fundamentals of modeling a software project.
Activity: Think-Pair-Share(TPS)

Unit-V:
Software Maintenance:

Software maintenance, Maintenance Process Models, Maintenance Cost, Software Configuration Management, Devops.

Software Reuse:

What can be reused? Why almost No Reuse So Far? Basic Issues in Reuse Approach, Reuse at Organization Level.

Outcome:

Obtain knowledge about estimation and maintenance of software systems

Activity:

A small project on Software Development Life Cycle
Text Books:

1.Software engineering A practitioner's Approach, Roger S. Pressman, Seventh Edition

2.Mc GrawHill International Edition.

3.Fundamentals of Software Engineering, Rajib Mall, Third Edition, PHI.

4.Software Engineering, Ian Sommerville, Ninth edition, Pearson education

Reference Books:

1. Software Engineering : A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008
2. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
3. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
4. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.

Course Code	OBJECT ORIENTED PROGRAMMING	L	T	P	Credits
1019172105		3	1	0	3

Course Overview:

Students should have knowledge of

- Object Oriented Programming (OOP) using the C++ language. Topics covered will be C++ classes/objects, input/output streams, overloading, inheritance, templates and exception handling. This is a first semester course in C/C++.Students entering the course should already be familiar with the C programming language.

Course Objectives:

- To write efficient, maintainable and portable code.
- To learn and acquire art of computer programming.
- To know about some popular programming and how to choose Programming language for solving a problem.

Course Outcomes:

After completion of course students will be able to

	Course outcome	Skill	PO
CO1	Apply the basic terminology of C++.	Understanding	PO1, PO2
CO2	Write, compile and debug programs in C++ language. Use different data types in a computer program. Design programs involving decision structures, loops and functions.	Applying	PO1, PO2, PO4
CO3	Explaining with classes, objects and member functions, concepts of inheritance. Define and compare/contrast constructors and destructors.	Remembering	PO1, PO2, PO3, PO4
CO4	Usage of generic programming, overloading of functions and operators, overriding and exception handling in various contexts.	Applying	PO1, PO2, PO3, PO4

Unit-I:

Introduction to C++:

Difference between C and C++- Evolution of C++- The Object Oriented Technology- Disadvantage of Conventional Programming- Key Concepts of Object Oriented Programming- Advantage of OOP-Object Oriented Language.

Outcome:

- Compare between C and C++
- Explaining the concepts of basics of Object Oriented Programming (OOPs).
- Apply the Structure of a C++ Program.

Activity: Group Discussion

Unit-II:

Classes and Objects &Constructors and Destructor:

Classes in C++-Declaring Objects- Access Specifiers and their Scope- Defining Member Function-Overloading Member Function- Nested class, Constructors and Destructors, Introduction- Constructors and Destructor- Characteristics of Constructor and Destructor-Application with Constructor- Constructor with Arguments (parameterized Constructor-Destructors- Anonymous Objects.

Outcome:

- Define and compare/contrast constructors and destructors.
- Explaining with classes, objects and member functions.
- Difference between function overloading and function overriding
- Discuss basics of Nested Class.

Activity: Test / Seminar/Programming Contest

Unit-III:

Operator Overloading and Type Conversion & Inheritance:

The Keyword Operator- Overloading Unary Operator- Operator Return Type- Overloading Assignment Operator (=)- Rules for Overloading Operators, Inheritance, Reusability- Types of Inheritance- Virtual Base Classes- Object as a Class Member- Abstract Classes-Advantages of Inheritance-Disadvantages of Inheritance.

Outcome:

- Ability to overload operators in C++.
- Explain the basic concepts of inheritance

Activity: Practicing real time applications.

Unit-IV:

Pointers & Binding Polymorphisms and Virtual Functions:

Pointer, Features of Pointers- Pointer Declaration- Pointer to Class- Pointer Object- The this Pointer-Pointer to Derived Classes and Base Class, Binding Polymorphisms and Virtual Functions, Introduction-Binding in C++- Virtual Functions- Rules for Virtual Function-Virtual Destructor.

Outcome:

- Discuss on Pointers, pointer -pointer to derived classes and base class.
- Explain basic concepts of binding, polymorphism

Activity: Programming Contest

Unit-V:

Generic Programming with Templates & Exception Handling:

Generic programming with Templates, Need for Templates- Definition of class Templates- Normal Function Templates- Over Loading of Template Function, Difference Between Templates and Macros- Linked Lists with Templates, Exception Handling-Principles of Exception Handling- The Keywords try throw and catch.

Overview of Standard Template Library

Overview of Standard Template Library- STL Programming Model- Containers- Sequence Containers-Associative Containers- Algorithms- Iterators- Vectors- Lists- Maps.

Simple Case Studies/Mini Project.

Outcome:

- Usage of generic programming, overloading of functions and operators, overriding and exception handling in various contexts.
- Explain basics of templates and different types of templates.
- Learn syntax, features of, and how to utilize the Standard Template Library.

Activity: Practicing examples

Text Books:

1. A First Book of C++, Gary Bronson, Cengage Learning.
2. The Complete Reference C++, Herbert Schildt, TMH.
3. Programming in C++, Ashok N Kamathane, Pearson 2nd Edition.

Course Code		L	T	P	Credits
1099172106	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS	3	1	0	3

Course Overview:

The present course is designed in such a way that it gives an overview of concepts of Economics. Managerial Economics enables students to understand micro environment in which markets operate how price determination is done under different kinds of competitions. Financial Analysis gives clear idea about concepts, conventions and accounting procedures along with introducing students to fundamentals of ratio analysis and interpretation of financial statements. Break Even Analysis is very helpful to the Business Concern for Decision Making, controlling and forward Strategic Planning. Ratio analysis gives an idea about financial forecasting, financial planning, controlling the business and decision making.

Course Objectives:

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

1. Understand the concepts of managerial economics and the market dynamics namely Demand, Elasticity of demand and pricing in different market structures.
2. Acquire the knowledge about production theories and cost analysis besides dealing with the production and factors of production.
3. Analyze the different market structures and understand various pricing methods which are adopted in attracting the customers under different markets.To understand various forms of business organization and business cycles.
4. To provide the basic knowledge on financial accounting
5. To understand Capital budgeting decisions.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Describe the economic activities performed by the businessmen in the business for profit earning. Understand the significance of demand, its analysis, measurement of demand and its Forecasting.	Understanding	PO1, PO2, PO8, PO10, PO11, PO12
CO2	Evaluate the production theories and pricing policies of various enterprises.	Applying	PO1, PO2, PO8, PO10, PO11, PO12
CO3	Design and implement different structures of market covering how price is determined under different market structures. Also can able to take decisions using business cycles. Analyze different forms of business organizations existing in the modern business and able to choose suitable form of business.	Analyzing	PO1, PO2, PO8, PO10, PO11, PO12
CO4	Able to prepare financial statements. Evaluate investment proposals using capital budgeting tools and techniques.	Applying	PO1, PO2, PO8, PO10, PO11,PO12

Unit-I:

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand-Demand schedule, Demand curve, Law ofDemand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting

Outcome:

Describe the economic activities performed by the businessmen in the business for profit earning. Understand the significance of demand, its analysis, measurement of demand and its Forecasting

Activity: Forecast the Demand for various products/services

Unit-II:

Production and Cost Analyses:

Concept of Production function- Cobb-Douglas Production function- Leontief production function - Law of Variable proportions-Isoquants and Is costs and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs- Fixed costs, Variable Costs and Total costs – Cost –Volume-Profit analysis-Determination of Breakeven point(simple problems)-Managerial significance and limitations of breakeven point.

Outcome: Evaluate the production theories and pricing policies of various enterprises

Activity: Solving Business problems by applying BEP Analysis

Unit-III:

Part: I:

Introduction to Markets, Theories of the Firm & Pricing Policies: Managerial Theories of firm: Marris and Williamson's models – Significance of Pricing and various methods of pricing with contemporary examples. Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Price and Output Determination.

Part: II:

Types of Business Organization and Business Cycles: Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms – Business Cycles : Meaning and Features – Phases of Business Cycle.

Outcome:

Design and implement different structures of market covering how price is determined under different market structures. Also can able to take decisions using business cycles

Activity: Organization which pass business cycle& Identify the reasons

Unit-IV:

Introduction to Accounting: Introduction to Accounting, Double Entry Systems Journal, Ledger, Trail Balance, preparation of Financial Statements (Problems)

Outcome:

Analyze different forms of business organizations existing in the modern business and able to choose suitable form of business

Activity: Assess the financial position of various companies

Unit-V:

Capital Budgeting Decisions: Classification of Capital- Methods of appraising Project profitability: Traditional Methods (Payback period, Accounting rate of return) and Time value of money- Modern methods (Net Present Value method, Internal Rate of Return Method and Profitability Index Method) - Problems

Outcome:

Able to Prepare financial statements and implement the capital budgeting tools and techniques.

Activity: Analyze the investment decisions of companies by applying Capital budgeting.

Text Books:

1. M.Kasi Reddy & Saraswathi, "Managerial Economics and Financial Analysis", PHI Publications, New Delhi, 10th Revised Edition, 2012.
2. Varshney & Maheswari, "Managerial Economics", Sulthan Chand Publishers, 1st Revised Edition, 2009.
3. S.N. Maheshwari & S.K.Maheshwari, "Financial Accounting", Vikas Publication House Pvt.Ltd, 4th Edition, 2012.

Reference Books:

1. D.N. Dwivedi, "Managerial Economics", Vikas Publication House Pvt.Ltd, 2nd Edition, 2012.
2. R.Narayana Swamy, "Financial Accounting- A managerial Perspective", Pearson publications, 1st Indian Reprint Edition, 2012.
3. J.V.Prabhakar Rao & P.V.Rao, "Managerial Economics & Financial Analysis", Maruthi Publishers, 1st Revised Editon, 2011

Course Code	ELECTRONIC DEVICES AND CIRCUITS LAB	L	T	P	Credits
1004172121		0	0	3	2

Course Overview:

The students are required to perform the experiment to obtain the V-I characteristics and to determine the relevant parameters from the obtained graphs.

a) Electronic Workshop Practice:

1. Identification, Specifications, Testing of R, L, C Components (Color 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 Multi meter, Function Generator, Regulated Power Supply and CRO.

b) 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 Characteristics Part A: V-I Characteristics
   Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with c-filter) Part A: Half-wave Rectifier
   Part B: Full-wave Rectifier
4. BJT Characteristics(CE Configuration) Part A: Input Characteristics
   Part B: Output Characteristics
5. FET Characteristics(CS Configuration) Part A: Drain Characteristics
   Part B: Transfer Characteristics
6. SCR Characteristics
7. UJT Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

Equipment required:

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

Course Code	OOPS LAB	L	T	P	Credits
1019172122		0	0	3	2

Course Overview:

The course of Object-oriented programming aims to give students the necessary knowledge on the programming of computer and Internet systems using object oriented programming language. The course aims to cover theoretical and practical issues related to the techniques of Object Oriented, Event Driven and Visual Programming Planning and uses as a programming language the Java language

Course Objectives:

- To familiarize students with object-oriented concepts and their implementation in C++.
- To facilitate students with the skills required to solve problems using object oriented concepts.
- To impart the knowledge required to write code with good coding practices.

Course Outcomes:

Upon successful completion of the course, students will be able to:

- Understand the process of writing, compiling and executing programs in C++ using appropriate predefined functions in C++.
- Implement the object oriented concepts in developing application using C++.
- Developing applications in C++ using the understanding of Inheritance and polymorphism.
- Understand and use exception handling while developing a C++ application.
- Develop complex applications by identifying the appropriate features of object oriented programming to solve real world problems using C++.

Programming

Exercise – 1 (Basics)

Write a Simple Program on printing “Hello World” and “Hello Name” where name is the input from the user a) Convert any two programs that are written in C into C++
b) Write a description of using g++ (150 Words)

Exercise – 2 (Expressions Control Flow)

a) Write a Program that computes the simple interest and compound interest payable on principal amount (in Rs.)of loan borrowed by the customer from a bank for a given period of time (in years) at specific rate of interest. Further determine whether the bank will benefit by charging simple interest or compound interest.
b) Write a Program to calculate the fare for the passengers traveling in a bus. When a Passenger enters the bus, the conductor asks “What distance will you travel?” On knowing distance from passenger (as an approximate integer), the conductor mentions the fare to the passenger according to following criteria.

Distance (in KMS)	Fare (per KM)
0 – 20	65 paisa
21 – 40	75 paisa
41 – 60	78 paisa
61 – 80	80 paisa
81 – 100	95 paisa
101 and above	1.05 paisa

Exercise – 3 (Variables, Scope, Allocation)

a) Write a program to implement call by value and call by reference using reference variable.

b) Write a program to illustrate scope resolution, new and delete Operators. (Dynamic Memory Allocation).

c) Write a program to illustrate Storage classes.

d) Write a program to illustrate Enumerations.

Exercises –4 (Functions)

Write a program illustrating Inline Functions

a) Write a program illustrate function overloading. Write 2 overloading functions for power.

b) Write a program illustrate the use of default arguments for simple interest function.

Exercise -5 (Functions –Exercise Continued)

a) Write a program to illustrate function overloading. Write 2 overloading functions for adding two numbers

b) Write a program illustrate function template for power of a number.

c) Write a program to illustrate function template for swapping of two numbers.

Exercise -6 (Classes Objects)

Create a Distance class with:

1. Feet and inches as data members.
2. Member function to input distance.
3. Member function to output distance.
4. Member function to add two distance objects.

a). Write a main function to create objects of DISTANCE class. Input two distances and output the sum.

b). Write a C++ Program to illustrate the use of Constructors and Destructors (use the above program.)

c) Write a program for illustrating function overloading in adding the distance between objects (use the above problem)

d). Write a C++ program demonstrating a Bank Account with necessary methods and variables

Exercise – 7 (Access)

Write a program for illustrating Access Specifies public, private, protected.

a) Write a program implementing Friend Function.

b) Write a program to illustrate this pointer.

c) Write a Program to illustrate pointer to a class.

Exercise -8 (Operator Overloading)

a). Write a program to Overload Unary, and Binary Operators as Member Function, and Non Member Function.

i. Unary operator as member function.

ii. Binary operator as non member function.

b). Write a c ++ program to implement the overloading assignment = operator.
c).Write a case study on Overloading Operators and Overloading Functions (150 Words).

Exercise -9 (Inheritance)
a) Write C++ Programs and incorporating various forms of Inheritance
i) Single Inheritance.
ii) Hierarchical Inheritance.
iii) Multiple Inheritances.
iv) Multi-level inheritance.
v) Hybrid inheritance.
b) Write a program to show Virtual Base Class.
c) Write a case study on using virtual classes (150 Words).

Exercise-10 (Inheritance –Continued)
a) Write a Program in C++ to illustrate the order of execution of constructors and destructors in inheritance.
b) Write a Program to show how constructors are invoked in derived class.

Exercise -11 (Polymorphism)
a) Write a program to illustrate runtime polymorphism .
b) Write a program to illustrate this pointer.
c) Write a program illustrates pure virtual function and calculate the area of different shapes by using abstract class.
d) Write a case study on virtual functions (150 Words).

Exercise -12(Templates)
a) Write a C++ Program to illustrate template class.
b) Write a Program to illustrate class templates with multiple parameters.
c) Write a Program to illustrate member function templates.

Exercise -13 (Exception Handling)
a).Write a Program for Exception Handling Divide by zero.
b). Write a Program to rethrow an Exception.

Exercise -14 (STL)
a) Write a Program to implement List and List Operations.
b) Write a Program to implement Vector and Vector Operations.

Exercise -15 (STL Continued)
a) Write a Program to implement Deque and Deque Operations.
b) Write a Program to implement Map and Map Operations.

Course Code		L	T	P	Credits
1099172103	PROFESSIONAL ETHICS & HUMAN VALUES	2	1	0	0

Course Overview:

Professional Ethics and Human Values subject provides character oriented education that instills basic values and ethnic value in one's individual professionalism.

Course Objectives:

1. To encourages students to discover what they consider valuable.
2. To move from discrimination to commitment. It is to create an ability to act on any discrimination in a given situation.
3. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
4. To appreciate the rights of others.
5. Making the students aware and sensitive to value system in real life situations. To help the students to discriminate between ephemeral and eternal values.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Recognize importance of human values, harmony and ethical behavior in real life situations	Understanding	8
CO2	Describe the core values that shape the ethical behaviour of an engineer	Understanding	8
CO3	Recall basics of professional ethics and human values.	Remembering	8
CO4	Listing sustained happiness through identifying the essentials of human values and skills.	Remembering	8
CO5	Describe the practical importance of trust, mutually satisfying human behaviour and enriching interaction with nature	Understanding	8

Unit-I:

Human Values :

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully -Caring – Sharing – Honesty –Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality-Character

Outcome:

- To understand different types of human values.
- To Identify values linked to the ethical behavior

Activity: Seminar

Unit-II:

Engineering Ethics:

The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy – Professional and Professionalism –Professional Roles to be played by an Engineer –Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics- Kohlberg's Theory – Gilligan's Argument – Heinz's Dilemma

Outcome:

- To enable understanding on engineering ethics
- To enable knowledge on professional level ethical theories

Activity: Seminar

Unit-III:

Engineering as Social Experimentation:

Comparison with Standard Experiments – Knowledge gained –Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering.

Outcome: Seminar

- To Understand the application of ethics in social experimentation
- To gain knowledge on a engineers as different roles

Activity: Case Analysis
Unit-IV:

Engineers' Responsibility for Safety and Risk:

Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences- Expected Probability- Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk- Safety and the Engineer – Designing for Safety – Risk-Benefit Analysis-Accidents.

Outcome: Seminar

- To understandthechallengefor engineers to create safety to risk
- To enable the knowledge ontherisk bearable level

Activity: Seminar

Unit-V:

Engineers' Responsibilities and Rights:

Collegiality-Loyalty-Professionalism and Loyalty- Professional Rights –Professional

Responsibilities – confidential and proprietary information-Conflict of Interest-Ethical egoism-Collective bargaining-Confidentiality-Acceptance of Bribes/Gifts- when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational Crimes-industrial espionage-price fixing-endangering lives- Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing. Cross-culture Issues.

Outcome: Seminar

- To enable understanding on engineers responsibilities
- To enable knowledge on different types of rights of engineers

Activity: Seminar

Text Books:

1. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar- PHI Learning Pvt. Ltd-2009
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
4. "Professional Ethics and Human Values" by Prof.D.R.Kiran

Reference Books:

1. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BSP Publication
2. "EthicsinEngineering"byMikeW.MartinandRolandSchinzinger–TataMcGraw-Hill–2003.
3. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.

DETAILED SYLLABUS

FOR

II B.Tech

II Semester

Course Code	PRINCIPLES OF COMMUNICATIONS	L	T	P	Credits
1019172201		3	1	0	3

Course Overview:

To introduce concepts of basic signal analysis of analog and digital, various analog and digital modulation and demodulation techniques**.**

Course Objectives:

The main objectives of this course are:

1. To explain the building blocks of Analog and digital communication system.
2. To prepare mathematical background for communication signal analysis.
3. Analyze the analog-to-digital conversion process with emphasis on Nyquist Sampling Criteria, line coding, pulse shaping and optimum detection functions.
4. To describe and analyze the signal flow in a Analog and digital communication system.

Course Outcomes:

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

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Explain the basic principle of communication system. Describe the principles of amplitude modulated and angle modulated communication systems and be able to analyze their performance in the presence of noise.	Understand	PO-1, PO-2, PO-3
CO2	Explain and solve communication system parameters for various types of modulation and demodulation techniques.	Understand	PO-1, PO-2, PO-3
CO3	Apply the concepts to practical applications in telecommunication.	Apply	PO-1, PO-2, PO-3
CO4	Analyze communication systems in both the time and frequency domains	Understand, Analyze	PO-1, PO-2, PO-3

Unit-I:

Introduction:

Types of communications, Analog, pulse and digital Types of signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Autocorrelation, convolution.

Outcome:

- Explain the different types of communications and signals.
- Analysis of analog and digital signals.

Activity: Problems on Fourier transforms for various signals

Unit-II:

Amplitude Modulation: Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM: Diode detector.

Outcome:

- Explain the need for modulation.
- Explain the various amplitude modulation and demodulation techniques.
- Compare various AM techniques.

Activity: Power point presentation on various AM modulation and demodulation techniques.

Unit-III:
Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

Outcome:

- Explain and analyze the various angle modulation and demodulation techniques.
- Compare Frequency Modulation and Phase Modulation techniques

Activity: Group Discussion on FM and PM techniques**.**

Unit-IV:
Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Divison Multiplexing, Frequency Divison Multiplexing.

Outcome:

- Explain the concept of sampling of Band limited signals.
- Explain various Pulse modulation and demodulation techniques.
- Explain the concept of Time division multiplexing and Frequency division multiplexing.

Activity: Hands on experience on Pulse modulation and demodulation techniques in lab

Unit-V:

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison. Digital Modulation: ASK, FSK, PSK, DPSK, QPSK; demodulation

Outcome:

- Explain the basic blocks of digital communication.
- Analysis of various Delta and Digital Modulation techniques.
- Compare various Delta and Digital Modulation techniques.

Activity:

Calculation of probability error and quantization error in various digital modulation techniques.

Text Books:

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

Reference Books:

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and MasoudSalehi, PHI, 2ndEd.2004.
3. Principles of Communication Systems - Simon Haykin, John Wiley, 2nd Ed

Course Code	CONTROL SYSTEMS	L	T	P	Credits
1004172202		3	1	0	3

Course Overview:

To introduce concepts of open loop and closed loop system and its stability analysis using various methods.

Course Objectives:

- To introduce the concepts of open loop and closed loop systems, mathematical models of mechanical and electrical systems, and concepts of feedback.
- To study the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis.
- To develop the acquaintance in analyzing the system response in time-domain and frequency domain in terms of various performance indices.
- To analyze the system in terms of absolute stability and relative stability by different approaches.
- To design different control systems for different applications as per given specifications.
- To introduce the concepts of state variable analysis, design and also the concepts of controllability and observability.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understands the concepts of feedback and its advantages to various control systems	Understand	PO-1, PO-2, PO-3
CO2	Understand the characteristics of the given system in terms of the transfer function and introducing various approaches to reduce the overall system for necessary analysis	Understand, Apply, Analyze	PO-1, PO-2, PO-3
CO3	Analyze the system in terms of absolute stability and relative stability by different approaches.	Analyze	PO-1, PO-2, PO-3
CO4	In addition to the conventional approach, the state space approach for the analysis of control systems is also introduced	Understand, Apply	PO-1, PO-2, PO-3

Unit-I:

Introduction:

System Control System, Open Loop Control System, Closed loop Control System, Different Examples Meaning of the terms reference input, control input, disturbance input and controlled output. Mathematical models of Physical Systems. Differential equations of physical systems, Transfer functions, Block diagram Algebra, Signal flow graphs with illustrative examples. Effects of Feedback Feedback Characteristics and its advantages, linearizing effect of feedback.

Outcome:

This course introduces concept of feedback and its advantages to various control systems

Activity: Real time examples for open & closed loop systems.

Unit-II:

Time Response Analysis:

Standard test Signals, Time response of first and second order systems, steady state errors and error constants, Effect of adding a zero to a system, Design specifications of second order systems, Performance indices.

Introduction to Design:

The design problem, Preliminary consideration of classical design, Realization of basic Compensators, Cascade compensation in time domain and frequency domain, PID controllers

Outcome: The performance metrics to design control systems in time domain are introduced.

Activity: Practice sessions on design problems

Unit-III:

Concepts of Stability and Algebraic Criteria:

The concept of Stability, Necessary Conditions for Stability, Routh-Hurwitz Stability Criterion, Relative stability analysis,
The Root Locus Technique: Introduction, The Root Locus concepts, Construction of Root Loci

Outcome: Control systems for various applications can be designed using S-domain analysis.

Activity: Practice sessions on Root locus & implementation using MATLAB.

Unit-IV:
Frequency response analysis:

Introduction, Correlation between time and frequency response, Polar Plots, Bode Plots, Nyquist Stability Criterion. - Constant M and N Circles - Nichol's Chart - Use of Nichol's Chart in Control System Analysis.

Outcome:

The performance metrics to design control system in frequency –domain are introduced.

Activity: Practice sessions using Maths

Unit-V:

State Variable Analysis and Design:

Introduction, Concepts of State, State Variables and State models, State models for linear continuous-time systems, State variables and linear discrete-time systems, Diagonalization, Solution of state equations and Concepts of Controllability and Observability.
Outcome: The state space approach for analysis of control systems is introduced.

Activity: Practice sessions on different state space methods.

Text Books:

1. Katsuhiko Ogata, "Modern Control Engineering," Pearson, FifthEdition
2. I.J.Nagarath and M.Gopal, " **Control System Engineering,"** New Age International ublishers, Fifth Edition

Reference Books:

1. S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, " Control Systems Engineering," Pearson, First Impression
2. Benjamin C. Kuo, FraridGolnaraghi, " Automatic Control Systems," Wiley Student Edition, Eigth Edition
3. PadmaRaju and Reddy , " Instrumentation and Control Systems ", McGrawHill Education,2016

Course Code	MANAGEMENT SCIENCE	L	T	P	Credits
1099172203		3	1	0	3

Course Overview:

This course is intended to familiarize the students with the framework for the managers and leaders available for understanding and making decisions relating to issues related organizational structure, production operations, marketing, Human resource Management, product management and strategy.

Course Objectives:

1. Management Science is an approach to management decision-making that makes extensive use of quantitative methods
2. This course aims to introduce students to the application of quantitative techniques to problems where models capture problem structure and use it to help optimize the decision outcome.
3. The classes demonstrate how advances in imputing power have made these techniques more accessible to managers and how the techniques can be applied to a range of different situations.
4. Provide a basic understanding of management science and engineering principles, including analytical problem solving and communications skills.
5. Prepare for practice in a field that sees rapid changes in tools, problems, and opportunities.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Define management and its nature scope and functions and hierarchical levels and organizational structure and managing the culture	Understanding	PO1, PO2, PO8, PO10, PO11, PO12
CO2	Illustrate various functions of production and inventory management Determine the various concepts of strategic management and project management	Remembering	PO1, PO2, PO5, PO8, PO10, PO11, PO12
CO3	Analyze the process of matching manager qualifications with position requirements and concept of marketing mix	Analyzing	PO1, PO2, PO8, PO10, PO11, PO12
CO4	Compare the various contemporary issues of management	Analyzing	PO1, PO2, PO8, PO10, PO11, PO12

Unit-I:

Introduction to Management:

Concept –nature and importance of Management –Generic Functions of Management –

Principles of Management – Evolution of Management thought- Theories of Motivation (Maslowo's, hertz berg and X-Y Theory) – Decision making process-Designing organization structure- Principles of organization.

Outcome:

- Student will be able to understand the importance of management
- Able to determine various organizational structures and their merits and demerits
- Student will be able to differentiate between financial and non financial motivation of employees
- Will be to explain the different styles of Leadership

Activity:
Case study on financial and non financial motivation of the employees.

Unit-II:

Operations Management:

Plant location, Principles and Types of plant layout, production methods (job, batch mass production) – Work study- Statistical Quality Control- Control Charts (X Bar chart &R-charts, P-chart and C-chart) Simple problems- Material Management: Need for Inventory control- Tools and techniques of Inventory Control - EOQ, ABC analysis, HML, SDE, VED, and FSN analyses

Outcome:

- Able to understand the various functions of production and inventory management
- student can analyze the importance of plant location and plant layout for a successful manufacturing Industry
- student will be able to construct various Statistical Quality Control charts for variables and attributes as well
- student may be able to compare and distinguish the various techniques of inventory control

Activity:

Seminar on ABC analysis and other associated inventory control techniques.

Unit-III:

Strategic Management:

Vision, Mission, Goals, Strategy – Elements of Corporate Planning Process –Environmental Scanning – SWOT analysis- Steps in Strategy Formulation and Implementation, Generic Strategy, Alternatives. Global strategies, theories of Multinational Companies.

Project Management:

(PERT/CPM): Development of Network – Difference between PERT and CPM Identifying Critical Path- Probability (Problems)

Outcome:

- Students will able to Bring out various concepts of strategic management and project management
- Student will be able to understand the importance of corporate planning process
- Student will able to construct the SWOT analysis for various organisation and individual as well
- Student can interpret the importance of PERT and CPM under net work analysis

Activity: Case study on SWOT analysis of generic alternative strategies

Unit-IV:

Functional Management:

Concept of HRM, HRD and PMIR- Functions of HR Manager- Wage payment plans (Problems) – Job Evaluation and Merit Rating – Salient features of The Factories Act 1948 - Marketing Management, Marketing Mix strategies – Product, Price, Place and Promotion.

Outcome:

- Student will be able to Elucidate the process of matching manager qualifications with position requirements and concept of marketing mix
- Student will be able to Analyse the Marketing functions
- Student will be able to highlight the various methods used for job evaluation and merit rating
- Student will be to understand the importance various statutory and non statutory well fare benefits according to the factories act 1948

Activity: Seminar on factories act 1948, statutory welfare and non statutory welfare measures

Unit-V:

Contemporary Management Practices:

Basic concepts of MIS, MRP, Justin- Time(JIT) system, Total Quality Management(TQM), Six sigma and Capability Maturity Model(CMM) Levies, Supply Chain Management, Enterprise Resource Planning (ERP), Business Process outsourcing (BPO), Business process Re-engineering and Bench Marking, Balanced Score Card.

Outcome:

- Student will be able to list out various contemporary management practices
- Student will be able understand the importance of Management Information System
- Student can be able to discuss the concepts of MRP, ERP, TQM And JIT systems
- Student can summariase the importance of six sigma , bench marking and Balanced Score card

Activity: Case study on the importance of Quality Management, TQM and six sigma

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.

Reference Books:

1. Koontz &Weihrich: 'Essentials *of management'* TMH 2011
2. Seth & Rastogi: Global Management Systems, Cengage learning , Delhi, 2011
3. Robbins: Organizational Behaviour, Pearson publications, 2011
4. Kanishka Bedi: Production & Operations Management, Oxford Publications, 2011 Philip Kotler & Armstrong: Principles of Marketing, Pearson publications
5. Biswajit Patnaik: Human Resource Management, PHI, 2011

Course Code	COMPUTER ORGANIZATION	L	T	P	Credits
1005172204		3	1	0	3

Course Overview:

This course is intended to give you a basic understanding of how computers execute programs. Understanding computers means understanding the hardware/software process of how you and the computer work together to have the computer carry out a task. In this course, building will not mean connecting chips and gates. Rather, you will describe the hardware in diagrams, finite-state machines, and hardware simulators.

Course Objectives:

- To study the basic organization and architecture of digital computers (CPU, memory, I/O, software). Also the Performance measurement of the computer system.
- To understand various data transfer techniques in digital computer.
- Be familiar with functional units of processor such as register file and arithmetic logic unit.
- To understand the stages in instruction set life cycle.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	To conceptualize the basics of organizational and architectural issues of a digital computer and to perform computer arithmetic operations.	Understanding	PO1, PO2
CO2	To analyze performance issues in processor and can calculate the effective address of an operand by addressing modes.	Analyzing	PO1, PO2, PO3, PO4
CO3	Ability to design memory organization that uses banks for different word size operations to understand the concept of cache memory techniques	Applying	PO1, PO2, PO3, PO4, PO5
CO4	To understand the concept of Input / Output organization.	Understanding	PO1, PO2

Unit-I:
Introduction to Computers:

Basic of Computer, internal organization of CPU, Functional Units, Software, Basic Operational Concepts, Von Neumann Architecture, Data Representation, Fixed-Point Representation, Floating-Point Representation.

Outcome:

To conceptualize the basics of organizational and architectural issues of a digital computer and to perform computer arithmetic operations.

Activity: Outline the characteristics of any computer architecture.

Unit-II:

Register Transfer and Micro operations:

Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Micro operations, Arithmetic Logic Unit.
Basic Computer Organization: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output and Interrupt.

Outcome: To understand the concept of Input / Output organization.

Activity: Design a logic circuit for an arithmetic operation

Unit-III:
Central Processing Unit:

Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes with numerical examples, Data Transfer and Manipulation, Program Control, Program Interrupt, Types of interrupts, CISC Characteristics, RISC Characteristics. Introduction to Parallel Processing, Pipelining – General Considerations.

Control Design:

Hardwired & Micro Programmed (Control Unit), Control Memory, Address Sequencing, Conditional and Unconditional Branching, Micro program Example.

Outcome:

To analyse performance issues in processor and can calculate the effective address of an operand by addressing modes.

Unit-IV:
Memory Organization:

Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

Outcome: Understand the concept of various memory organizations

Activity: Analyse the memory organization of your system and list the system configuration.

Unit-V:

Input-Output Organization:

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access. Multi Processors: Introduction, Characteristics or Multiprocessors, Interconnection Structures, Inter Processor Arbitration.

Outcome: Understand various data transfer mechanisms
Activity: Attend a webinar and write a report on input -output organization

Text Books:

1. Computer System Architecture, M.Moris Mano, 3rd Edition, Pearson/PHI
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

Reference Books:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - SivaRamaDandamudi Springer Int. Edition.
4. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy

Course Code	PULSE AND DIGITAL CIRCUITS	L	T	P	Credits
1004172205		3	1	0	3

Course Overview:

This is the basic course for electronic engineers to know the behavior of active and passive devices and circuit configurations used for the generation and processing of pulse, digital and switching waveforms. These non-sinusoidal signals find extensive application in fields such as computers, control systems, counting and timing systems, data-processing systems, digital instrumentation ,pulse communication, radar, telemetry, television and in many areas of experimental research

Course Objectives:

1. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.
2. To study the design and analysis of various Multivibrators.
3. To understand the functioning of different types of time-base Generators.
4. To learn the working of logic families & Sampling Gates

Course Outcomes:

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

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Design linear and non-linear wave shaping circuits	Understand, Apply	PO-1, PO-2, PO-3
CO2	Apply the fundamental concepts of wave shaping for various switching and signal generating circuits	Understand, Apply	PO-1, PO-2, PO-3
CO3	Design different multi vibrators and time base generators	Understand	PO-1, PO-2, PO-3
CO4	Utilize the non sinusoidal signals in many experimental research areas	Understand	PO-1, PO-2, PO-3

Unit-I:

Linear Wave Shaping:

High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, attenuators, its applications in CRO probe, RL and RLC circuits and their response for step input, Ringing circuit

Outcome: Design linear wave shaping circuits.

Activity:

study and analyze linear wave shaping circuits such as R-C and R-L-C transient circuits

Unit-II:

Non-Linear Wave Shaping:

Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers

Outcome: Design non-linear wave shaping circuits.

Activity:

Study and analyze non-linear wave shaping circuits such as clippers, clampers and comparators

Unit-III:

Switching Characteristics Of Devices:

Diode as a switch, piecewise linear diode characteristics, Transistor as a switch, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor- switching times.

Digital Logic gate circuits:

Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families

Outcome:

Apply the fundamental concepts of wave shaping for various switching and signal generating circuits

Activity:

Study the switching characteristics of diode, transistor and realize logic gates using diodes and transistors

Unit-IV:

Multi vibrators:

Bistable Multi Vibrator:
Analysis and Design of Fixed Bias, Self Bias Bistable Multi Vibrator, Collector catching Diodes, Commutating Capacitors, Methods of Triggering using RC network & Diode, Emitter Coupled Bistable Multi Vibrator (Schmitt trigger).

Monostable Multi Vibrator:
Analysis and Design of Collector Coupled Mono stable Multi Vibrator, Triggering method of a Monostable Multi Vibrator, Application of Monostable Multi Vibrator as a Voltage to Time Converter.

Astable Multi Vibrator:
Analysis and Design of Collector Coupled Astable Multi vibrator Application of Astable Multi Vibrator as a Voltage to Frequency Converter. All circuits are transistor version.

Outcome: Design different multivibrators.

Activity: Design and analyze various multivibrators using transistors.

Unit-V:
Voltage Time Base Generators& Sampling Gates:

General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time basegenerator

Sampling Gates:
Basic operating principles of sampling gates, Unidirectional and Bi- directional sampling gates, Reduction of pedestal in gate circuits, Applications of sampling gates.

Outcome: Utilize the non sinusoidal signals in many experimental research areas

Activity:

Design and analyze time base generators and study the operating principles of various sampling gates

Text Books:

1. Pulse, Digital and Switching Waveforms - J. Millman and H. Taub, Mothiki S Prakash Rao McGraw-Hill, Second Edition,2007.

Reference Books:

1. 1 Pulse and Digital Circuits – A. Anand Kumar, PHI,2005
2. Pulse and Digital Circuits – Prof.B.N.Yoga Narasimhan
3. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn.,2002
4. Pulse & Digital Circuits by Venkata Rao,K,Ramasudha K, Manmadha Rao,G.,Pearson,2010

Course Code	OPERATING SYSTEMS	L	T	P	Credits
1005172206		3	1	0	3

Course Overview:

This course will introduce the core concepts of operating systems, such as processes and threads, scheduling, synchronization, memory management, file systems, input and output device management and security.

Course Objectives:

- Study the basic concepts and functions of operating systems.
- Understand the structure and functions of OS.
- Learn about Processes, Threads and Scheduling algorithms.
- Understand the principles of concurrency and Deadlocks.
- Learn various memory management schemes.
- Study I/O management and File systems.

Course Outcomes:

	Course outcome	Skill	PO
CO1	Apply the appropriate process models for the application development of SDLC	Applying	PO1, PO2, PO3, PO5
CO2	Understand the phases of SDLC from requirement gathering phase to design phase via Analysis Phase	Understanding	PO1,PO2
CO3	Analyzing the strategies for coding and testing phase in Software product development	Analyzing	PO1,PO2,PO3
CO4	Apply the knowledge about estimation and maintenance of software systems and modeling the software project by using CASE tools	Applying	PO1, PO2, PO3, PO5

Unit-I:

Introduction to Operating System Concept: Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types.

Outcome: Define Operating System and describe types of Operating Systems.

Activity: Brainstorming method

Unit-II:

Process Management – Process concept, The process, Process State Diagram ,Process control block, Process Scheduling- Scheduling Queues, Schedulers, Operations on Processes, Inter process Communication, Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms. Case Studies: UNIX, Linux, Windows

Outcome: Define the concept of process and apply process scheduling algorithms

Activity: Problem solving related to CPU Scheduling algorithms

Unit-III:

Memory Management:

Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation Case Studies: UNIX, Linux, Windows

Virtual Memory Management:

Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing

Outcome: Illustrate the concept of Paging and Segmentation

Activity: Visualization of concepts using model charts

Unit-IV:

Concurrency:

Process Synchronization, The Critical- Section Problem, SynchronizationHardware, Semaphores, Classic Problems of Synchronization, Monitors, SynchronizationExamplesCase Studies: UNIX, Linux, Windows

Principles of deadlock :

System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

Outcome: Apply the concept of Concurrency to real world problems

Activity: Role play related to classic problems of synchronization

Unit-V:

File system Interface:

The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection. File System implementation- File system structure, allocation methods, free-space management Mass-storage structure overview of Mass-storage structure, Disk scheduling, Device drivers, Case Studies: UNIX, Linux, Windows

Outcome: Design and Implement a prototype file systems

Activity: Seminar method

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012.
2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011.
3. Operating Systems-S Halder, Alex A Aravind Pearson Education Second Edition 2016.

Reference Books:

1. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley,2001.
2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata Mc Graw Hill Education", 1996.
3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, TataMc Graw-Hill Education, 2007.

Course Code		L	T	P	Credits
1019172221	PULSE &DIGITAL CIRCUITS & COMMUNICATIONS LAB	0	0	3	2

Course Overview:

This course introduces the design a pulse circuits and to verify functionality of digital circuits, various amplitude, angle, pulse and digital modulation circuits along with their applications. Upon completion, students should be able to construct, analyze, verify, and troubleshoot pulse circuits, digital circuits and analog and digital modulation using appropriate techniques and test equipment.

Course Objectives:

The main objectives of this course are:

- This lab focuses the fundamental concepts on Amplitude and Angle, Pulse modulations, digital modulation techniques, source coding techniques and Error-control coding techniques
- This lab focuses on design of multi vibrators (using Transistors), filters, switch (using Transistor), and Time base generators, Clippers and Clampers.
- The students will be able to realize logic gates using discrete components, and applications

Course Outcomes:

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

- Generation and processing of sinusoidal and non-sinusoidal signals.
- Generation and processing of various modulation and demodulation techniques.
- Fundamentals of basic logic gates and its applications.
- Analysis and design of various multi vibrators circuits.
- Design and analysis of UJT relaxation oscillator and boot-strap sweep circuits
- Process converting analog information into digital data via sampling, quantization, and coding.

Pulse and Digital Circuits
(Any Six) – By Designing the Circuit

1. Linear wave shaping (Diff. Time Constants, Differentiator, Integrator)
2. Non Linear wave shaping – Clippers, Clampers.
3. Logic Gates with discrete components (Diodes, Transistors)
4. Bistable Multi vibrator.
5. Astable Multi vibrator.
6. Monostable Multi vibrator.
7. Schmitt Trigger.
8. UJT Relaxation Oscillator.
9. Boot Strap Sweep Circuit
10. Sampling Gates.

Communications Lab Experiments(Any Six)

1. Amplitude Modulation – Mod &Demodulation.
2. AM - DSB SC – Modulation & Demodulation.
3. Diode Detector
4. Pre-emphasis & De-emphasis
5. Frequency Modulation – Modulation & Demodulation.
6. Sampling Theorem
7. Pulse Amplitude Modulation – Modulation & Demodulation.
8. PWM, PPM – Modulation & Demodulation.
9. PCM - Modulation & Demodulation.
10. PSK Modulation & Demodulation.

Equipment Required:

1. RPS - 0-30V
2. C R O - 0-20MHz
3. Function Generator - 0-1MHz
4. Components
5. Multimeters

Course Code	OPERATING SYSTEMS LAB	L	T	P	Credits
1019172222		0	0	3	2

Course Overview:

The goal of this course is to understand and appreciate the principles in the design and implementation of operating systems software.

Course Objectives:

- Study the basic concepts of operating system scheduling algorithms
- Understand the structure and functions of OS.
- Learn about Deadlock prevention and detection algorithms.
- Understand page replacement techniques.
- Learn various disk space allocation methods.
- Study I/O management and File systems.

Course Outcomes:

.Apply CPU Scheduling algorithms.

- Explain different problems related to process synchronization.
- Apply deadlock prevention and deadlock detection algorithms
- Describe the concepts of paging and segmentation for memory management.
- Apply different page replacement algorithms
- Describe different disk space allocation methods and free space management techniques.

Operating Systems Lab: Lab Experiments:

1. Simulate the following CPU scheduling algorithms
   a) Round Robin b) SJF c) FCFS d) Priority
2. Loading executable programs into memory
   and execute System Call implementation- read(), write(), open () and close()
3. Multiprogramming-Memory management- Implementation of Fork(), Wait(), Exec() and Exit() System calls
4. Simulate all File allocation strategies
   a) Sequenced b) Indexed c) Linked
5. Simulate MVT and MFT
6. Simulate all File Organization Techniques
   a) Single level directory b) Two level c) Hierarchical d) DAG
7. Simulate Bankers Algorithm for Dead Lock Avoidance
8. Simulate Bankers Algorithm for Dead Lock Prevention.
9. Simulate all page replacement algorithms.
   a) FIFO b) LRU c) LFU etc….
10. Simulate Paging Technique of memory management.

Course Code	INDUSTRIAL VISIT	L	T	P	Credits
1019172231		0	0	0	2

Industrial Visit: The industrial visit shall be carried out in their domain during the summer vacation after the second year second semester. A student has to submit a report which will be evaluated for 100 marks and will be submitted to an internal evaluation committee comprising Head of the Department or his / her nominee and two seniorfaculty of the department including the industrial visits coordinator/ supervisor. The industrial visit report shall be evaluated at the beginning of third year first semester before the first mid-term exams**.** Industry oriented MOOCs course (including NPTEL/ Coursera) for not less than EIGHT weeks can be considered as equivalent. The list of courses in such case shall be approved by Head of the department concerned. The registered course must not be same as any of the courses listed in the program structure of their regulation till final year. Marks/grades are awarded based on the performance in viva voce or written examination conducted for Coursera courses and online courses other than SWAYAM/NPTEL where there is no end examination.

PROGRAM STRUCTURE
FOR
III- B.Tech
I & II Semesters

III B.Tech **I Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1004173101	Linear IC Applications	3	1*	0	3
2	1004173104	Digital IC Applications	3	1*	0	3
3	1019173105	MicroProcessors and MicroControllers	3	1*	0	3
4	1012173103	Database Management Systems	3	1*	0	3
5	1005173102	Python Programming	3	1*	0	3
6	1019173121	IC Applications Lab	0	0	3	2
7	1019173122	Python Programming Lab	0	0	3	2
8	1019173123	Database Management Systems Lab	0	0	3	2
9	1099173101	IPR & Patents	2	0	0	0
Total Credits						**21**

III B.Tech **II Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019173201	Design and Analysis of Algorithms	3	1*	0	3
2	1019173202	Web Design	3	1*	0	3
3	1004173203	VLSI Design	3	1*	0	3
4	1004173204	Digital Signal Processing	3	1*	0	3
5	**Open Elective-I**					
	1019173203	1. Software Project Management	3	1*	0	3
	1019173204	2. Bio-Medical Engineering				
	1019173205	3. Unix Programming				
	1003173203	4. Robotics				
6	**Open Elective -II(CBCS)(MOOCS)**					
	1019173291	MOOCS Course	3	1*	0	3
		*Any available online course approved by department committee at the time of semester commencement)				
7	1004173221	Micro Processors & Micro Controllers Lab	0	0	3	2
8	1004173222	VLSI Lab	0	0	3	2
9	1019173221	Web Design Lab	0	0	3	2
Total Credits						**24**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019173241	Industry Oriented Mini Project	0	0	0	2

DETAILED SYLLABUS

FOR

III B.Tech

I Semester

Course Code		L	T	P	Credits
1004173101	**Linear IC Applications**	3	1	0	3

Course Overview:

To provide an over view of principles and applications of different Linear Integrated Circuits.

Course Objectives:

- To understand the basic operation differential amplifiers with deferent modes.
- To understand & learn the electrical characteristics of Op-Amp.
- To learn the linear and non-linear applications of operational amplifiers.
- To understand the analysis & design of different types of active filters using Op-Amp.
- To learn the internal structure and operation of different analog to digital and digital to analog converters.

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Understand basic operation and characteristics of op-amp.	Understand	PO-1, PO-2, PO-12
CO2	Interpret different linear and non-linear applications of Op-Amp.	Apply	PO-1, PO-2, PO-3
CO3	Design & analyze different types of active filters using Op-Amp.	Analyze	PO-1, PO-2, PO-3, PO-4, PO-10
CO4	Compare different types of ADC and DACs	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-10

Unit-I:

Integrated Circuits:
Block diagram of Operational amplifier, Differential Amplifier- DC analysis, AC analysis of different types of configurations of differential amplifier (Double Input/output, Single Input/output), Cascaded differential amplifier and level Translator

Outcome:

- Summarize the characteristics of ICs
- Demonstrate the basic concepts of differential amplifier and its use in IC design.

Activity/Event:

Output signal verification of differential amplifier in common mode and differential mode of operations.

Unit-II:

Characteristic of Op-Amp :
Inverting and Non-inverting amplifier, Ideal and practical characteristics of Op-Amps, DC and AC characteristics, Op-amp parameters & measurement(Input & Output off set voltages & currents, slew rate , CMMR, PSRR) Frequency compensation techniques.

Outcome:

- Summarize the electrical characteristics of Op-Amps and Its Parameters.
- Describe the operation and application of IC 741 Op-Amp.

Activity/Event:

Measurement of various parameters of Op-Amp practically.

Unit-III:

Applications of Op-Amp

Linear Applications: Summing, scaling and averaging amplifiers, Integrator and differentiator, difference amplifier, Instrumentation amplifier, V to I and I to V converters.

Non – Linear Applications Comparator, Schmitt Trigger, AC amplifier, multivibrators, function generator, log amplifier and anti-log amplifiers, precision rectifiers (Half-wave and full-wave rectifiers).

Unit-III:

- Differentiate the Linear and Non-Linear applications of Op-Amp.
- Design circuits using operational amplifiers for various linear and non-linear applications.

Activity/Event:

Assignment to draw and describe the different configurations of Op-Amp in various linear and non linear applications.

Unit-IV:

Active Filters and Timers:

Design & Analysis of Butterworth Active Filters – 1st order, 2nd order LPF HPF filters. Band – Pass, Band – reject and all – pass filters.

Timers: Functional Block diagram of IC 555, applications of IC 555 (Monostable multivibrator and Astable multivibrator). VCO – IC 566, PLL –IC 565

Outcome:

- Design and analysis of different Filters and its use in design of different ICs.
- Analyze the function of 555 timer for various applications.

Activity/Event:

Find the frequency response of different filters and Check the Astable and Monostable multivibrator operation using 555 timer

Unit-V:
DAC & ADC Converters

DAC Converters: Introduction, Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, and IC 1408 DAC.

ADC Converters: Introduction, parallel comparator, Counter type ADC, successive approximation ADC and dual slope ADC.

Outcome: Analyze the different types ADCs and DACs and its use.

Activity/Event:

Generation of Analog signal using DAC and Generation of Digital signal using ADC.

Text Books:

1. Linear Integrated Circuits – D. Roy Chowdary, New Age International (P) Ltd, 2nd edition, 2003.
2. Op-Amp and Linear IC's – Ramakanth A Gayakwad, PHI, 1987.

Reference Books:

1. Operational Amplifiers & Linear Integrated Circuits –Sanjay Sharma ;SK Kataria &Sons;2nd Edition,2010
2. Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, McGraw Hill, 1988.
3. Operational Amplifiers & Linear Integrated Circuits–R.F.Coughlin & Fredrick Driscoll, PHI, 6th Edition.

Course Code	Digital IC Applications	L	T	P	Credits
1004173104		3	1	0	3

Course Overview:

In this course it is aimed to introduce to the students of the electrical behavior of CMOS both in static and dynamic conditions and before that study the diode/transistor-transistor logic and Emitter coupled logic. In this course, students can study Integrated circuits for all digital operational designs like adder, subtractor, multipliers, multiplexers, registers, counters, flip flops, encoders, decoders and memory elements like RAM and ROM. Design and to develop the internal circuits for different digital operations and simulate them using hardware description language. Understand the concepts of SSI Latches and Flip-Flops and Design of Counters using Digital ICs, modeling of sequential logic integrated circuits using VHDL

Course Objectives:

- Introduction of digital logic families and interfacing concepts for digital design is considered.
- VHDL fundamentals were discussed to modeling the digital system design blocks.
- VHDL compilers, simulators and synthesis tools are described, which are used to verify digital systems in a technology-independent fashion.
- Design and implementation of combinational and sequential digital logic circuits is explained

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understand the various digital modulation techniques.	Understand	PO1
CO2	Learn about various digital carrier modulation techniques.	Understand	PO1
CO3	Apply various errors correction and detection codes to digital data.	Apply	PO1,PO2,PO4
CO4	Evaluate the error probability calculations for digital modulation techniques available	Analyze	PO1,PO2,PO4

Unit-I:

Digital Logic Families and Interfacing: Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, transistor-transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic.

Outcome:
Understand the structure of commercially available digital integrated circuit families

Activity/Event: study the electrical behaviour of logic families and interfacing

Unit-II:

Digital Design Using HDL: Design flow, program structure, History of VHDL, VHDL requirements, Levels of Abstraction, Elements of VHDL, Concurrent and Sequential Statements, Packages, Libraries and Bindings, Subprograms, Comparison of VHDL and Verilog HDL

Outcome:
Learn the IEEE Standard VHDL,Model complex digital systems at several levels of abstractions, behavioral, structural, dataflow

Activity/Event: study the VHDL language

Unit-III:

VHDL Modelling :
Simulation, Logic Synthesis, Inside a logic Synthesizer, Functional
Gate-Level verification, Place and Route, Post Layout Timing Simulation, Static Timing, Major Netlist formats for design representation

Memories

ROM: Internal structure, 2D-Decoding, Commercial ROM types, timing and applications,. Static RAM: Internal structure, SRAM timing, standard,synchronous SRAMS, Dynamic RAM: Internal structure, timing, synchronous DRAMs

Outcome: Understand the simulation, synthesis and different memories in digital ICs

Activity/Event: study the simulation, synthesis and different memories

Unit-IV:

Combinational Logic Design: Adders & Subtractors, Ripple Adder, Look Ahead Carry Generator, Binary Parallel Adder, Binary Adder-Subtractor, ALU, Decoders, encoders, three state devices, multiplexers and demultiplexers, Code Converters, parity circuits, comparators, multipliers, Barrel Shifter, Simple Floating-Point Encoder, Cascading Comparators, Dual Priority Encoder, Design considerations with relevant Digital ICs, modeling of Circuits by using VHDL.

Outcome:
Analyze and design basic digital circuits with combinational logic circuits using VHDL

Activity/Event:
Design combinatorial logic circuits using VHDL

Unit-V:

Sequential Logic Design: SSI Latches and Flip-Flops, Counters, Design of Counters using Digital ICs, Ring Counter, Johnson Counter, Modulus N Synchronous Counters, MSI Registers, Shift Registers, Modes of Operation of Shift Registers, Universal Shift Registers, MSI Shift Registers, Design considerations with relevant Digital ICs, modeling of circuits by using VHDL.

Outcome: Analyze and design basic digital circuits with sequential logic circuits using VHDL

Activity/Event: Design sequential logic circuits using VHDL

Text Books:

1. Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3rd Edition.

Reference Books:

1. Fundamentals of Digital Logic with VHDL Design- Stephen Brown, ZvonkoVranesic, McGraw-Hill, 3rdEdition

Course Code	Micro Processors and	L	T	P	Credits
1019173105	Micro Controllers	3	1	0	3

Course Overview:

This Course brings out the basic hardware design concept of Intel 16 bit microprocessor 8086 and Intel 8 bit 8051 Microcontroller and 8 bit PIC16CXX Microcontroller. It introduces the assembly language programming with 8086 and 8051 processors and programming is practiced simultaneously in MPMC Lab course. I/O and memory interfacing is studied both with 8086 and 8051 Microcontrollers and supported by practical in MPMC Lab Course. Finally students are introduced to use the usage of this chip for industrial automation.

Course Objectives:

1. To understand the architecture, addressing modes, Instruction set of Intel 8086 Microprocessor and Intel 8051and PIC 16CXX Microcontrollers.
2. To apply the instruction set in solving simple problems and create small assembly language programs.
3. Understand the hardware concepts of basic peripheral Chips and evaluate the interfacing requirements of the basic peripheral chips.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understand the concepts of architecture, memory organization of Intel 8086 microprocessor and Intel 8051 and PIC 16C6X/7X microcontrollers.	Understand	PO1
CO2	Understand the concepts of addressing modes, instruction set of Intel 8086 microprocessor and Intel 8051 and ARM processor	Understand	PO2
CO3	Write assembly language programs for simple problem statements	Apply, Analyze	PO2, PO4, PO5
CO4	Design an interface between peripheral chips & processors and write programs for data transfer	Analyze	PO2, PO4, PO5

Unit-I:

8086 Architecture:

Main features, pin diagram/description, 8086 microprocessor family, 8086 internal architecture, bus interfacing unit, execution unit, 8086system timing, minimum mode and maximum mode configuration. Architecture of 80386 processor, Comparison of Pentium and other advanced processors

Outcome:

Student understand the internal block diagram of 16 bit 8086 chip and it's functions. Further student is introduced to the concept of interconnecting the 8086 microprocessor with memory and peripheral chips to make a system. Student Understands the timing and sequence of control signals between processor and other memory and peripheral chips for data transfer between them.

Activity/Event:

Draw diagrams for the internal architecture, pin diagram and signal description, minimum mode system and maximum mode system, Timing diagram for bus signals during read and write operation.

Unit-II:

8086 Programming:

Program development steps, instructions, addressing modes, assembler directives, interrupts and interrupt responses, writing simple programs with an assembler, assembly language program development tools.

Outcome:

Student understands the operations of instruction set and the operand addressing modes. Able to explain the concept of interrupt and processor response for the interrupt. Able to explain how to use interrupt mechanisms to execute some functions. Understand the facilities available for program development and able to make assembly language programs.

Activity/Event:

Write assembly language programs with procedures and interrupt procedures for solving a given problem following program development steps.

Unit-III:

8086 Interfacing: Semiconductor memories interfacing(RAM,ROM), Intel8259 programmable interrupt controller, Intel 8237a DMA controller, Intel 8255 programmable peripheral interface, Intel8279 programmable keyboard/display controller, 8251 USART interfacing.

Outcome:

Student explains the techniques for interfacing semiconductor memories(RAM and ROM) with system bus. Understand the functions of internal blocks and registers available in peripheral chips like 8259, 8255, 8257 and 8251 chips and the interfacing of these chips to system bus.

Activity/Event:
Draw interface circuits of the peripheral chips 8259,8255,8257 and 8251 to system bus and peripheral devices to effect data transfer; draw the control words and internal architecture of above peripheral devices.

Unit-IV:

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.
Stepper motor interfacing.

Outcome:

Understand the internal architectural blocks and their functions including timer/counter operation and serial port operation. Understand the data addressing modes available, operation of instructions and write assembly language programs for simple programs. Able to interface keyboards, display devices like LED, 7-segment display, LCD, stepper motor and A/D and D/A converters.

Activity/Event:

Draw architectural diagram and pin diagram of 8051.Write programs for simple mathematical operations, Draw an interfacing circuit and write program for data transfer between keyboard, display devices, stepper motors, ADC and DAC devices.

Unit-V:

Introduction, characteristics of PIC microcontroller, PIC microcontroller families, memory organization, parallel and serial input and output, timers, Interrupts, PIC 16F877architecture, instruction set of the PIC 16F877.

Outcome:
Understand the difference between CISC and RISC processors.

Activity/Event: execution of simple programs on keil software

Text Books:

1. Microprocessors and Interfacing–Programming and Hardware by Douglas V Hall, SSSPRao, Tata Mc Graw Hill Education Private Limited, 3rd Edition.
2. Microcontrollers (Theory and Applications) by Ajay V Deshmukh, Tata McGraw-Hill

Reference Books:

1. The8051Microcontroller&EmbeddedSystemsUsingAssemblyandCbyKennethJ.Ayala, hananjayV.Gadre, CengageLearning, India Edition.
2. Microprocessors and Microcontrollers by R. S. Kaler, I. K. International Publishing House Pvt. Ltd
3. Microprocessors and Microcontrollers by N. Senthil Kumar, M.Saravanan and S. Jeevananthan,OxfordUniversityPress, Seventh Impression 2013

Course Code	DATA BASE MANAGEMENT SYSTEMS	L	T	P	Credits
1012173103		3	1	0	3

Course Objectives:

- Provide students with theoretical knowledge and practical skills in the use of database and database management systems in information technology applications.
- The logical design, physical design and implementation of relational databases are covered.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	To develop an understanding of essential DBMS concepts involved in implementation of Database systems.	Understand	PO1, PO2, PO4
CO2	Compare relational model with the structured query language (SQL)	Applying	PO1, PO2, PO4, PO5
CO3	Design and build database system for a given real world problem	Applying	PO1, PO2, PO4,PO5
CO4	Examine issues in data storage and query processing and can formulate appropriate solutions.	Understand	PO1, PO2

Unit-I:

Introduction to Database Systems, File System Vs DBMS, Advantages of DBMS, Structure of DBMS, Levels of Data Abstraction (Data Independence), Database Users and Administrators, Database Architecture, Different Data Models.

Entity Relationship Model: Introduction, Representation ofentities, attributes, entity set, relationship, relationship set, constraints, sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

Outcome: After Completion of the Unit, Student will Be able to:

- Describe the Architecture of Database Management Systems
- Design different ER Models
- Understand the applications of dbms,difference between file systems vs dbms, identify the data models ,understand dbms structure

Activity: Draw ER Diagram for Various Real Time Systems.

Unit-II:

Relational Model: Introduction to relational model,concepts of domain, attribute, importance of null values, constraints (Domain, Key constraints, integrity constraints) and their importance.

Basic SQL: Simple Database schema, data types, tabledefinitions (create, alter), different DML operations (insert, delete, update), basic SQL querying (select and project) using where clause, arithmetic & logical operations, SQL functions (Date and Time, Numeric, String conversion).

Outcome: After Completion of the Unit, Student will Be able to:

- To differentiate the knowledge in TRC & DRC
- Compare relational model with the structured query language (SQL)
- Understands the relational algebra concepts, selection ,projection ,relational calculus which helps in understanding queries

Activity: Tabulate Various Relational Models for Real Time Application.

Unit-III:

SQL: Creating tables with relationship, implementation of key andintegrity constraints, nested queries, sub queries, grouping, aggregation, ordering, implementation of different types of joins, views, relational set operations.

Schema Refinement (Normalization) : Purpose ofNormalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and 3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

Outcome: After Completion of the Unit, Student will Be able to:

- Design the new database.
- Master the basic concepts and appreciate the applications of database systems.
- Master the basics of SQL and construct queries using SQL.

Activity: Design a new Database and normalize the data

Unit-IV:
Transaction Management and Concurrency Control:

Transaction, properties of transactions, transactionlog, and transaction management with SQL using commit rollback and save point.

2.
Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods : lock granularity, lock types, two phase locking for ensuring serializability, deadlocks, Concurrency control with time stamp ordering : Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

3.
SQL constructs that grant access or revoke access from user or user groups. Basic PL/SQL procedures, functions and triggers.

Outcome: After Completion of the Unit, Student will Be able to:

- Make us of transactions for new concepts.
- Understands the properties of transaction management.

- Master the basics of query evaluation techniques and query optimization.
- Be familiar with the basic issues of transaction processing and concurrency control

Activity: Perform Transaction on Various Real Time Concepts.

Unit-V:

Overview of Storage and Indexing:

Data on External Storage – File Organization and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree based Indexing.
Outcome: After Completion of the Unit, Student will Be able to:

- Differentiate different indexing techniques in real time.
- An ability to use and apply current technical concepts and practices in the
- coreinformation technologies.
- Be familiar with a commercial relational database system (Oracle) by
- writing SQLusing the system.
- Be familiar with the relational database theory, and be able to
- Write relational algebraexpressions for queries

Activity: Create your own data base and connect the front-End and back-End

Text Books:

1. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH
2. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA
3. Database System Concepts. 6/e Silberschatz, Korth, TMH

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Database Principles Fundamentals of Design Implementation and Management, Corlos Coronel, Steven Morris, Peter Robb, Cengage Learning.

Course Code	PYTHON PROGRAMMING	L	T	P	Credits
1005173102		3	1	0	3

Course Overview:

This course introduces Computer Programming using the Python Programming language which will help you to master the Programming with Python by introducing the Object Oriented Programming concepts, creation of Data Structures, Implementation of Functions, and Visualization libraries. Lastly you will get into design, code, test, and debug Python Programming Language Scripts.

Course Objectives:

- Introduction to Scripting Language.
- Exposure to introduce Data Structures concepts using Python.
- Emphasis to Object Oriented programming concepts.
- Gain knowledge of Python visualization libraries.
- Exposure to various problems solving approaches of computer science and information Technology.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Install Python IDE and run basic Python scripts.	Understand	PO1
CO2	Understand the operators, functions, key Concepts of Object Oriented Programming in python.	Understand	PO1, PO2
CO3	Access Python from various online resources and import packages to the current working environment.	Applying	PO5
CO4	Develop front end GUI using Visualization Libraries and Multithreading techniques.	Analyzing	PO12

Unit-I:

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.

Types, Operators and Expressions: Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations.

Outcome:

- Understand the Introduction of Python IDE.
- Learn the basics building blocks of python.
- Write the basic programs in python.
- Learn the different types of operators in python

Activity/Event:
Install Python on PCs or through Mobile applications run basic Python Scripts for a given data.

Unit-II:

Control Flow- if, if-elif-else, for, while, break, continue, pass.

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

Outcome:

- Understand the syntax of conditional statements in python
- Understand the syntax of Data Structures in python

Activity/Event:
Identify Operators and types in Python. Implement Data Structure concepts by writing Python Scripts.

Unit-III:

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.

Outcome:

- Understanding Functions implementation using Python.
- Learn the scope or life time of variables in a function.
- Usage of import statement in modules.
- Create a package, import and install PIP package in python

Activity/Event: Using Functions develop simple scripts in Python Programming.
Unit-IV:

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

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

Outcome:

- Implement the OOP concepts using python
- Understand the Exception handling in python

Activity/Event: Implement OOP concepts in Writing Python Scripts

Unit-V:

Multithreading: Understanding threads, Forking threads synchronizing the threads, programming using multithreading.
File Handling: Python File(doc and csv) Operation Reading config files in python, Writing log files in python, Understanding read functions, Understanding write functions, Manipulating file pointer using seek, Programming using file operations.
Standard Libraries: Introduction to NumPy and Pandas

Outcome:

- Understand standard Libraries and GUI visualization in Python.

Activity/Event: Write various test cases and implement specific test for a given case study.

Text Books:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly
3. Complete Reference to Python – TMH-2018

Reference Books:

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson
3. Introduction to Python, Kenneth A.Lambert, Cengage.
4. http://nptel.ac.in/courses/117106113/34, https://www.python.org/

Course Code	IC Applications Lab	L	T	P	Credits
1019173121		0	0	3	2

Course Overview:

The students are required to verify the functionality of the IC in the given application. To design, draw the internal structure of the following Digital Integrated Circuits and to develop VHDL source code.

LIST OF EXPERIMENTS:

PART - I

Linear IC Experiments

1. OP AMP Applications – Adder, Subtractor, Comparators.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
5. IC 555 Timers – Monostable and Astable Multivibrator Circuits.
6. Schmitt Trigger Circuits – using IC 741
7. IC 565 – PLL Applications.
8. Voltage Regulator using IC 723, Three Terminal Voltage Regulators – 7805, 7809, 7912.

PART - II

Digital IC Applications

1. Realization of Logic Gates
2. 3-8 decoder using 74138
3. 4-bit comparator using 7485.
4. 8*1 Multiplexer using 74151 and 2*4 Demultiplexer using 74155.
5. D, JK Flip Flops using 7474, 7483.
6. Decade counter using 7490.
7. UP/DOWN counter using 74163
8. Shift Register-7495
9. Universal shift registers using 74194/195.
10. RAM (16*4) using 74189 (Read and Write operations).

Equipment Required:

1. 20 MHz/ 40 MHz/60 MHz Oscilloscopes.
2. 1 MHz Function Generator (Sine, Square, Triangular and TTL).
3. Regulated Power Supply.
4. Multimeter / Volt Meter.
5. Xilinix ISE software-latest version
6. Personal computer with necessary pheripherals.

Course Code		L	T	P	Credits
1019173122	PYHTON PROGRAMMING LAB	0	0	3	2

Course Overview:

This course introduces Computer Programming using the Python Programming language which will help you to master the Programming with Python by introducing the Object Oriented Programming concepts, creation of Data Structures, Implementation of Functions, and Visualization libraries. Lastly you will get into design, code, test, and debug Python Programming Language Scripts.

Course Objectives:

- Write, test, and debug simple Basics of Python programming
- Implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Object Oriented Programming using Python.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python
- Learn GUI Programming and Databases operations in Python

Course Outcomes:

- Understand how to write, test, and debug simple Python programs.
- Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python Develop Python programs step-wise by defining functions and calling them..
- Express different Decision Making statements and Functions
- Understand and summarize different File handling operations
- Explain how to design GUI Applications in Python and evaluate different database operations.

List of Experiments:

Exercise 1- Basics

a) Running instructions in Interactive interpreter and a Python Script
b) Write a program to purposefully 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 countdown 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 birthday 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 character? Frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 7 - 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 birthday with a dictionary data structure.

Exercise – 8 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 character Frequency to tell whether the given file is a Python program file, C program file or a text file?

Exercise - 9 Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and b are nearly equal when a can be generated by a single mutation on b.
b) Write a function dups to find all duplicates in the list.
c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - 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 11 - Multi-D Lists

a) Write a program that defines a matrix and prints.
b) Write a program to perform addition of two square matrices.
c) Write a program to perform multiplication of two square matrices.

Exercise - 12 - Modules

a) Install packages requests, flask and explore them. using (pip).
b) Write a script that imports requests and fetch content from the page. Eg. (Wiki).

Exercise - 13 OOP

a) Class variables and instance variable and illustration of the self-variable
i) Robot.
ii) ATM Machine.

Exercise - 14 File access

a) Create a CSV file (roll no, subject1, subject2, subject 3) with 100 rows. All the marks randomly generated raving range (0-100). roll no are having range (1-100)
b) Read the above CSV file having(roll no,subject1, subject2,subject 3) and create new CSV (roll no,subject1, subject2,subject 3, average marks)

Exercise – 15

a) Give some use case scenario and design a system with python program on templates

Course Code	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	Credits
1019173123		0	0	3	2

COURSE OBJECTIVES:

- To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product-specific tools.
- To familiarize the participant with the nuances of database environments towards an information oriented data-processing oriented framework
- To give a good formal foundation on the relational model of data
- To present SQL and procedural interfaces to SQL comprehensively
- To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physical design

COURSE OUTCOMES:

- Understand, appreciate and effectively explain the underlying concepts of database technologies
- Design and implement a database schema for a given problem-domain
- Populate and query a database using SQL DML/DDL commands.
- Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.

LIST OF EXPERIMENTS

1. Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION,
3. INTERSET, Constraints.
4. Example:- Select the roll number and name of the student who secured fourth rank in the class.
5. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
6. Queries using Conversion functions (to_char, to_number and to_date), string functions(Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), datefunctions(Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc,round, to_char, to_date)
7. Creation of simple PL/SQL program which includes declaration section, executable

sectionand exception –Handling section (Ex. Student marks can be selected from the table andprinted for those who secured first class and an exception can be raised if no records were found).

8. Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT inPL/SQL block.
9. Develop a program that includes the features NESTED IF, CASE and CASE expression.
10. The program can be extended using the NULLIF and COALESCE functions.
11. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATIONERROR.
12. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.
13. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
14. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
15. 12) Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers.

Text Books:

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition
2. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc-Graw Hill.
3. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.
4. Data Base Management System, Oracle SQL and PL/SQL, Pranabkumar Das Gupta, P Radha Krishna, PHI.

Course Code		L	T	P	Credits
1099173101	IPR & PATENTS	2	0	0	0

Course Objectives:

To know the importance of Intellectual property rights, which plays a vital role in advanced Technical and Scientific disciplines.
Imparting IPR protections and regulations for further advancement, so that the students can familiarize with the latest developments.

Course Outcomes:

IPR Laws and patents pave the way for innovative ideas which are instrumental for inventions to seek Patents.
Studentget an insight on Copyrights, Patents and Software patents which are instrumental for further advancements.

Unit-I:
Introduction to Intellectual Property Rights (IPR)

Concept of Property - Introduction to IPR – International Instruments and IPR - WIPO - TRIPS – WTO -Laws Relating to IPR - IPR Tool Kit - Protection and Regulation - Copyrights and Neigh boring Rights – Industrial Property – Patents - Agencies for IPR Registration – Traditional Knowledge –Emerging Areas of IPR - Layout Designs and Integrated Circuits – Use and Misuse of Intellectual Property Rights.

Unit-II: Copyrights and Neigh boring Rights

Introduction to Copyrights – Principles of Copyright Protection – Law Relating to Copyrights - Subject Matters of Copyright – Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of Performers **–** Copyright Registration – Limitations – Infringement of Copyright – Relief and Remedy – Case Law - Semiconductor Chip Protection Act

Unit-III: Patents

Introduction to Patents - Laws Relating to Patents in India – Patent Requirements – Product Patent and Process Patent - Patent Search - Patent Registration and Granting of Patent - Exclusive Rights – Limitations - Ownership and Transfer — Revocation of Patent – Patent Appellate Board - Infringement of Patent – Compulsory Licensing — Patent Cooperation Treaty – New developments in Patents – Software Protection and Computer related Innovations.

Trademarks

Introduction to Trademarks – Laws Relating to Trademarks – Functions of Trademark – Distinction between Trademark and Property Mark – Marks Covered under Trademark Law - Trade Mark Registration – Trade Mark Maintenance – Transfer of rights - Deceptive Similarities

- Likelihood of Confusion - Dilution of Ownership – Trademarks Claims and Infringement – Remedies – Passing Off Action.

Unit-IV: Trade Secrets

Introduction to Trade Secrets – General Principles - Laws Relating to Trade Secrets - Maintaining Trade Secret – Physical Security – Employee Access Limitation – Employee Confidentiality Agreements – Breach of Contract –Law of Unfair Competition – Trade Secret Litigation – Applying State Law.

Unit-V:Cyber Law and Cyber Crime

Introduction to Cyber Law – Information Technology Act 2000 - Protection of Online and Computer Transactions - E-commerce - Data Security – Authentication and Confidentiality - Privacy - Digital Signatures – Certifying Authorities - Cyber Crimes - Prevention and Punishment – Liability of Network Providers.
Relevant Cases Shall be dealt where ever necessary.

Reference Books:

- Intellectual Property Rights (Patents & Cyber Law), Dr. A. Srinivas. Oxford University Press, New Delhi.
- Deborah E.Bouchoux: Intellectual Property, Cengage Learning, New Delhi.
- Prabhuddha Ganguli: Intellectual Property Rights, Tata Mc-Graw –Hill, New Delhi
- Richard Stim: Intellectual Property, Cengage Learning, New Delhi.
- Kompal Bansal &Parishit Bansal Fundamentals of IPR for Engineers, B. S. Publications (Press).
- Cyber Law - Texts & Cases, South-Western's Special Topics Collections
- R.Radha Krishnan, S.Balasubramanian: Intellectual Property Rights, Excel Books. New Delhi.
- M.Ashok Kumar and MohdIqbal Ali: Intellectual Property Rights, Serials Pub.

DETAILED SYLLABUS

FOR

III B.Tech

II Semester

Course Code	DESIGN AND ANALYSIS OF ALGORITHMS	L	T	P	Credits
1019173201		3	1	0	3

Course Overview:

This course introduces different techniques to design algorithms using Divide and Conquer, Greedy Approach, Dynamic Programming, Randomized techniques, Multi-Threading, Backtracking and Branch and Bound. It also focuses on how to measure the time and space complexities of algorithms

Course Objectives:

- Devising algorithms for problems.
- Analyze the performance of algorithms.
- Designing of different algorithm techniques.
- Meet the requirements of industry.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Able to analyze the performance of an algorithm in terms of time and space.	Analysis	PO1, PO2, PO3
CO2	Give an intuition on how to find a solution to large problems by dividing them into smaller sub problems.	Understanding	PO2, PO3
CO3	Identifying which designing technique can be used to solve a particular problem.	Applying	PO1, PO2, PO12
CO4	Knowing how to explore the solution space by using Branch and Bound technique.	Understanding	PO1, PO2

Unit-I:

Introduction: Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, Amortized analysis.

Outcome:

Students have a basic understanding on the time and space complexities. Students know how to use Masters Theorem to find the time complexity.

Activity/Event:

For a set of basic problems, students have to develop programs and provide complexity analysis.

Unit-II:

Dived and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Merge Sort, Quick Sort

Outcome:

Students should get an idea on what kind of problems a divide-and-conquer can be applied and know how to divide a problem into sub problems to find a solution

Activity/Event:

Students have to develop programs for all the algorithms (problems) that are discussed in the classroom and know the importance of profiling.

Unit-III:

The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-cost Spanning Trees, Prim's Algorithm, Kruskal's Algorithms, Optimal Merge Patterns, Single Source Shortest Paths.

Outcome:

Students should know what kind of problems a Greedy Approach can be used and how to choose a greedy strategy to get an optimal solution. Students have basics on how to apply probabilistic analysis for Randomized algorithms.

Activity/Event:

Students know how to develop a greedy solution for a problem and able to apply the concept of randomization while developing algorithms for few problems.

Unit-IV:

Dynamic Programming: All - Pairs Shortest Paths, Single – Source Shortest paths General Weights, 0/1 Knapsack, Reliability Design, Travelling sales person problem

Outcome:

Students should know how to apply principle of optimality to get an optimal solution using Dynamic Programming approach and able to apply multithreading concepts to solve a few simple problems

Activity/Event: Develop programs for a set of problems using Dynamic programming.

Unit-V:

Backtracking: The General Method, the 8-Queens Problem, Sum of Subsets, Graph Coloring, Hamiltonian Cycles.
Branch and Bound: General method, applications - Travelling sales person problem,0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution.

Outcome:

Students should be able to understand how to explore a solution space by using Backtracking and Branch-and-Bound. Students have to develop an intuition on what kind of problems can be solved with the help of Backtracking or Branch-and-Bound. Students are able to know how a problem can be classified into either P-class or NP-class.

Activity/Event:

Student are able to generate all possible outcomes for a given problem either by using Backtracking or Branch-and-Bound.

Text Books:

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
2. Design and Analysis of Algorithms , S Sridhar, Oxford
3. Design and Analysis of Algorithms, Parag Himanshu Dave, Himansu Balachandra Dave, 2ed,Pearson Education.

Reference Books:

1. Design and Analysis of algorithms, Aho, Ullman and Hopcroft,Pearson education.
2. Introduction to the Design and Analysis of Algorithms, Anany Levitin, PEA
3. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein,PHI Pvt. Ltd.
4. Algorithm Design, Foundation, Analysis and internet Examples, Michel T Goodrich, Roberto Tamassia, Wiley

Course Code	WEB DESIGN	L	T	P	Credits
1019173202		3	1	0	3

Course Overview:

On completion of this course, a student will be familiar with client server architecture and able to develop a web application using java technologies. Students will gain the skills and project-based experience needed for entry into web application and development careers.

Course Objectives:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web.
- The course will introduce web-based media-rich programming tools for creating interactive web pages.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understand HTML tags to design static web pages	Understand/Remember	PO1
CO2	Describe the basic concepts of Java Scripts to design dynamic web pages	Understand	PO1, PO10
CO3	Familiarize the concepts of PHP and AJAX	Apply	PO1, PO2, PO3, PO5
CO4	Analyze a given problem and apply requisite appropriate tools for designing dynamic and interactive web applications	Analysing	PO1, PO2, PO4, PO12

UNIT-I:

HTML for Structure: Common tags, HTML Tables, Forms, Frames, Adding Links, Adding Images, Lists, Creating a Simple Page.

CSS for Presentation: Introducing Cascading Style Sheets, Formatting Text, Colors and Backgrounds, Thinking Inside the Box, Floating and Positioning.

Outcome: Understand HTML tags to design static web pages

Activity/Event: Design Static website using basic tags and Lists, Tables, Forms.

Unit-II:

Java Script for Behavior: Introduction to JavaScript, Control Statements, Functions, Arrays & Objects.

XML: Document type Definition, XML schemas, Document object model, XSLT

Outcome:

- Describe the basic concepts of Java Scripts to design dynamic web pages
- Familiarize the concepts of XML

Activity/Event:

- Validate the login and registration pages.
- Validate the XML Files.

Unit-III:

Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization Parameters, The javax.servlet. HTTP package, Handling, Http Request & responses, Using Cookies, Session Tracking, Security Issues.

Outcome:

- Develop interactive web applications using HTML forms and servlets.
- Demonstrate the complex conversation with HTTP clients using session attributes.

Activity/Event:

Seminar or Guest Lecture by P.Kameswara Rao, Software Developer in ADAP

Unit-IV:

Introduction to JSP: The Problem with Servlets, The Anatomy of a JSP Page, JSP Processing, JSP Application Design with MVC.

JSP Application Development: Generating Dynamic Content, Using Scripting Elements, Implicit JSP Objects, Conditional Processing – Displaying Values, Using an Expression to Set an Attribute, Declaring Variables and Methods, Error Handling and Debugging, Passing Control and Data Between Pages

Outcome:

- Discuss the architecture of web-based systems.

Describe Web development process and varies server-side technologies.

Activity/Event: Developing various applications

Unit-V:

Database Access: Database Programming using JDBC, Studying Javax.sql.* package. Accessing a Database from a JSP Page, Application – Specific Database Actions.

Outcome:

- Outline the fundamentals of JDBC and its importance, uses, strengths and weaknesses.

Evaluate the process results using scrollable result sets and row sets.

Activity/Event : Implement/ Design a employee database application using JDBC

Text Books:

1. Internet and World Wide Web: How to program, 6/e, Dietel, Dietel, Pearson.
2. The Complete Reference Java2, 8/e, Patrick Naughton, Herbert Schildt, TMH.
3. Java Server Faces, Hans Bergstan, O'reilly.

Reference Books:

1. Web Programming, building internet applications, 2/e, Chris Bates, Wiley Dreamtech
2. Programming World Wide Web, Sebesta, PEA
3. Web Tehnologies, 2/e, Godbole, kahate, TMH
4. An Introduction to web Design , Programming ,Wang, Thomson

Web Links:

1. https://www.w3schools.com/html/html_lists.asp
2. https://www.w3schools.com
3. www.tutorialspoint.com
4. https://mva.microsoft.com/en-us/training-courses/getting-started-with-web-technologies-15937?l=5ovpdCq9B_2406218949

Course Code		L	T	P	Credits
1004173203	VLSI Design	3	1	0	3

Course Overview:

Design the stick and layout diagrams for NMOS, PMOS & CMOS technologies.

Course Objectives:

The student will be able to

- Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects.
- Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
- Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.
- The concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).
- Design static CMOS combinational and sequential logic at the transistor level, including mask layout.

Course Outcomes:

After completion of the course students able to learn :

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Describe the fabrication process for MOS,CMOS and BICMOS technologies along with their electrical properties	Understanding	PO1,PO2
CO2	Outline the concepts of design rules during the layout design	Understanding	PO2,PO3,PO5
CO3	Model various scaling Models and factors and their effects on MOSFET parameters.	Apply	PO3,PO4
CO4	Examine various design issues of VLSI Circuits and illustrate FPGA Design	Analyze	PO3,PO4

Unit-I:

Introduction:

Introduction to IC Technology, MOS and related VLSI Technology, IC production process, MOS and CMOS Fabrication processes, BiCMOS Technology, Comparison between CMOS and Bipolar technologies.

Basic Electrical Properties Of MOS and Bi-CMOS Circuits: Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans conductance, Output Conductance and Figure of Merit. The Pass transistor, NMOS Inverter, Pull-up to Pull-down Ratio for NMOS inverter driven by another NMOS inverter. Alternative forms of pull-up, The CMOS Inverter, MOS transistor circuit model, Bi-CMOS Inverter, Latch-up in CMOS circuits and BiCMOS Latch-up Susceptibility

Outcome: Understand the concepts of MOS, CMOS&BICMOS technologies for the layout design.

Activity/Event: Derive the expressions for V-I for EMOSFET & DMOSFET.

Unit-II:

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick
Diagrams, Design Rules and Layout, General observations on the Design rules, 2μm Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2μmDouble Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter.

Outcome: Apply the concepts of design rules during the layout design.

Activity/Event:

Design the stick and layout diagrams of basic, universal, AOPI, OAI & special gates.

Unit-III:

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, The Delay Unit, Inverter Delays, Propagation Delays, Wiring Capacitances, Fan-in and fan-out characteristics, Choice of layers, Transistor switches, Realization of gates using NMOS, PMOS and CMOS technologies.

Scaling Of MOS Circuits: Scaling models, Scaling factors for device
Parameters, Limits due to sub threshold currents, current density limits on logic levels and supply voltage due to noise.

Outcome: How MODFET parameters affects the scaling of MOS circuits.

Activity/Event: Determine the sheet resistance, standard unit of capacitance and delays for different technologies.

Unit-IV:

Subsystem Design: Architectural issues, switch logic, Gate logic, examples of structured design, clocked sequential circuits, system considerations, general considerations of subsystem design processes, an illustration of design processes.

Outcome: Model & simulate digital VLSI systems using HDL and synthesize digital VLSI systems from RTL.

Activity/Event: Design the switch logic and gate logic circuits.

Unit-V:

VLSI Design Issues: VLSI Design issues and design trends, design process, design for testability, technology options, power calculations, package selection, clock mechanisms, mixed signal design, ASIC design flow, FPGA design flow, introduction to SoC design.

FPGA Design: Basic FPGA architecture, FPGA configuration,
configuration modes, FPGA families, FPGA design examples-stack, queue and shift register implementation using VHDL.

Outcome: Understand the current trends in semiconductor technology & how it impacts scaling & performance.

Activity/Event: Execute different VHDL programs using front end design process.

Text Books:

1. Essentials of VLSI Circuits and Systems By Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, Prentice-Hall of India Private Limited,2005 Edition.
2. VLSI Design-Black Book By Dr. K.V.K.K. Prasad, Kattul Shyamala, Kogent Learning Solutions Inc.2012 Edition.

Reference Books:

1. VLSI Design By A.Albert Raj & T.Latha,PHI Learning Private Limited,2010.
2. VLSI Design-A.Shanthi and A.Kavita, New Age International Private Limited, 2006 First Edition.

Course Code	DIGITAL SIGNAL PROCESSING	L	T	P	Credits
1004173204		3	1	0	3

Course Overview:

Signal processing is one of the fundamental theories and techniques to construct modern information systems. Signal processing is concerned with the representation, transformation, and manipulation of signals and the information they contain.

Course Objectives:

The student will be able to

- Define and use Discrete Fourier Transforms (DFTs)
- Use Z - transforms and discrete time Fourier transforms to analyze a digital system.
- Understand simple finite impulse response filters
- Learn the design procedures used for filter bank
- Learn to program a DSP processor to filter signals

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Design, simulate and realize different digital filters.	Apply, Analyze	PO1,PO2,PO3, PO4, PO5
CO2	Estimate the spectra of signals that are to be processed by discrete time system and to verify the performance of various spectrum estimation techniques	Understand , Apply	PO1,PO2, PO5
CO3	Design multi rate digital signal processing system.	Apply	PO1,PO2,PO3, PO4, PO5
CO4	Understand the architecture of DSP processor	Understand	PO1

Unit-I:

Introduction: Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality. Linear constant coefficient difference equations, solution of difference equations. Frequency domain representation of discrete time signals and systems.

Outcome: Able to analyze different systems.

Activity/Event: By solving the different example problems.

Unit-II:

Discrete Fourier Series & Fourier Transforms: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT, Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

Outcome: To get the complete knowledge on Fourier Transform

Activity/Event: Discussion on the topic among the students.

Unit-III:

IIR & FIR Digital filters: Basic structures of IIR and FIR systems, Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples: Analog-Digital transformations Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters.

Outcome: Able to design the filters.

Activity/Event: Problem solving using MATLAB software.

Unit-IV:

Multirate Digital Signal Processing: Decimation, interpolation, fractional sampling rate conversion and its Implementation, efficient transversal structure for interpolator and decimator, applications of multi rate DSP.116

Outcome: Able to know about the concept of sampling.

Activity/Event: By solving different examples.

Unit-V:

Introduction to DSP Processors: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, VLSI architecture, Pipelining, Special addressing modes, On-Chip Peripherals. Architecture of TMS 320C5XIntroduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, Some flags in the status registers, On- chip registers, On-chip peripherals.

Outcome: Able to know about the concept of DSP processors.

Activity/Event: By conducting seminars.

Text Books:

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris Z.Manolakis, Pearson Education / PHI, 2007.
2. Digital Signal Processing, A. Anand Kumar, PHI, 2012.
3. Digital Signal Processors – Architecture, Programming and Applications, B.Venkataramani, M.Bhaskar, TATA McGraw Hill, 2002.

Reference Books:

1. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI.
2. Digital Signal Processing – K Raja Rajeswari, I.K. International Publishing House.

Course Code		L	T	P	Credits
1019173203	SOFTWARE PROJECT MANAGEMENT (OPEN ELECTIVE-I)	3	1	0	3

Course Objectives:

- To study how to plan and manage projects at each stage of the software development life cycle (SDLC).
- To train software project managers and other individuals involved in software project planning and tracking and oversight in the implementation of the software project management process.
- To understand successful software projects that support organization's strategic goals.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	To match organizational needs to the most effective software development model. To understand the basic concepts and issues of software project management	Applying	PO1, PO2, PO3, PO5
CO2	To effectively planning the software projects. To implement the project plans through managing people, communications and change.	Understanding	PO1,PO2
CO3	To select and employ mechanisms for tracking the software projects To conduct activities necessary to successfully complete and close the Software projects.	Analyzing	PO1,PO2,PO3
CO4	To develop the skills for tracking and controlling software deliverables. To create project plans that address real-world management challenges.	Applying	PO1, PO2, PO3, PO5

UNIT-I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Outcome:

- To match organizational needs to the most effective software development model.
- To understand the basic concepts and issues of software project management

Activity/Event: Group discussion on various life cycle models

Unit-II:

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections. The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Outcome:

- To effectively planning the software projects.
- To implement the project plans through managing people, communications and change.

Activity/Event: Seminar and Class Test

Unit-III:

Life cycle phases: Engineering and production stages, Inception, Elaboration, Construction, Transition phases.
Artifacts of the process: The Artifact sets, Management artifacts, Engineering artifacts, Programmatic artifacts.

Outcome:

- To select and employ mechanisms for tracking the software projects
- To conduct activities necessary to successfully complete and close the Software projects.

Activity/Event: Discussion on various scenarios with real time applications
Unit-IV:

Model based Software Architectures: A Management perspective and technical perspective.
Work Flows of the process: Software process workflows, Iteration workflows.

Outcome:

- To develop the skills for tracking and controlling software deliverables.

Activity/Event: Seminar and Class test

Unit-V:

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments. Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Outcome:

To create project plans that address real-world management challenges.

Activity/Event: Distinguish with different software metrics with latest applications

Text Books:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

Reference Books:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education. 3. Software Project Management in practice, Pankaj Jalote, Pearson Education.2005.

Course Code	BIO-MEDICAL ENGINEERING	L	T	P	Credits
1019173204	(OPEN ELECTIVE-I)	3	1	0	3

Course Overview:

Biomedical Engineering combine engineering principles with medical and biological sciences to design and create equipment, devices, computer systems, and software used in healthcare.

Course Objectives:

- Biomedical engineering education must allow engineers to analyze a problem from both an engineering and biological perspective
- To anticipate the special difficulties in working with living systems and to evaluate a wide range of possible approaches to solutions
- The undergraduate program in Biomedical Engineering provides a strong foundation in the basic sciences, mathematics, engineering and life sciences.

Course Outcomes:

After completion of the course students able to learn :

- Man instrument system and types of electrodes and transducers to extract biopotential signals
- Anatomy of heart, lungs, eye and ears. Devices to do tests on heart, lungs, eye and ears.
- Diagnose & Monitor the health of patient in intensive care unit.
- Monitors, recorders and electrical accident prevention methods

UNIT-I:

Introduction to Biomedical Instrumentation:

Man Instrumentation System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Resting and Action Potentials, Bioelectric Potentials-ECG, EEG and EMG.

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.

Outcome:

Man instrument system and types of electrodes and transducers to extract biopotential signals

Activity/Event: Explain about ECG, EMG and EEG

Unit-II:

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.

Outcome: Anatomy of heart, lungs, eye and ears. Devices to do tests on heart, lungs, eye and ears.

Activity/Event: Prepare a model of heart and demonstrate how heart works
Assignment on spirometer and lung volumes.

Unit-III:

Patient Care and Monitoring:

Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

Therapeutic and Prosthetic Devices:

Audiometers and Hearing Aids. Myoelectric Arm, Laparoscope, Ophthalmology Instruments, Anatomy of Vision, Electro physiological Tests, Ophthalmoscope, Tonometer for Eye Pressure Measurement. Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

Outcome:
Diagnose & Monitor the health of patient in intensive care unit. Learn about different equipment used to monitor the health of patient. Understand equipments like pacemaker, audiometers, ophthalmoscope, Tonometer etc

Activity/Event: Seminar on , audiometers, ophthalmoscope, Tonometer and diathermy.

Unit-IV:

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, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring.

Outcome:

Monitors, recorders and electrical accident prevention methods Lear about different devices to diagnose the disease of the patient. Learn about telemetry system to transmit bio medical signals like ECG, EEG etc

Activity/Event:

Presentation of MRI, CT scan, Ultrasonic imaging and X-Ray using graphic videos.

Unit-V:

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.

Outcome:

Learn about different techniques to record and display signals. Learn about the ways to prevent shock hazards.

Activity/Event: Discussion on monitors, recorders and shock hazards

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", Instrumentation", Kandahar. McGrawHill

Course Code	UNIX PROGRAMMING (OPEN ELECTIVE-I)	L	T	P	Credits
1019173205		3	1	0	3

Course Objectives:

- Written technical communication and effective use of concepts and terminology.
- Facility with UNIX command syntax and semantics.
- Ability to read and understand specifications, scripts and programs.
- Individual capability in problem solving using the tools presented within the class. Students will demonstrate a mastery of the course materials and concepts within in class discussions.

Course Outcomes:

- Documentation will demonstrate good organization and readability.
- File processing projects will require data organization, problem solving and research.
- Scripts and programs will demonstrate simple effective user interfaces.
- Scripts and programs will demonstrate effective use of structured programming.
- Scripts and programs will be accompanied by printed output demonstrating completion of a test plan.
- Testing will demonstrate both black and glass box testing strategies.
- Project work will involve group participation.

Unit-I:

Introduction to UNIX-Brief History-What is Unix-Unix Components-Using Unix-Commands in Unix-Some Basic Commands-Command Substitution-Giving Multiple Commands.

Outcome:

- Demonstrate basic commands, command substitution, command chaining in UNIX.
- Explain basics of files, directory hierarchy, permissions, and inodes in UNIX.

Activity/Event: Illustrate how UNIX commands are applicable in real time with an example.

Unit-II:

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

Outcome:

- Analyze file command to know the file type and chmod command to change file permissions.

- Demonstrate the chown command and chgrp command to change the owner and group of a file.

Activity/Event: Demonstrate the use of chmod, chown, chgrp commands in real time applications.

Unit-III:

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

Outcome:

- Demonstrate command arguments, shell variables, looping in shell programs.

Activity/Event:

Demonstrate the use of export, exit, expr, sleep, script, eval, exec command in real time applications.

Unit-IV:

Filters-The Grep Family-Other Filters-The Stream Editor Sed-The AWK Pattern Scanning and processing Language- Good Files and Good Filters.

Outcome:

- Illustrate filters, the stream editor, the awk pattern scanning and processing language.

Activity/Event:

Demonstrate the use of command arguments, shell variables, filters in real time applications.

Unit-V:

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

Outcome:

- Demonstrate the export, read, set, exit, expr commands.
- Analyze The here Document(<<)-The Sleep Command-The Script Command-The Eval Command-The Exec Command

Activity/Event:

Demonstrate the use of export, exit, expr, sleep, script, eval, exec command in real time applications.

Text Books:

1. The Unix programming Environment by Brain W. Kernighan & Rob Pike, Pearson.
2. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Pearson.

Reference Books:

1. Unix and shell programming by B.M. Harwani, OXFORD university press.

Course Code	ROBOTICS	L	T	P	Credits
1003173203	(OPEN ELECTIVE-I)	3	1	0	3

Course Overview:

Robots in industrial automation with kinematic and dynamic analysis of manipulators.

Course Objectives:

1. To give students practice in applying their knowledge of mathematics, science, and Engineering and to expand this knowledge into the vast area of robotics.
2. The students will be exposed to the concepts of robot kinematics, Dynamics, Trajectory planning.
3. Mathematical approach to explain how the robotic arm motion can be described.
4. 4. The students will understand the functioning of sensors and actuators.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Identify various robot configuration and components	Understand/Remember	PO1
CO2	Select appropriate actuators and sensors for a robot based on specific application.	Understand	PO1, PO10
CO3	Carry out kinematic and dynamic analysis for simple serial kinematic chains.	Apply	PO1, PO2, PO3, PO5
CO4	Perform trajectory planning for a manipulator by avoiding obstacles.	Analyzing	PO1, PO2, PO4, PO12

Unit-I:

Introduction: Automation and Robotics, – An over view of Robotics – Classification by coordinate system and control system. COMPONENTS OF THE INDUSTRIAL ROBOTICS: Common types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors.

Outcome: Understand the specifications of Robots and its applications.

Activity/Event: Describe the useful applications of Robot Kinematics

Unit-II:

Motion Analysis: Homogeneous transformations as applicable to rotation and translation – problems. MANIPULATOR KINEMATICS: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

Outcome: Illustrate the Orientations and frames of Robot Arm dynamics and D-H representation.

Activity/Event: Seminar on Forward and Inverse kinematics of Robot Arm

Unit-III:

Differential transformation and manipulators, Jacobians – problems Dynamics: Lagrange – Euler and Newton – Euler formulations – Problems.

Outcome: Recognize the Robot drives and power transmission systems in real life applications.

Activity/Event: Seminar on Robot Drive mechanisms and manipulators.

Unit-IV: General Considerations in path description and generation. Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion – Robot programming, languages and software packages-description of paths with a robot programming language.

Outcome: Know the tools required for Robot End Effectors.

Activity/Event: Case study based seminar on Robot End Effectors in reality.

Unit-V:

Robot Actuators and Feed Back Components: Actuators: Pneumatic, Hydraulic Electrical actuators–comparison. Electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors. ROBOT APPLICATIONS: IN

Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Outcome: Demonstrate the programming of straight line motion and path planning.

Activity/Event: List out the various robot softwares and robot languages.

Text Books:

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

References:

1. Robotics / Fu K S/ McGraw Hill.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall.
3. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter Science.
4. Introduction to Robotics / John J Craig / Pearson Edu.

Open Elective -II (CBCS)(MOOCS)

MOOCs: It is an online course (Minimum of 12 weeks) to promote advanced knowledge suitable for placement and research.

To award credits, the student should get certificate after they have registered for written exam and successfully passed

(Or)

College will conduct the examination/Viva-voce and award the credits and grades.

In case a student fails in any online course, he/she may be permitted to register for the same course or an alternate course decided by the department committee. The internal marks secured earlier will be nullified if the course is changed. The assessment procedure of MOOCs course remains same as general theory course.

Note: The registered course must not be same as any of the courses listed in the program structure of their regulation till final year.

Course Code	MICRO PROCESSORS & MICRO CONTROLLERS LAB	L	T	P	Credits
1004173221		0	0	3	2

LIST OF EXPERIMENTS

PART- A: (Minimum of 5 Experiments has to be performed)

8086 Assembly Language Programs:

1. Multi byte Addition/Subtraction, Multiplication and Division operations.
2. ASCII Arithmetic Operations & Code Conversions
3. Sum of Squares/Cubes of a givenn-numbers
4. Factorial of givenn-numbers
5. String Operations.
6. Sorting

PART- B: (Minimum of 3 Experiments has to be performed)

8051 Assembly Language Programs:

1. Finding number of 1's and number of 0's in a given 8-bitnumber
2. Addition of even numbers from a given array
3. Ascending / Descending order
4. Average of n-numbers

PART- C: (Minimum of 4 Experiments has to be performed)

Interfacing of I/O Devices:

1. Hardware/Software Interrupt Application using 8086 & 8051
2. D/A Interface through Intel8255 to 8086 & 8051
3. Keyboard and Display Interface through Intel8279
4. Stepper Motor Interface to 8086 & 8051
5. Traffic Light Controller

Equipment Required:

1. Adapters
2. keyboards
3. Analog/Digital Storage Oscilloscopes
4. 8086 Micro processor kits
5. 8051 micro controller kits
6. DAC module
7. Stepper motor module
8. Traffic light module

Course Code	VLSI Lab	L	T	P	Credits
1004173222		0	0	3	2

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**.**

Minimum 10 experiments should be conducted

List of Experiments:

1. Design and Implementation of cmos inverter
2. Design and Implementation cmos nand & nor gates
3. Design and Implementation full adder
4. Design and Implementation full subtractor
5. Design and Implementation of cmos exor & exnor gates
6. Design and Implementation of gated s r latch and dlatch
7. Design and Implementation of decoder
8. Design and Implementation of demultiplexer
9. Design and Implementation of cmos sram
10. Design and Implementation of 3 bit asybnchronous counter
11. Design and Implementation 4 bit R-2R ladder DAC
12. Design and Implementation differential amplifier

Software Required:

1. Mentor Graphics Software / Equivalent Industry Standard Software.
2. Personal computer system with necessary software to run the programs and to implement.

Course Code	WEB DESIGN Lab	L	T	P	Credits
1019173221		0	0	3	2

Course Overview:

The main objective of this Lab is to create a fully functional website with MVC architecture i.e. to develop an online Book store using which we can sell books**.** This lab demonstrates an in-depth understanding of the tools and Web technologies necessary for business application design and development. It covers client side scripting like HTML, JavaScript and server side scripting like servlets, JSPs and database interfacing.

Course Objectives:

- To make effective use of Java generic types.
- To write multi-threaded Java applications, servlets & JSP
- To develop advanced HTML pages with the help of frames, scripting languages, and evolving technology like DHTML, XML.
- To design dynamic web pages using JavaScript.

Course Outcomes:

The Student will be able to:

- Analyze a web page and identify its elements and attributes.
- Build static and dynamic web pages using HTML and CSS.
- Develop client side manipulations in web pages using Java Script.
- Understanding various applications to implement in JDBC.

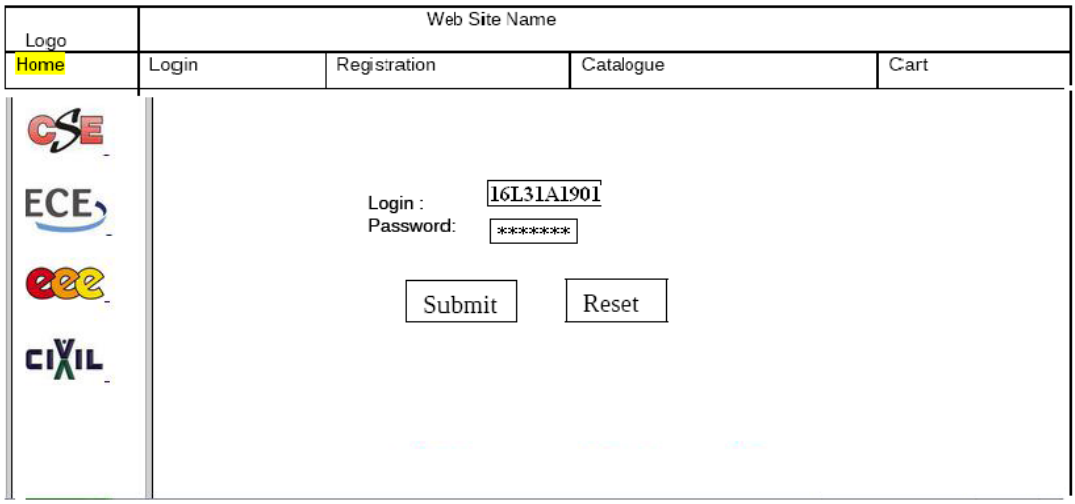
List of Experiments:

1. Design the following static web pages required for an online book store web site.

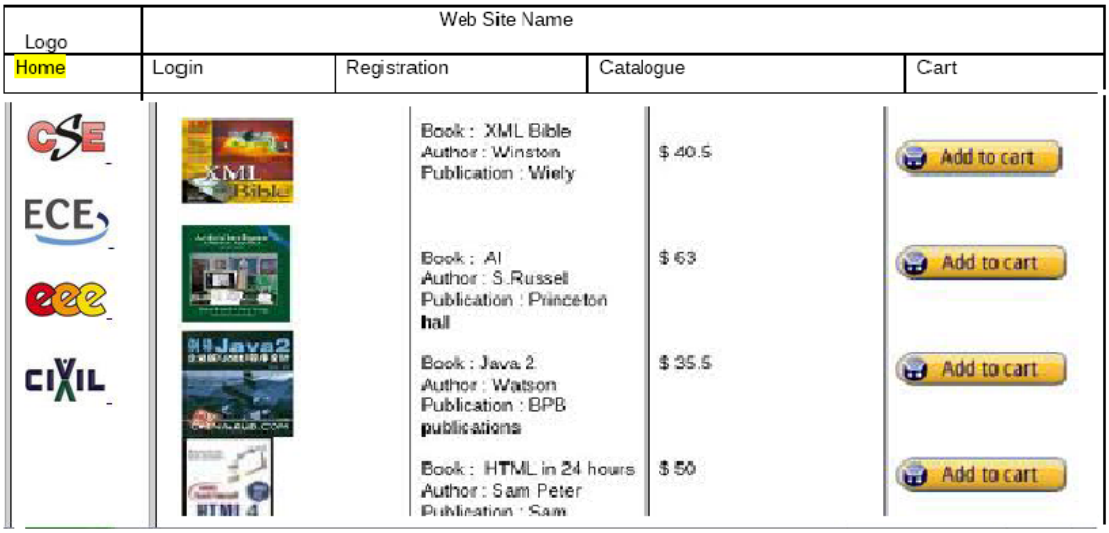
1) Home Page: The static home page must contain three frames.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).
Left frame: At least four links for navigation, which will display the catalogue of respective links. For e.g.: When you click the link "ECM" the catalogue for ECM Books should be displayed in the Right frame.
Right frame: The *pages to the links in the left frame must be loaded here*. Initially this page contains description of the web site.

2) Login Page



3) Catalogue Page: The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following: 1. Snap shot of Cover Page. 2. Author Name. 3. Publisher. 4. Price. 5. Add to cart button.

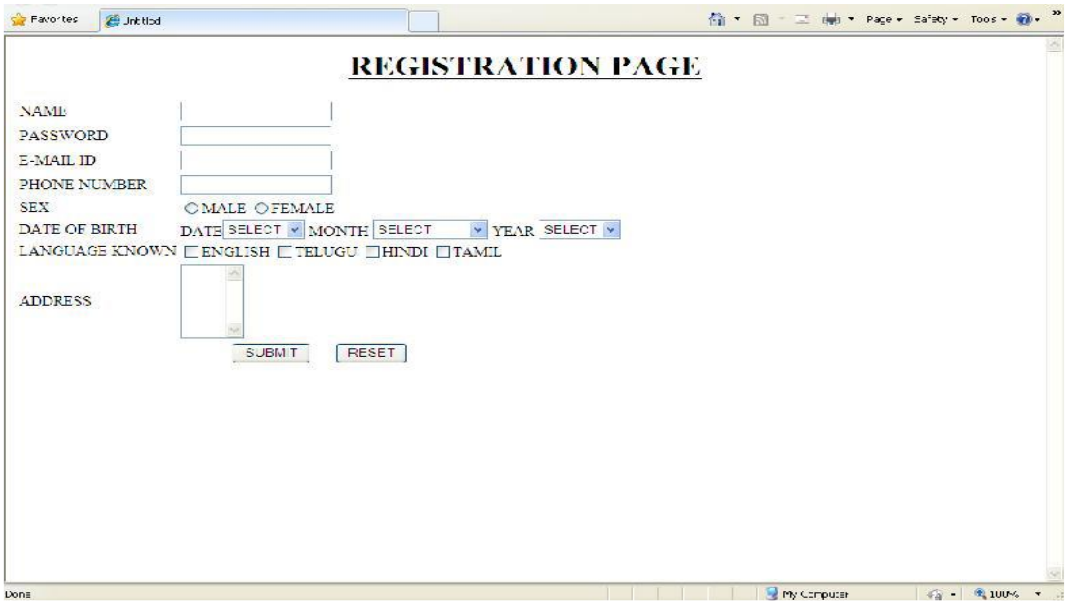


4. Registration Page: Create a "registration form "with the following fields

1) Name (Text field)

2) Password (password field)

3) E-mail id (text field)
4) Phone number (text field)
5) Sex (radio button)
6) Date of birth (3 select boxes)
7) Languages known (check boxes – English, Telugu, Hindi, Tamil)
8) Address (text area)



5. Design a Web Page Using CSS (Cascading Style Sheets) which includes the following:

1) Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.

6. Design a web page using CSS which includes the following:

(i) Use different font styles
(ii) Set a background image for both the page and single elements on the page.
(iii) Control the repetition of the image with the background-repeat property.
(iv) Define styles for links as
A: link A: visited A: active A: hover
(v) Work with layers
(vi) Adding a Customized cursor

7. Write the steps to Install TOMCAT web server and APACHE.
8. Write a JAVA servlet program to implement a dynamic HTML using Servlet (user name and password should be accepted using HTML and displayed using a servlet).
9. Write a JAVA Servlet program to implement and demonstrate get () and post () methods (Using HTTP Servlet class).
10. Write a JSP program that demonstrates the concept of Session Tracking.
11. Write a Java Program to insert data into database and retrieve data from database.
12. reate tables in the database which contain the details of items (books in our case like Book name, Price, Quantity, Amount) of each category. Modify your catalogue page (week 2) in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.

Course Code		L	T	P	Credits
	INDUSTRY ORIENTED MINI PROJECT				
1019173241		**0**	**0**	**0**	**2**

Industry Oriented Mini Project: The Industry oriented mini project is carried out during the third year second semester vacation. The students have an option to choose their own area of interest which may be related to the course work. Mini project report is evaluated for 100 marks in fourth year first semester before the first mid-term exam. Assessment is done by the supervisor /guide for 40 marks based on the work and mini project report. The remaining 60 marks are allocated for presentation by the student to a committee comprising of the project supervisor and senior faculties members nominated by Head of the Department.

PROGRAM STRUCTURE

FOR

IV -B.TECH

I & II SEMESTERS

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING
PROGRAM STRUCTURE (VR 17)

IV B.Tech **I Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019174101	Data Communication and Computer Networks	3	1*	0	3
2	1004174105	IoT & its Applications	3	1*	0	3
3	1005174102	Machine Learning	3	1*	0	3
4	1004174102	Digital Image Processing	3	1*	0	3
5	**Elective-I**		3	1*	0	3
	1019174102	1. Advanced Computer Architecture				
	1004174201	2. Satellite Communications				
	1019174103	3. System Programming				
	1019174104	4. Fundamentals of Data Mining and Data Warehousing				
6	**Elective-II**		3	1*	0	3
	1019174105	Structural Digital Design				
	1012172205	Object Oriented Analysis and Design using UML				
	1005174103	Big Data Analytics				
	1019174106	Analog IC Design				
7	1019174121	Digital Signal Processing Lab	0	0	3	2
8	1019174122	IoT Lab	0	0	3	2
Total Credits						**22**

IV B.Tech **II Semester**

S.No	Course Code	Name of the Course	L	T	P	Credits
1	1019174201	Introduction to Embedded Systems	3	1*	0	3
2	1012173201	Software Testing Methodologies	3	1*	0	3
3	**Elective-III**		3	1*	0	3
	1019174202	Digital IC Design				
	1019174203	Automata Theory & Compiler Design				
	1019174204	Advanced Microcontrollers				
	1012173101	Human Computer Interaction				
4	**Elective –IV**		3	1*	0	3
	1019174205	Real Time Operating Systems				
	1005174101	Cryptography and Network Security				
	1019174206	Wireless Sensor Networks				
	1004174101	Cellular and Mobile Communications				
OR						
	1019174281	Internship	0	0	0	12
5	1019174251	Technical Seminar	0	3	0	2
6	1019174261	Comprehensive Viva	0	0	0	2
7	1019174231	Main Project	0	0	0	10
Total Credits						**26**

DETAILED SYLLABUS

FOR

IV B.Tech

I Semester

Course Code	DATA COMMUNICATON AND COMPUTER	L	T	P	Credits
1019174101	NETWORKS	3	1	0	3

Course Overview: Computer networking or data communication is a most important part of the information technology. A computer network is comprised of connectivity devices and components. To share data and resources between two or more computers network is required. There are different types of a computer network such as LAN, MAN, WAN and wireless network. The key devices involved that make the infrastructure of a computer network are Hub, Switch, Router, Modem, Access point, LAN card and network cables. There are different topologies of a computer network. A topology defines the physical layout or a design of a network. These topologies are star topology, bus topology, mesh topology, star bus topology etc.

Course Objectives:

1.To have a detailed study of various analog and digital modulation and demodulation techniques
2. To have a thorough knowledge of various multiplexing schemes and Data communication protocols
3. Understand state-of-the-art in network protocols, architectures, and applications.
4. Process of networking research
5. Constraints and thought processes for networking research

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Knowledge of working of basic communication systems	Understand	PO-1, PO-2, PO-1,2
CO2	Understand OSI and TCP/IP models	Apply	PO-1, PO-2, PO-3
CO3	Analyze MAC layer protocols and LAN technologies	Analyze	PO-1, PO-2, PO-3, PO-4, PO-10
CO4	Design applications using internet protocols	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-10

Unit-I: DIGITAL MODULATION TECHNIQUES: ASK, FSK, M-Array PSK, BPSK, Band width efficiency, clock recovery, Probability of error and bit error rate.

Unit-I Outcome:

- Knowledge of working of basic communication systems

Activity/Event on Unit-1: Quiz

Unit-II:DATA COMMUNICATIONS: Serial, Parallel configuration, Topology, Transmission modes, codes, Error Control, Synchronization, And LCU. Serial and Parallel Interfaces, Telephone Networks and Circuits, Data modems.

Unit-II Outcome:

- Knowledge of working of basic communication systems

Activity/Event on Unit-II: Group Discussion

Unit-III: Introduction: Network Topologies WAN, LAN, MAN. Reference models - The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models

The Physical Layer: Guided Transmission Media, Data Link Layer Design Issues.

Unit-III Outcome:

- Understand OSI and TCP/IP models

Activity/Event on Unit-III: Discussion about real time applications of OSI layers

Unit-IV: The Data Link Layer : Services Provided to the Network Layer – Framing – Error Control – Flow Control, Error Detection and Correction – Error-Correcting Codes – Error Detecting Codes, Elementary Data Link Protocols- A Utopian Simplex Protocol-A Simplex Stop and Wait Protocol for an Error free channel-A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols-A One Bit Sliding Window Protocol-A Protocol Using Go-Back-N- A Protocol Using Selective Repeat.

Unit-IV Outcome:

- Analyze MAC layer protocols and LAN technologies

Activity/Event on Unit-IV: Discussion about Error detection and correction techniques

Unit-V: The Network Layer: Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service-Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path Algorithm, Congestion Control Algorithms.

Transport Layer: The Internet Protocols: UDP &TCP.

Unit-V Outcome:

- Design applications using internet protocols

Activity/Event on Unit-V: Discussion about Switching services & Internet Protocols

Text Books:

1. Digital and Analog Communication systems, Samshanmugan, John Willey 2005
2. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson education.
3. Computer Networks, Tanenbaum and David J Wetherall, 5th Edition, Pearson Edu, 2010

Reference Books:

1. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.TMH.
2. Computer Networks: A Top Down Approach, Behrouz A. Forouzan, Firouz Mosharraf, McGraw Hill Education

Course Code		L	T	P	Credits
1004174105	IOT AND ITS APPLICATIONS	3	1	0	3

Course Overview: The purpose of this course is to impart knowledge on IoT Technology and Architecture, Internal communication protocols, corrections with other technologies, real time applications ad study practical design and implementation issues

Course Objectives: The main objective of course make student to understand the IoT basic concepts, standards, communication protocols, technological relation and real time applications and their design, implementation and deployment issues.

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	To Understand the Architecture, protocols and applications of IoT.	Understand	PO1
CO2	To Analyse the communication protocols and standards used in IoT	Analyse	PO2
CO3	To analyse and design the simple IoT applications to monitor or control IoT devices using simulation or hardware	Design and Creative thinking	PO3,PO6,PO7
CO4	To implement the real time IoT applications.	Design and Deployment	PO4,PO5,PO11, PO12

Unit-I: Introduction to IoT, Need of Internet of Things, Internet of Things ERA, Characteristics of Internet of Things, architectural view of Internet of Things, Technologies behind Internet of Things – Server- End Technology – Major Components of IoT system – Development Tools – API and device interfacing components, Sources of IoT, Examples of IoT – Smart Watch – Smart Home – Smart Phone.

Unit-I Outcome: Understand the characteristics, physical and logical of IoT and their application.

Activity/Event on Unit-1: Identify physical and logical components involved in IoT applications

Unit-II: Introduction, Generic computing systems Vs. Embedded systems, Purpose of Embedded Systems - Typical Embedded System – Core of the Embedded System – Memory – Sensors and Actuators with I/O subsystems – Communication Interfaces – Wireless Interfaces and Wire Interfaces – Characteristics of Embedded Systems – Quality Attributes of an Embedded Systems.

Unit-II Outcome: Analyze and design hardware and software components of IoT application

Activity/Event on Unit-2: Identification day to day embedded devices along with hardware and software components

Unit-III:M2M communication – M2M to IoT – M2M architecture – software development tools, Communication Technologies – Wireless communication technologies – Wired Communication, Physical Design of IoT – Things in IoT – IoT Protocols, Logical design of IoT – IoT functional blocks – IoT communication models.

Unit-III Outcome: Analyze and design the communication protocols of IoT applications

Activity/Event on Unit-3: Identification of communication styles of various IoT Protocols

Unit-IV: Basic building blocks of an IoT devices, Introduction about the Raspberry Pi Board, Operating systems for Raspberry Pi, Interfaces for IoT – Serial Interface – SPI – I2C, IoT Design Methodology – Requirements – Process – Domain Model – Information model – service – Functional View – Operational View – Device & components Integration – Application development.

Unit-IV Outcome: Construction of IoT systems with raspberry pi and simulation tools

Activity/Event on Unit-4: Hands-on setup of IoT Systems using Raspberry pi

Unit-V:Case Studies: Home Automation – Smart lighting – Home intrusion detection, Cities – smart parking, Environment – Weather monitoring system – Air Pollution Monitoring – Forest Fire Detection, Agriculture – smart irrigation system.

Unit-V Outcome: Understand physical and logical aspects of real time IoT applications.

Activity/Event on Unit-5: Mini project on IoT applications for monitoring/control devices

Text Books:

1. Internet of Things: A hands-On Approach, ArshdeepBahga, Vijay Madisetti, 2014 edition, University Press.
2. The Internet of Things: Enabling technologies, Platforms and Use cases, Pethuru Raj and Anupama C. Raman, 2017 edition, CRC Press, Taylor and Francis Group.
3. Introduction to Embedded Systems, Shibu K V, 2nd Edition, Tata Mc-Graw hill Edition.

Reference Books:

1. Internet of Things: Architecture and design Principles, Raj Kamal, Tata Mc-Graw hill Edition.
2. Embedded Systems: Architecture and applications, Raj Kamal, Tata Mc-Graw hill Edition.

Course Code	MACHINE LEARNING	L	T	P	Credits
1005174102		3	1	0	3

Course Overview:
This class is an introductory undergraduate course in machine learning. The class will briefly cover topics in regression, classification, mixture models, neural networks, deep learning, ensemble methods and reinforcement learning.
Prerequisites 1. Data Structures 2. Knowledge on statistical methods

Course Objectives:
- Familiarity with a set of well-known supervised, unsupervised and semi-supervised learning
- The ability to implement basic machine learning algorithms
- Understanding of how machine learning algorithms are evaluated
- Applying new concepts in machine learning

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Recognize the characteristics of machine learning that make it useful to real-world Problems	Understand/ Remember	PO1,PO3, PO4
CO2	Characterize machine learning algorithms as supervised, semi-supervised, and Unsupervised	Understand/ analyze	PO1,PO5, PO9,
CO3	Be able to use support vector machine, regularized regression algorithms	Create	PO3,PO5, PO9,PO2
CO4	Understand the concept behind neural networks for learning non-linear functions	Evaluate/Apply	PO2,PO3, PO5,PO12

Unit-I:
INTRODUCTION TO MACHINE LEARNING:
Introduction to machine learning, Definition, traditional programming vs machine learning algorithms, learning a system, supervised learning, unsupervised learning and reinforcement learning, application areas

Unit-I Outcome:
- Familiarize with a set of well known problem and feature of machine learning

Unit-I Activity: Apply characteristics with real world problems

UNIT- II:

Classification and Regression Models

Linear separability and decision regions, linear discriminants, linear regression, logistic regression, decision trees-ID3 and C4.5, KNN

UNIT- II Outcome:

- Able to understand the difference between classification and regression problems

UNIT- II Activity: Regression analysis and hypothesis space

Unit-III:

Dimensionality reduction and Support vector machines

Dimensionality reduction and Feature selection, Dimensionality reduction algorithms: LDA and PCA, Margin of a classifier, Support Vector Machine, Learning nonlinear hypothesis using kernel functions.

Unit-III Outcome:

- Ability to implement basic machine learning algorithms

Unit-III Activity: Implement tree models, rule models and linear models on simple dataset

Unit-IV:

Clustering and Ensemble Methods

Introduction to clustering: K-means clustering, Gaussian mixture model, Ensemble Methods: bagging and boosting, Random forest and AdaBoost algorithms and Bayesian learning algorithm.

Unit-IV Outcome:

- Able to understand how to evaluate machine learning algorithms

Unit-IV Activity: Implement classification algorithms on a dataset

Unit-V:

ARTIFICIAL NEURAL NETWORKS

Introduction, The perceptron, the perceptron learning algorithm, Multilayer neural networks, activation functions, Back Propagation algorithm and introduction to Deep learning models: CNN

Unit-V Outcome:

- Able to understand the ensemble methods and ANN algorithms

Unit-V Activity: Understand the concept of neural networks for learning non linear functions

Text Books:

1. Machine Learning, Tom M. Mitchell, (MGH)Mc GrawHill publications, 1997.
2. Machine Learning: The art and science of algorithms that make sense of data, Peter Flach,
   Cambridge.
3. Introduction to Machine Learning with Python By Andreas C. Müller, Sarah Guido O'Reilly Media

Reference Books:

1. Understanding Machine Learning: From Theory toAlgorithms, Shai Shalev-Shwartz, Shai Ben- David, Cambridge.
2. Machine Learning in Action, Peter Harington, 2012, Cengage.

Course Code		L	T	P	Credits
1004174102	**DIGITAL IMAGE PROCESSING**	**3**	**1**	**0**	**3**

Course Overview:

Digital image fundamentals- Relationships between pixels-Image Transforms- Histogram processing- Image smoothing- Image sharpening-Image Restoration-Image Segmentation-Image Compression-Color Image Processing-Morphological Image Processing.

Course Objectives:

- Describe and explain basic principles of digital image processing
- Design and implement algorithms that perform basic image processing (e.g. noise removal and image enhancement).
  Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- Assess the performance of image processing algorithms and systems (colour and morphological).

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Summarize the fundamentals of gray scale and color image processing.	Understand	PO2, PO4, PO5
CO2	Apply different transforms and compression methods on image for image processing applications.	Apply	PO2,
CO3	Analyze the methods to extract information from the image in terms of spatial filtering, frequency filtering, restoration and segmentation.	Apply	PO2
CO4	Examine the different techniques of color and multi resolution processing.	Analyze	PO2, PO4, PO5

Unit-I:

Evolution of Digital image processing, Examples of fields that use digital image processing, Fundamental steps of digital image processing, Components of an image processing system, Image Sensing and Acquisition, Image Sampling and Quantization, Some basic Relationships between pixels.

Unit-I Outcome:

- Explain mathematical models of various types of image concepts
- Define image sampling and quantization in image processing.

Activity/Event on Unit-1: Seminar

Unit-II:IMAGE TRANSFORMS: Orthogonal Sinusoidal Basis Function – Discrete Fourier Transform, Discrete Cosine Transform **Non-sinusoidal orthogonal basic**

function - Haar, Walsh, Hadamard, Slant.**Statistics of input signal** - KL transform, Singular Value Decomposion

Unit-II Outcome:

- Demonstrate types of Image transforms
- Applying Image transforms to real time applications.

Activity/Event on Unit-II: Executing programs using MATLAB software.

Unit-III: Image Enhancement: Need for Image Enhancement, Histogram Process.

Image Enhancement in Spatial domain: spatial filtering, smoothing low pass filter, sharpening high pass filter

Image Enhancement in Frequency domain: Image smoothing using low pass, Image sharpening using high pass filter.

Image Restoration techniques: A model of the image degradation/restoration process, Noise models, Restoration in presence of noise: Mean filters, Adaptive filters, Inverse filter, Wiener filter.

Unit-III Outcome:

- Describe various spatial and time domain techniques in filtering.
- Illustrate detection of restoration and degradation with noise recognition.

Activity/Event on Unit-III: Executing programs using MATLAB software.

Unit-IV:

Image Compression: Need for image compression, Huffman coding, Arithmetic coding, LZW coding ,Run-length coding, Block Transform coding, Predictive coding (lossless and lossy). Image standards (JPEG, MPEG, GIF).

Image Segmentation: Fundamentals, Point, Line and Edge detection, Region based segmentation, Edge detection, Edge linking, Thresholding.

Unit-IV Outcome:

- Describe various region and edge detection concepts
- Apply various compression techniques in real time applications.

Activity/Event on Unit-IV: Executing programs using MATLAB software.

Unit-V:Color Image Processing: Color fundaments, Pseudo color image processing, Basic of full color image processing, Color image smoothing and sharpening, Using color in image segmentation, Noise in color images, Color image compression.

Unit-V Outcome:

- **Describe various colour models**
- **Apply various techniques for morphological image processing**

Activity/Event on Unit-V: Executing programs using MATLAB software.

Text Books:

1. "Digital image processing", Gonzalez, R. C., and R. Woods, 3rd ed." (2020).
2. "Digital image processing TMH publication." , Jayaraman, S., S. Esakkirajan, and T. Veerakumar, Year of Publication (2009).

Reference Books:

1. "Digital image processing using MATLAB", Gonzalez, Rafael C., Richard Eugene Woods, and Steven L. Eddins, Pearson Education India, 2020.
2. "Fundamentals of Digital Image Processing", Sharma, Dr Sanjay, SK Kataria and Sons, 2008.

Course Code	ADVANCED COMPUTER ARCHITECTURE (Elective-I)	L	T	P	Credits
1019174102		3	1	0	3

Course Overview:

An overview of computer architecture, which stresses the underlying design principles and the impact of these principles on computer performance. General topics include design methodology, processor design, control design, memory organization, system organization, and parallel processing.

Prerequisites: Programming and Data structures, Discrete Maths, and a basic knowledge of Computer organization

Course Objectives:

The student will be introduced to

- Understand the Concept of Parallel Processing and its applications.
- Implement the Hardware for Arithmetic Operations.
- Analyze the performance of different scalar Computers.
- Develop the Pipelining Concept for a given set of Instructions.
- Distinguish the performance of pipelining and non pipelining environment in a processor.

Course Outcomes:

After going through this course the student will be able to

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understand the Concept of Parallel Processing and its applications	Understand	PO-1, PO-2, PO-3, PO-4
CO2	Implement the Hardware for Arithmetic Operations	Understand	PO-1, PO-2, PO-3, PO-6, PO-7
CO3	Analyze the performance of different scalar Computers	Analyze	PO-1, PO-2, PO-5, PO-6, PO-10, PO-12
CO4	Develop the Pipelining Concept for a given set of Instructions	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-5, PO-12

Unit-I: Pipeline and vector processing : Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

Outcome:

- Understand the concept of Parallel Processing.

Activity/Event on Unit-1: Create a Presentation based on Parallel And Pipelining Processing

Unit-II: Computer Arithmetic : Addition and Subtraction, Hardware Implementation, Multiplication Algorithms and Hardware Implementation, Division Algorithms and Hardware Implementation, Floating Point Arithmetic Operations

Unit-II Outcome:

- Analyze the concept of Different computer Arithmetic.

Activity/Event on Unit-II: Hardware Implementation of different algorithms.

Unit-III: Parallel Computer Models : Evolution of Computer Architecture, System Attributes to Performance, Shared Memory Multiprocessors, Distributed Memory Multicomputer, Vector Super Computers, SIMD Super Computers.

Unit-III Outcome:

- Understand and analyze the Parallel Computer Models.

Activity/Event on Unit-III: Study project on any model of Parallel Computer.

Unit-IV: Processors and Memory Hierarchy : Advanced Processor Technology: Design Space of Processors, Instruction-Set Architectures, CISC scalar Processors, RISC scalar Processors, Super Scalar and Vector Processors: Superscalar Processors.

Unit-IV Outcome: Analyze the Characteristics of Processors and Memory Hierarchy.

Activity/Event on Unit-IV: Study project on any Memory Hierarchy.

Unit-V:Pipelining and Superscalar Techniques : Linear Pipeline Processors: Asynchronous and Synchronous models, Clocking and Timing Control, Speedup, Efficiency and Throughput, Pipeline Schedule Optimization, Instruction Pipeline Design: Instruction Execution Phases, Mechanisms for Instruction Pipelining, Dynamic Instruction Scheduling, Branch Handling Techniques.

Unit-V Outcome: • Understand and analyze the Pipelining and Superscalar Techniques.

Activity/Event on Unit-V: Prepare a document that gives the utility of all Pipelining and Superscalar Techniques in present days.

Text Books:

1. Computer System Architecture, Morris M. Mano, 3rd edition, Pearson/Prentice Hall India.
2. Advanced Computer Architecture, Kai Hwang, McGraw-Hill, India.

Reference Books:

1. Computer Organization and Achitecture, William Stallings ,8th edition,PHI
2. Computer Organization, Carl Hamachar, Vranesic,Zaky, 5th edition, McGraw Hill.

Course Code	SATELLITE COMMUNICATIONS	L	T	P	Credits
1004174201	(Elective-I)	3	1	0	3

Course Overview: This course will introduce students to this rapidly growing field and equip them with some of its basic principles and applications. Students will learn concepts of Frequency allocations, Applications, and Future Trends of Satellite Communications, the G/T ratio, Design of down links, up link design, Tracking systems, Terrestrial interface, Delay & Throughput considerations, System considerations, operational NGSO constellation Designs, and CDMA,TDMA,FDMA.

Course Objectives:

1. Summarize Frequency allocations, Applications, and Future Trends of Satellite Communications.
2. Enlighten the concepts of telemetry, tracking, Command and monitoring, communication subsystems
3. Explain the G/T ratio, Design of down links, up link design, Design of satellite links for specified C/N,
4. Analyse concepts of Tracking systems, Terrestrial interface, Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, operational NGSO and compare multiple access techniques.

Course Outcomes:

After completion of the course students able to learn :

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Explain the concepts, Basic Concepts, Frequency allocations, Applications, and Future Trends of Satellite Communications. **Submit Review report from Research journals with professional ethics, team work and self-learning.**	Understand Apply	PO-1, PO-2, PO-8, PO-9, PO-10, PO-12
CO2	Apply Concepts to Attitude and orbit control, telemetry, tracking, Command and monitoring, communication subsystems. **Submit Review report from Research journals with professional ethics, team work and self-learning.**	Apply Analyse	PO-1, PO-2, PO-8, PO-9, PO-10, PO-12
CO3	Analyse 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, System design example. Submit Review report On Satellite Link Design (Uplink/Downlink, C/N design)from Research journals with professional ethics, team work and self-learning.	Analyse	PO-1, PO-2, PO-8, PO-9, PO-10, PO-12
CO4	Analyse concepts of Tracking systems, Terrestrial interface, Orbit consideration,	Analyse	PO-1, PO-2, PO-8, PO-9,

	coverage and frequency considerations, Delay & Throughput considerations, System considerations, operational NGSO constellation Designs, and CDMA,TDMA,FDMA. **Submit Review report from Research journals with professional ethics, team work and self-learning.**		PO-10, PO-12

Unit-I:

INTRODUCTION: Historical Back-ground, Basic Concepts of Satellite Communications, Frequency allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

ORBITAL MECHANICS AND LAUNCHERS: Orbital Mechanics, Look Angle determination, Orbital perturbations, Orbit determination, launches and launch vehicles, Orbital effects in communication systems performance.

Unit-I Outcome:

Explain the concepts, Applications, and Future Trends of Satellite Communications

Activity/Event on Unit-1: Case study: Submit Review report from Research journals with professional ethics, team work and self-learning

Unit-II:

SATELLITE SUBSYSTEMS: Attitude and orbit control system, telemetry, tracking, Command and monitoring, power systems, communication subsystems, Satellite antenna Equipment reliability and Space qualification.

Unit-II Outcome:

Apply Concepts to Attitude and orbit control, TTC and communication subsystems.

Activity/Event on Unit-II: Case study: Submit Review report from Research journals with professional ethics, team work and self-learning

Unit-III:

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, System design example.

Case study from Journals like IEEE, Elsevier: On Satellite Link Design (Uplink/Downlink, C/N design)

Unit-III Outcome:

Analyze 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.

Activity/Event on Unit-III: Case study: Submit Review report from Research journals with professional ethics, team work and self-learning.

Unit-IV:

MULTIPLE ACCESS: Frequency division multiple access (FDMA) Intermodulation, Calculation of C/N. Time division Multiple Access (TDMA) Frame structure, Examples. Satellite

Switched TDMA Onboard processing, DAMA, Code Division Multiple access (CDMA), Spread spectrum transmission and reception.
Case study from Journals like IEEE, Elsevier: On TDMA, DAMA, CDMA.

Unit-IV Outcome:
Analyze concepts of Multiple access techniques CDMA, TDMA, FDMA.
Activity/Event on Unit-IV: Case study: Submit Review report from Research journals with professional ethics, team work and self-learning.

Unit-V:
EARTH STATION TECHNOLOGY: Introduction, Transmitters, Receivers, Antennas, Tracking systems, Terrestrial interface, Primary power test methods.
LOW EARTH ORBIT AND GEO-STATIONARY SATELLITE SYSTEMS: Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Designs.

Unit-V Outcome:
Analyze concepts of Tracking systems, Terrestrial interface, Orbit consideration, coverage and frequency considerations, Delay & Throughput considerations, System considerations, operational NGSO constellation Designs, and CDMA, TDMA, and FDMA.
Activity/Event on Unit-V: Case study: Submit Review report from Research journals with professional ethics, team work and self-learning.

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 Communication - D.C Agarwal, Khanna Publications, 5th Ed.
2. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004

Course Code	SYSTEM PROGRAMMING (Elective-I)	L	T	P	Credits
1019174103		3	1	0	3

Course Overview:

This course covers the main design practices and principles for the development of programming languages. This course covers the basic of finite automata and regular expressions. It also covers the analysis and synthesis phases of a language processor: lexical analysis, syntax analysis (top-down and bottom-up techniques), semantic analysis, runtime environments, error handling, intermediate code, code optimization, and final code generation.

Course Objectives:

- Describes how a programming language works
- How input is converted into output from the machine hardware level and various phases of compiler
- Understanding the Language Semantics
- Understanding the relation between the source code and generated machine code.

Course Outcomes:

After completion of the course students able to learn :

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	To apply the various phases of compiler and compare its working with assembler.	Applying	PO3, PO4
CO2	Understand various concepts in assemblers and processors	Understanding	PO1, PO2
CO3	Classify machines by their power to recognize languages	Understanding	PO1, PO2
CO4	Analyze how linker and loader executable, interpreters and editors	Analyzing	PO1,PO2, PO3, PO4

UNIT I:

Overview of System Software, Software, Software Hierarchy, System Programming, Machine Structure, Interfaces, Address Space, Computer Languages, Life Cycle of a Source Program, System Software Development, Levels of System Software

Unit-I Outcome:

- Learn the basic terminology and operations of languages; identify the difference between DFA and NFA.

Activity/Event on Unit-I:

Construct the equivalent DFA for the NFA chosen from any source.

UNIT II:

Overview of Language Processors, Programming Languages and Language Processors, Language Processing Activities, Fundamentals of Language Processing, Symbol Tables, Data Structures for Language Processing, Assemblers, Elements of Assembly Language Programming Design of Assembler, Assembler Design Criteria, Types of Assemblers, Assembler for Intel x86.

Unit-II Outcome:

- Learn the basics of context free grammars and various Parsing techniques
- Identify various parsing techniques for a given grammars.

Activity/Event on Unit-II:

- Obtain the leftmost and rightmost derivations for a given grammar.

UNIT III:

Macro Language and Macro Processor:

Macro and Macro Processors, Macro Definition and Call, Macro Expansion, Nested Macro Facility, Advanced Macro Facilities, Design of Macro Preprocessor, Design of Macro Assembler, Functions of Macro Processor, Basic Tasks of Macro Processor, Design Features and Issues of Macro Processor, Macro Processor Design Options, Two-pass Macro Processors, One-pass Macro Processors

Unit-III Outcome:

Describe the various concepts of assemblers and macro processors.

Activity/Event on Unit-III:

Design a simple Macro with assembler

UNIT IV:

Loaders: Linkers and Loaders, Basic Linker and Loader Functions, Relocation and Linking Concepts Design of Linker, Relocating and Self-Relocating Programs, Linking in MS DOS, Linking of Overlay Structured Programs, Dynamic Linking Loaders, Different Loading Schemes, Design of Absolute Loaders, Design of Direct-Linking Loaders

Unit-IV Outcome:

To analyze how linker and loader create an executable program from an object module created by assembler and compiler.

Activity/Event on Unit-IV:

How to execute the program with linker and loader

UNIT V:

Interpreters & Editors:

Interpreters- Benefits of interpretation, overview of interpretation, The Java Language environment

Editors: Screen editors, word processors, Structure editors, Design of an editor.

Unit-V Outcome:

To know various editors and debugging techniques

Activity/Event on Unit-V: Design an editor with real time application

Text Books:

1. System Programming & Operating System, Dhamdhere, - TMH
2. System Programming, John J. Donovan - TMH

Course Code	FUNDAMENTALS OF DATA MINING AND DATA WAREHOUSING (Elective-I)	L	T	P	Credits
1019174104		3	1	0	3

Course Overview:

This course discusses techniques for pre-processing data before mining and presents the concepts related to data warehousing, online analytical processing (OLAP), and data generalization. It presents methods for mining frequent patterns, associations, and correlations. It also presents methods for data classification and prediction, data-clustering approaches, and outlier analysis.

Course Objectives:

- To understand data warehouse and data mining concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques on real-time data

Course Outcomes:

	Course outcome	Cognitive Level as per Bloom's Taxonomy	PO
CO1	Understand the concepts of data warehouse and data mining	Understand	PO-1, PO-2, PO-12
CO2	Use data pre processing techniques to build data warehouse	Apply	PO-1, PO-2, PO-3
CO3	Analyze transaction databases for association rules	Analyze	PO-1, PO-2, PO-3, PO-4, PO-10
CO4	Understand the details of different algorithms made available by popular commercial data mining software and Solve real data mining problems by using the right tools to find interesting patterns	Evaluate	PO-1, PO-2, PO-3, PO-5, PO-10

Unit-I: Introduction: What Motivated Data Mining? Why Is It Important, Data Mining—On What Kind of Data, Data Mining Functionalities—What Kinds of Patterns Can Be Mined? Are All of the Patterns Interesting? Classification of Data Mining Systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or Data Warehouse System, Major Issues in Data Mining.

Unit-I Outcome:

- Understand the importance of data mining and the principles of business intelligence
- To introduce the concept of data Mining as an important tool for enterprise data management and as a cutting edge technology for building competitive advantage.

Activity/Event on Unit-1: Illustrate how does Data warehouse help in improving the business of an organization.

Unit-II:Data Pre-processing: Why Pre-process the Data? Descriptive Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation.

Unit-II Outcome:

- Organize and prepare the data needed for data mining using preprocessing techniques.
- Perform exploratory analysis of the data to be used for mining.

Activity/Event on Unit-II: Discuss various steps and approaches for data cleaning.

Unit-III:Data Warehouse and OLAP Technology: An Overview: What Is a Data Warehouse? A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining.

Unit-III Outcome:

- Ability to understand why there is a need for data warehouse in addition to traditional operational database systems and identify components in typical data warehouse architecture.

Activity/Event on Unit-III: Briefly compare the following concepts. You may use an example to explain your point(s).
(a) Star schema, Snowflake schema and fact constellation
(b) Enterprise warehouse, data mart and virtual warehouse.

Unit-IV: Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction. Model Over fitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, and cross-validation, bootstrap.

Association Analysis: Basic Concepts, FrequentItemset Mining Methods-Apriori Algorithm, Pattern-Growth Approach, Generating Association Rules from Frequent Itemsets.

Unit-IV Outcome:

- To make students well versed in all data mining algorithms, methods of evaluation.

Activity/Event on Unit-IV: Implement the Decision Tree Induction algorithm and find the best splitting attribute.

Unit-V: Cluster Analysis: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, K-means, The Basic K-means Algorithm, K-means additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses.
Hierarchical Clustering: Agglomerative and Divisive Hierarchical Clustering algorithms, Strengths and Weaknesses of Hierarchical Clustering.
DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses.

Unit-V Outcome:

- Define and apply metrics to measure the performance of various data mining algorithms.
- Compare and analyze the implementation of different clustering algorithms.

Activity/Event on Unit-V:
Generalize each of the following clustering algorithms in terms of the following criteria: (i) shapes of clusters that can be determined; (ii) input parameters that must be specified; and (iii) limitations.
(a) k-means

(c) DBSCAN

Text Books:

1. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.
2. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.

Reference Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining: Introductory and Advanced topics, Dunham, Pearson.
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

Course Code	STRUCTURAL DIGITAL DESIGN (Elective-II)	L	T	P	Credits
1019174105		3	1	0	3

Course Overview: This course instructs the students in the use of VHDL ((Very High Speed Integrated Circuit Hardware Description Language) for describing the behavior of digital systems. VHDL is a standardized design language used in computer/ semiconductor industry. This course will teach students the use of the VHDL language for representation of digital signals, use of IEEE standard logic package/library, design description, design of arithmetic, combinational, and synchronous sequential circuits.

Course Objectives:

- Students must demonstrate the use and application of Boolean Algebra in the areas of digital circuit reduction, expansion, and factoring.
- Students must learn the IEEE Standard 1076 VHDL Hardware Description Language
- Students must be able to simulate and debug digital systems described in VHDL
- Students must be able to synthesize complex digital circuits at several level of abstractions;

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Complete understanding of CAD Tools and VHDL language	Understand	PO1,PO3,PO6
CO2	Design combinational circuits like adder, sub tractor ,code converter etc. using VHDL code	Applying, Analyzing	PO1,PO2,PO3,PO5, PO6
CO3	Design sequential circuits like counters and sequence generatorsetc using VHDL code	Applying & Analyzing	PO1,PO2,PO3,PO5, PO6
CO4	Understand the Verilog language and testing of combinational and sequential circuits	Understand ,Applying & Analyzing	PO1,PO2,PO3,PO5, PO6
CO5	Understand the Synthesis process and testing of digital logic circuits using CAD tools	Understand, Applying & Analyzing	PO1,PO2,PO3,PO5, PO6

UNIT-I: INTRODUCTION TO HDL: Design Concepts: The Design process, Design of Digital Hardware, Introduction to Logic Circuits, Introduction to CAD Tools, Introduction to VHDL, Introduction to Digital Design Methodology, Design methodology, Introduction to Verilog.

DIGITAL LOGIC DESIGN USING VHDL: Introduction, designing with VHDL, design entry methods, logic synthesis , entities , architecture , packages and configurations, types of models: dataflow , behavioral , structural, signals vs. variables, generics, data types, concurrent vs. sequential statements , loops and program controls

Activity/Event on Unit-1: Hangman

UNIT-II:

COMBINATIONAL LOGIC CIRCUIT DESIGN USING VHDL: Combinational circuits building blocks: Multiplexers, Decoders , Encoders , Code converters , Arithmetic comparison circuits , VHDL for combinational circuits , Adders-Half Adder, Full Adder, Ripple-Carry Adder, Carry Look-Ahead Adder, Subtraction, Multiplication.

Activity/Event on Unit-II: Building Card Towers

UNIT-III:

SEQUENTIAL LOGIC CIRCUIT DESIGN USING VHDL:. Flip-flops, registers & counters, synchronous sequential circuits: Basic design steps, Mealy State model, Design of FSM using CAD tools, Serial Adder Example, State Minimization, Design of Counter using sequential Circuit approach.

Activity/Event on Unit-III: Quiz Challenges

UNIT-IV:

DIGITAL LOGIC CIRCUIT DESIGN USING VERILOG: Verilog Data types and Operators, Binary data manipulation, Combinational and Sequential logic design, Structural Models of Combinational Logic, Logic Simulation, Design Verification and Test Methodology, Propagation Delay, Truth Table models of combinational and sequential logic using Verilog, Verilog for combinational circuits.

DIGITAL LOGIC CIRCUIT DESIGN EXAMPLES USING VERILOG:

Behavioral modeling , Data types, Boolean-Equation-Based behavioral models of combinational logics , Propagation delay and continuous assignments , latches and level-sensitive circuits in Verilog, Cyclic behavioral models of flipflops and latches and Edge detection, comparison of styles for behavioral model; Behavioral model, Multiplexers, Encoders and Decoders, Counters, Shift Registers, Register files, Dataflow models of a linear feedback shift register, Machines with multi cycle operations, ASM and ASMD charts for behavioral modeling, Design examples, Keypad scanner and encoder

Activity/Event on Unit-IV: A Divided Assignment

UNIT-V:

SYNTHESIS OF DIGITAL LOGIC CIRCUIT DESIGN: Introduction to Synthesis, Synthesis of combinational logic, Synthesis of sequential logic with latches and flip-flops, Synthesis of Explicit and Implicit State Machines, Registers and counters.

TESTING OF DIGITAL LOGIC CIRCUITS AND CAD TOOLS: Testing of logic circuits, fault model, complexity of a test set, path-sensitization, circuits with tree structure, random tests, testing of sequential circuits, built in self test, printed circuit boards, computer aided design tools, synthesis, physical design

Activity/Event on Unit-V: What's Your Problem?

Text Books:

1. "Fundamentals of Digital logic design with VHDL", Stephen Brown &ZvonkoVranesic Tata McGraw Hill,2nd edition.
2. "Advanced digital design with the Verilog HDL", Michael D. Ciletti, Eastern economy edition, PHI.

Reference Books:

1. "Digital systems design with FPGAs and CPLDs", Ian Grout, Elsevier Publications.
2. "Fundamentals of Digital logic with Verilog design", Stephen Brown &ZvonkoVranesic, Tata McGraw Hill,2nd edition.
3. "VHDL Primer", Bhaskar,3rd Edition, PHI Publications.

Course Code OBJECT ORIENTED ANALYSIS AND L T P Credits

1012172205 **DESIGN USING UML (Elective –II)** **3 1 0 3**

Course Overview:

The course discusses object-oriented analysis and design using Unified Modelling Language (UML) by understanding the insight knowledge into analyzing and designing Complex software system using Object – Oriented approach and Provide the notations of Unified Modelling Language like Basic Behavioral, Advanced Behavioral and Architectural Modelling.

Course Objectives:

- Explore and analyze different analysis and design models, such OO Models, Structured Analysis and Design Models, etc.
- Understanding the insight and knowledge into analyzing and designing software using different object-oriented modeling techniques
- Understanding the fundamental principles through advanced concepts of analysis and design using UML notations.

Course Outcomes:

	Course Outcome	**Cognitive level as per Bloom's Taxonomy**	**PO**
CO1	Build solutions to the complex problems using object oriented approach	Creating	PO1,PO2, PO3,PO4
CO2	Identify classes and responsibilities of the problem domain	Understand	PO1, PO2,PO3,PO5
CO3	Apply UML tools for various case studies	Apply	PO1,PO4, PO5, PO6,PO9,PO12
CO4	Represent classes, objects, responsibilities and states using UML notations.	Remember and Understand	PO1, PO2,PO3,PO5

Unit-I: Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems, Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

Unit-I Outcome:

To design a solution using Object-Oriented method for a Complex Software System.

Activity/Event on Unit-1:

Illustrate a solution to a complex software system.

Unit-II: Classes and Objects: Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

Unit-II Outcome:

- Understand the basic relationship among Classes and Objects

- Identification of Class and Object in Object-oriented approach.

Activity/Event on Unit-II:

To identify the difference between a Class and Object diagram using sample scenarios.

Unit-III: Introduction to UML: Why we model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams.

Basic Behavioral Modeling: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

Unit-III Outcome:

- Understand conceptual model of UML using different notations.
- To design Basic Behavioral modeling diagram using Use Case, Interaction and Activity scenarios.

Activity/Event on Unit-III:

- Design a Use case diagram for sample case study.
- Develop Interaction and Activity Diagrams using sample case studies.

Unit-IV: Advanced Behavioral Modeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams.

Unit-IV Outcome:

- Learn about events and signals to be handle in developing a state chart diagram.

Activity/Event on Unit-IV:

Create a State Chart diagram using a sample scenario in real time application.

Unit-V:

Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams.

Case Study: The Unified Library application.

Unit-V Outcome:

- To design and understand the component diagram.
- To identify the difference between component and deployment diagram.

Activity/Event on Unit-V:

Perform a real time activity to identify component and deployment diagrams in UML.

Text Books:

1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH,Robert Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, 3rd edition, 2013,PEARSON.
2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012,PEARSON.

Reference Books:

1. "Object-oriented analysis and design using UML", Mahesh P. Matha,PHI
2. "Head first object-oriented analysis and design", Brett D.McLaughlin, Gary Pollice,
   Dave West,O'Reilly
3. "Object-orientedanalysisanddesignwiththe Unifiedprocess",JohnW.Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning

Course Code	BIG DATA ANALYTICS (Elective-II)	L	T	P	Credits
1005174103		3	1	0	3

Course Overview: This course provides practical foundation level training that enables immediate and effective participation in big data projects. The course provides grounding in basic and advanced methods to big data technology and tools, including Map Reduce and Hadoop and its ecosystem

Course Objectives:

- Optimize business decisions and create competitive advantage with Big Data analytics
- Introducing Java concepts required for developing map reduce programs
- Derive business benefit from unstructured data
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm
- To introduce programming tools PIG & HIVE in Hadoop echo system

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Preparing for data summarization, query, and analysis.	Understanding	PO1, PO2
CO2	Applying data modeling techniques to large data sets	Applying	PO1, PO2,PO4
CO3	Creating applications for Big Data analytics	Applying	PO1, PO2,PO4
CO4	Building a complete business data analytic solution	Applying	PO1, PO2,PO4, PO5

UNIT-I:

Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) – Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, and TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files.

Outcome:

- Analyze the distinction between GFS and HDFS
- Demonstrate understanding of different mode of Hadoop Installations.

Activity/Event:

- Installation of Hadoop and configuring various XML files

Unit 2:

Writing Map Reduce Programs: A Weather Dataset, Understanding Hadoop API for Map Reduce Framework (Old and New), Basic programs of Hadoop Map Reduce: Driver code, Mapper code, Reducer code, Record Reader, Combiner, Partitioner

Outcome:

- Analyze the distinction Map Reduce execution of old and new versions
- Demonstrate understanding of different code blocks

Activity/Event/:

- Running of Map Reduce program to forecast weather.

Unit 3: Effort estimation & activity Planning

Hadoop I/O: The Writable Interface, Writable Comparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, Bytes Writable, Null Writable, Object Writable and Generic Writable, Writable collections, Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators

Outcome:

- Understanding the I/O classes used for Hadoop Map Reduce concept
- Able to write wrapper classes and Generic class programs

Activity/Event :

- Implementation of I/O operations using writable wrappers

Unit 4:

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the Pig Script Interfaces, Scripting with Pig Latin

Outcome:

- Understand the PIG Architecture and Modes of operations.
- Able to write the PIG scripts

Activity/Event :

- Installation of PIG and running pig scripts on different modes

UNIT – 5:

Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data

Outcome:

- Understand the HIVE Architecture and Modes of operations.
- Able to create database on HIVE environment

Activity/Event

- Installation of HIVE and running the queries on database

Text Books:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly
3. Hadoop in Action by Chuck Lam, MANNING Publ.

Reference Books:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop Map Reduce Cookbook, Srinath Perera, Thilina Gunarathne

Course Code	ANALOG IC DESIGN	L	T	P	Credits
1019174106	(Elective-II)	3	1	0	3

Course Overview:

- To introduce concepts of MOS Devices based on small signal and large signal models and to develop the Analog CMOS Circuits for different Analog operations.

Course Objectives:

The student will be introduced to

- The student will be able to understand the behaviour of MOS Devices and Small-Signal & Large-Signal Modeling of MOS Transistor and Analog Sub-Circuits.
- In this course, students can study CMOS Amplifiers like Differential Amplifiers, Cascode Amplifiers, Output Amplifiers, and Operational Amplifiers.
- Another main object of this course is to motivate the graduate students to design and to develop the Analog CMOS Circuits for different Analog operations.
- The concepts of Open-Loop Comparators and Different Types of Oscillators like Ring Oscillator, LC Oscillator etc.

Course Outcomes:

After going through this course the student will be able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the concepts of MOS Devices and Modeling.	Understand	PO-1, PO-2, PO-3, PO-4
CO2	Understand of Open-Loop Comparators and Different Types of Oscillators.	Understand	PO-1, PO-2, PO-3, PO-6, PO-7
CO3	Design and analyze any Analog Circuits in real time applications.	Analyze	PO-1, PO-2, PO-5, PO-6, PO-10, PO-12
CO4	Extend the Analog Circuit Design to Different Applications in Real Time.	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-5, PO-12

Unit-I: MOS Devices and Modeling: The MOS Transistor, Passive Components- Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

Outcome:

- Understand the concept of different components.
- Analysis of small signal and Large signal models.

Activity/Event on Unit-1:

Activity/Event on Unit-1: Problems on Analysis of small signal and Large signal models.

Unit-II: Analog CMOS Sub-Circuits: MOS Switch, MOS Diode, MOS ActiveResistor, Current Sinks and Sources, Current Mirrors-Current mirror withBeta Helper, Degeneration, Cascode current Mirror and Wilson CurrentMirror, Current and Voltage References, Band gap Reference.

Unit-II Outcome:

- Understand the CMOS Sub-Circuits.
- Analyze the characteristics of MOS with different Circuits.

Activity/Event on Unit-II: Implement a project using MOS Switching/Sub-Circuits in real time Environment.

Unit-III:CMOS Amplifiers: Inverters, Differential Amplifiers, Cascode Amplifiers,Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures.

CMOS Operational Amplifiers: Design of CMOS Op Amps,Compensation of Op Amps, Design of Two-Stage Op Amps, Power- SupplyRejection Ratio of Two-Stage Op Amps, Cascode Op Amps, MeasurementTechniques of OP Amp.

Unit-III Outcome:

- Understand and analyze the various CMOS Amplifiers.
- Analyze the design of CMOS Op Amps.

Activity/Event on Unit-III: Implement a project based on applications of CMOS Amplifiers and CMOS OP Amps

Unit-IV:Comparators: Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete- Time Comparators.

Unit-IV Outcome: Analyze the Characteristics of Comparators and its applications

Activity/Event on Unit-IV: Implement a project based on applications of Comparators in real time environment.

Unit-V:Oscillators & Phase-Locked Loops: General Considerations, Ring Oscillators, LC Oscillators, Voltage Controlled Oscillators. Simple PLL, Charge Pump PLLs, Non-Ideal Effects in PLLs, Delay Locked Loops, Applications.

Unit-V Outcome: Analyze the Characteristics of Oscillators & Phase-Locked Loops.

Activity/Event on Unit-V: Implement a project based on applications of Oscillators & Phase-Locked Loops in real time environment.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
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.

Course Code	DIGITAL SIGNAL PROCESSING LAB	L	T	P	Credits
1019174121		0	0	3	2

List of the Experiments / programs
To Student has to perform at least FIVE Experiments in each part

PART-1(SIGNALS & FILTERS)

1) Generation of discrete time signals for discrete signals
2) a) To verify the Linear Convolution
   b) To verify the Circular Convolution for discrete signals
3) Frequency Response of IIR low pass & high pass Butterworth Filter
4) Frequency Response of IIR low pass & high pass Chebyshev Filter
5) Frequency Response of FIR low pass Filter using Rectangle Window & Triangle Window

PART-2(IMAGE PROCESSING)

1) Implement the spatial image enhancement functions on a bitmap image –Mirroring (Inversion)
2) Implement the spatial image enhancement functions on a bitmap image –Rotation (Clockwise)
3) Implement the spatial image enhancement functions on a bitmap image –Enlargement (Double Size)
4) Implement (a) Low Pass Filter (b) High Pass Filter
5) Implement (a) Arithmetic Mean Filter (b) Geometric Mean Filter
6) Implement Smoothing and Sharpening of an eight bit color image
7) Implement (a) Boundary Extraction Algorithm (b) Graham's Scan Algorithm
8) Implement (a) Edge Detection (b) Line Detection

List of additional experiments to be done in Lab

1 Display an image and its histogram
2 Perform shrinking, zooming and cropping of an image
3 Perform the experiment for histogram equalization.
4 Perform blurring and de-blurring on an image.
5 Removal of salt and pepper noise

Experiments beyond syllabus: Experiment no: Objectives

1 Implement a function in MATLAB for image segmentation.
2 Implement a function in MATLAB for image morphology that analyze the form and shape detail of image structures.
3 Implement a function in MATLAB for Image Restoration.
4 Models for representing the color and methods of processing the color plane

Equipments & Software required:
Software :

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

Course Code	IOT LAB	L	T	P	Credits
1019174122		0	0	3	2

Course Overview:
Following are some of the programs that a student should be able to write and test on an Arduino/Raspberry Pi, but not limited to this only.

Course Objectives:
- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web based services on IoT devices.

Course Outcomes:
- Identify problems that are amenable to solution by various methods, and which different methods may be suited to solving a givenproblem.
- Formalize a given problem in the language/framework of different methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process,etc).
- Implement basic algorithms (e.g., standard search algorithms or dynamic programming).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluationsupports.

List of Experiments :

1. Start Raspberry Arduino/Pi and try various Linix commands in command terminal window: ls, cd, touch, mv, rm, man, mkdir, rmdir, tar, gzip, cat, more, less, ps, sudo, cron, chown, chgrp, ping etc.
2. Run some python programs on Arduino/Pi like:
   a) Read your name and print Hello message with name
   b) Read two numbers and print their sum, difference, product and division.
   c) Word and character count of a given string
   d) Area of a given shape (rectangle, triangle and circle) reading shape and appropriate values from standard input
   e) Print a name 'n' times, where name and n are read from standard input, using for and while loops.
   f) Handle Divided by Zero Exception.
   g) Print current time for 10 times with an interval of 10 seconds.
   h) Read a file line by line and print the word count of each line.
3. Light an LED through Python program
4. Get input from two switches and switch on corresponding LEDs
5. Flash an LED at a given on time and off time cycle, where the two times are taken from a file.
6. Flash an LED based on cron output (acts as an alarm)
7. Switch on a relay at a given time using cron, where the relay's contact terminals are connected to a load.
8. Get the status of a bulb at a remote place (on the LAN) through web.

The student should have hands on experience in using various sensors like temperature, humidity, smoke, light, etc. and should be able to use control web camera, network, and relays connected to the Arduino/Pi.

DETAILED SYLLABUS FOR

IV B.Tech
II Semester

Course Code	INTRODUCTION TO EMBEDDED	L	T	P	Credits
1019174201	SYSTEMS	3	1	0	3

Course Overview:

In this course, the fundamentals of embedded system hardware and firmware design will be explored. Issues such as embedded processor selection, hardware/firmware partitioning, glue logic, development tools, firmware architecture, firmware design, and firmware debugging techniques will be discussed.

Course Objectives:

- The basic concepts of an embedded system are introduced and the various elements of embedded hardware and their design principles are explained.
- Different steps involved in the design and development of firmware for embedded systems is elaborated
- Fundamental issues in hardware software co-design were presented and explained.
- Familiarise with the different IDEs for firmware development for different family of processors/controllers and embedded operating systems.
- Embedded system implementation and testing tools are introduced and discussed.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function	Understand	PO-1, PO-2, PO-6,PO-12
CO2	Design the Embedded hardware by considering the hardware components required for an embedded system	Apply	PO-1, PO-2, PO-3,PO-5
CO3	Analyse the various embedded firmware design approaches on embedded environment to suit for desired application	Analyze	PO-1, PO-2, PO-3, PO-5, PO-11
CO4	Understand how to integrate hardware and firmware of an embedded system and apply this knowledge to real time operating system.	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-5,PO-11,PO-12

Unit-I:

Embedded System -Definition, 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, Characteristics of an embedded system, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system

Unit-I Outcome:

- Able to understand the major application areas of an embedded systems

Activity/Event on Unit-1:

Student will examine all peripherals and its usage

Unit-II: 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-II Outcome: Design the Embedded hardware by considering the hardware components required for an embedded system

Activity/Event on Unit-II:

Student will distinguish various components based on functionality.

Unit-III: EMBEDDED FIRMWARE DESIGN: Embedded Firmware design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

Unit-III Outcome:

- Student can be able to design a new firmware required for a specific system.

Activity/Event on Unit-III:

The designed firmware will be simulated in keil

Unit-IV:HARDWARE SOFTWARE CO-DESIGN: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade-offs, Integration of Hardware and Firmware.

Unit-IV Outcome:

- Student will be able to design a prototype.

Activity/Event on Unit-IV:

PPT presentation

Unit-V: EMBEDDED SYSTEM DEVELOPMENT: The integrated development environment, Types of files generated on cross-compilation, Dissembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and tools.

Unit-V Outcome:

- Student will be able to use the different IDE tools.

Activity/Event on Unit-V:

Seminar presentation by every student individually

Text Books:

1. Embedded Systems-architecture, programming and design by RajKamal 3rd edition, McGraw hill
2. Embedded Systems Architecture- By Tammy Noergaard, Elsevier Publications, 2013.
3. Embedded Systems-By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.

Reference Books:

1. Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.
2. Embedded Systems-Lyla B.Das-Pearson Publications, 2013.

Course Code		L	T	P	Credits
1012173201	**SOFTWARE TESTING METHODOLOGIES**	**3**	**1**	**0**	**3**

Course Overview:

This course explains the fundamentals of software testing. It will provide a theoretical framework and also demonstrate how to practically implement software testing techniques. This course will explain how the testing process works and how it should be implemented. Candidates will gain an understanding of the different terminology involved in software testing and how each fits into the development of software.

Course Objectives:

- Fundamentals for various testing methodologies.
- Describe the principles and procedures for designing test cases.
- Provide supports to debugging methods.
- Acts as the reference for software testing techniques and strategies.

Course Outcomes:

	Course outcome	**Cognitive Level as per Bloom's Taxonomy**	**PO**
CO1	Understanding the purpose of Software Testing.	Understand	PO1
CO2	Understand the Transaction Flow Testing and Dataflow testing	Understand	PO1,PO2
CO3	Test the software using domain testing and Logic Based Testing	Applying	PO1,PO2,PO3,PO4
CO4	Apply the software testing tools for real world applications	Applying, Create	PO1,PO2,PO3, PO4, PO5

Unit-I:

Introduction:

Purpose of Testing, Dichotomies, Model for Testing, Consequences ofBugs, Taxonomy of Bugs.

Flow graphs and Path testing:

Basics Concepts of Path Testing, Predicates, Path Predicatesand Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

Outcome:

- Understanding the purpose of Software Testing.
- Develop Model for Testing.
- Able to use flow graphs and path testing.

Activity/Event :

Write in detail about flow graphs and path testing.

Unit-II:

Transaction Flow Testing:

Transaction Flows, Transaction Flow Testing Techniques.

Dataflow testing:

Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

Domain Testing:

Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

Outcome:

- Obtain knowledge about Transaction Flow Testing and Dataflow testing

Activity/Event :

Develop an application and test that application using different testing techniques.

Unit-III:

Paths, Path products and Regular expressions:

Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection

Syntax Testing:

Why, What and How, A Grammar for formats, Test Case Generation, Implementation and Application and Testability Tips.

Outcome:

- Knowledge of various testing techniques.
- Understanding path products and regular Expressions.

Activity/Event :

Test the software using domain testing and Logic Based Testing

Unit-IV:

Logic Based Testing:

Overview, Decision Tables, Path Expressions, KV Charts, and Specifications.

State, State Graphs and Transition Testing:

State Graphs, Good & Bad State Graphs, State Testing, and Testability Tips.

Outcome:

- Understanding the use of state Graphs and Transition Testing.
- Knowledge of graph matrices and Application.

Activity/Event: Discuss about Graph matrices and its applications.

Unit-V:

Graph Matrices and Application:

Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm.

Software Testing Tools:

Introduction to Testing, Automated Testing, Concepts of Test Automation, Introduction to list of tools like Win runner, Load Runner, Jmeter, About Win Runner ,Using Win runner, Mapping the GUI, Recording Test, Working with Test, Enhancing Test, Checkpoints, Test Script Language, Putting it all together, Running and Debugging Tests, Analyzing Results, Batch Tests, Rapid Test Script Wizard.

Outcome:

- The need for automation and categorization of testing tools.
- Selection of testing tools and costs incurred.
- Guidelines for automated testing and an overview of some commercial testing tools.

Activity/Event : Discuss the usage of various testing tools.

Text Books:

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.
2. Software Testing- Yogesh Singh, Camebridge

Reference Books:

1. The Craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, 3rd edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).

3. Software Testing, N.Chauhan, Oxford University Press.
4. Introduction to Software Testing, P.Ammann&J.Offutt, Cambridge Univ.Press.
5. Effective methods of Software Testing, Perry, John Wiley, 2nd Edition, 1999.
6. Software Testing Concepts and Tools, P.NageswaraRao, dreamtech Press
7. Win Runner in simple steps by Hakeem Shittu, 2007 Genixpress.
8. Foundations of Software Testing, D.Graham& Others, Cengage Learning

Course Code	DIGITAL IC DESIGN (Elective-III)	L	T	P	Credits
1019174202		3	1	0	3

Course Overview:

- To introduce concepts of MOS Devices based on small signal and large signal models and to develop the Analog CMOS Circuits for different Analog operations.

Course Objectives:

The student will be introduced to

- To study Combinational MOS Logic Circuits and Sequential MOS Logic Circuits.
- To motivate the graduate students to design and to develop the Digital Integrated Circuits for different Applications.
- The concepts of Semiconductor Memories, Flash Memory, RAM array organization.

Course Outcomes:

After going through this course the student will be able to

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the concepts of MOS Design	Understand	PO-1, PO-2, PO-3, PO-4
CO2	Design and analysis of Combinational and Sequential MOS Circuits.	Understand	PO-1, PO-2, PO-3, PO-6, PO-7
CO3	Extend the Digital IC Design to Different Applications.	Analyze	PO-1, PO-2, PO-5, PO-6, PO-10, PO-12
CO4	Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization.	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-5, PO-12

Unit-I: MOS Design: 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.

Outcome:

- Understand the concept of different components.
- Analysis of different characteristics of MOS.

Activity/Event on Unit-1: Application of CMOS Inverter

Unit-II: Combinational MOS Logic Circuits: MOS logic circuits with NMOS loads,Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuitsdesign – Realizing Boolean expressions using NMOS gates and CMOS gates,AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designingwith Transmission gates.

Unit-II Outcome:

- Understand the Combinational MOS Logic Circuit with different Logics.
- Apply on Boolean expression for different Logic gates.

Activity/Event on Unit-II: Implement a project using Combinational MOS logic Circiuts in real time Environment.

Unit-III: Sequential MOS Logic Circuits: Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flipflop.

Dynamic Logic Circuits: Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

Unit-III Outcome:

- Understand and analyze the Sequential MOS Logic Circuits and Dynamic Logic Circuits.
- Analyze the behaviour of Sequential Logic circuits.

Activity/Event on Unit-III: Create a circuit based on applications of Sequential MOS Logic Circuit.

Unit-IV: Interconnect: Capacitive Parasitics, Resistive Parasitics, Inductive Parasitics, Advanced Interconnect Techniques.

Unit-IV Outcome: Analyze the Characteristics of interconnecting Techniques.

Activity/Event on Unit-IV: Prepare a comparative analysis of all Parasitics.

Unit-V: 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 NAND flash.

Unit-V Outcome: Analyze the different Semiconductor Memories.

Activity/Event on Unit-V: Prepare a document that gives the utility of all Memories in present days.

Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
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.

Course Code	AUTOMATA THEORY&COMPILER DESIGN (Elective-III)	L	T	P	Credits
1019174203		3	1	0	3

Course Overview:

This course covers the main design practices and principles for the development of programming languages. This course covers the basic of finite automata and regular expressions. It also covers the analysis and synthesis phases of a language processor: lexical analysis, syntax analysis (top-down and bottom-up techniques), semantic analysis, runtime environments, error handling, intermediate code, code optimization, and final code generation.

Course Objectives:

- Describes how a programming language works
- How input is converted into output from the machine hardware level and various phases of compiler
- Understanding the Language Semantics
- Understanding the relation between the source code and generated machine code.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Construct LL, SLR, CLR and LALR parse table.	Applying	PO3, PO4
CO2	Understand Parser and its types i.e. Top-down and Bottom-up parsers.	Understanding	PO1, PO2
CO3	Classify machines by their power to recognize languages	Understanding	PO1, PO2
CO4	Syntax directed translation, synthesized and inherited attributes and analyze techniques for code optimization	Analyzing	PO1,PO2, PO3, PO4

Unit-I:

Formal Language and Regular Expressions: Languages, operations on languages, regular expressions (re), Languages associated with (re), operations on (re), identity rules for (re), Finite Automata: DFA, NFA, Conversion of regular expression to NFA, NFA to DFA, Applications of Finite Automata to lexical analysis.

Unit-I Outcome:

- Learn the basic terminology and operations of languages; identify the difference between DFA and NFA.
- Understand the power and the limitations of regular languages and Lexical Analysis.

Activity/Event on Unit-1:

Construct the equivalent DFA for the NFA chosen from any source.

Unit-II:

Context Free grammars and parsing: Context free Grammars, Leftmost Derivations, Rightmost Derivations, Parse Trees, Ambiguity Grammars, Top-Down Parsing, Recursive

Descent Parsers: LL(1) Parsers. Rightmost Parsers: Shift Reduce Parser, LR (0) Parser, SLR (1) Parser, LR (1) & LALR (1) Parsers, Ambiguous Grammars.

Unit-II Outcome:

- Learn the basics of context free grammars and various Parsing techniques
- Identify various parsing techniques for a given grammars.

Activity/Event on Unit-II:

- Obtain the leftmost and rightmost derivations for a given grammar.
- Construct SLR, LR and LALR parsing tables for a given grammars using Bottom Up Parsing technique.

Unit-III:

Syntax Directed Translation: Definitions, construction of Syntax Trees, S-attributed and L-attributed grammars, Intermediate code generation, abstract syntax tree, translation of simple statements and control flow statements.

Semantic Analysis: Semantic Errors, Chomsky hierarchy of languages and recognizers, Type checking, type conversions.

Unit-III Outcome:

- Explain semantic analysis in the context of the compilation process.
- Describe scope checking and type checking.
- Specify the functions of semantic analysis.

Activity/Event on Unit-III:

- Distinguish between S-attributed grammars and L-attribute grammars and illustrate with an example.
- Construct syntax for the expression and identify the typical semantic errors.

Unit-IV:

Storage Organization: Storage Organization Issues, Storage Allocation Strategies, Scope, Access to Nonlocal Names, Parameter Passing, Dynamics Storage Allocation Techniques.

Code Optimization: Issues in the design of code optimization, Principal sources of optimization, optimization of basic blocks, Loop optimization, and peephole optimization.

Unit-IV Outcome:

- Describe the role of intermediate representation and runtime environments in the compilation process.
- Explain the encoding of data structures in runtime memory.
- Understand various code Optimization techniques.

Activity/Event on Unit-IV:

Describe about various storage allocation strategies and illustrate deep access and shallow access with an example.

Unit-V:

Code Generation: Issues in the design of code Generation, Machine Dependent Code Generation, object code forms, Register allocation and assignment, DAG representation of basic Blocks, Generating code from DAGs.

Unit-V Outcome:

- Explain the importance of Code Generation.
- Identify the difficult aspects of code generation.
- Construct DAG based representation of basic blocks.

Activity/Event on Unit-V:

Explain how a basic block is represented using a DAG and construct DAG based local optimization for a given basic block.

Text Books:

1. A Text Book on Automata Theory, Nasir S.F.B, P.K. Srimani, Cambridge university Press
2. Introduction to Automata Theory, Formal languages and computation, Shamalendu kandar,
3. Compilers Principles, Techniques and Tools, Aho, Ullman, Ravi Sethi, PEA

Reference Books:

1. Theory of Computer Science, Automata languages and computation , 2/e, Mishra, Chandra Shekaran, PHI
2. Theory of Computation , a problem solving approach, kavi Mahesh, Wiley

Course Code	ADVANCED MICROCONTROLLERS (Elective-III)	L	T	P	Credits
1019174204		3	1	0	3

Course Overview: The purpose of this course is to impart knowledge on microprocessor and microcontroller

Course Objectives:

- The course objective is to study the architecture and programming of ARM, covering the hardware components and software aspects and will get a good knowledge of ARM processors and LPC 2148 chip and their programming and interfacing.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the evolution and architectures of ARM processors.	Understand	PO-1, PO-2, PO-12
CO2	Apply the architectural features of ARM LPC2148 microcontrollers.	Apply	PO-1, PO-2, PO-3
CO3	Analyze and understand the instruction set and development tools of ARM	Analyze	PO-1, PO-2, PO-3, PO-4, PO-10
CO4	Hardware and interfacing peripheral devices to ARM LPC2148	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-10

Unit-I: ARM ARCHITECTURE & PROGRAMMING MODEL: ARM Design Philosophy, Registers, Program Status Register, Instruction Pipeline, Interrupt and Vector Table, ARM Processor Families. Instruction set: Data Processing Instructions, Addressing Modes, Branch, Load- Store instructions, PSR instructions, and Conditional instructions.

Unit-I Outcome:

- Understand the concept of microcontroller and their application domains

Activity/Event on Unit-1: Identify the components involved in microcontroller applications

Unit-II: LPC 2148 CONTROLLER ARCHITECTURE: General Description – Features – Block diagram –Overall pin description (functional) - Architectural Overview On-chip Flash program memory –On chip SRAM, Memory Map.
LPC 2148 PROGRAMMING: Programming of LPC 2148 GPIO ports - Generation of PWM signals - Simple programs.

Unit-II Outcome:

- Understand the memory based on microcontroller.

Activity/Event on Unit-II: Group discussion

Unit-III:TIMER, ADC, DAC, UARTs: Interrupt Controller – General Purpose I/O (GPIO) – ADC and DAC –UARTs - Timers and Counters

Activity/Event on Unit-III: Identify the logical component

Unit-IV: I2C, SPI, PWM, RTC, WATCHDOG TIMER: Features of I2C – bus serial I/O Controller, SPI- Serial I/O Controller – Watchdog Timer – Real-time CLK, Pulse Width Modulator.

Unit-IV Outcome:

- Application of advanced microcontroller to various field

Activity/Event on Unit-IV: Hands-on

Unit-V: Case Studies Illustrating IoT Design: ARM Cortex-M3: ARM Cortex-M3 Processor –Architecture- Instruction Set Development-The Thumb-2 Technology and Instruction Set Architecture-CORTEX-M3 Applications.

Unit-V Outcome: Understand the case studies such as real time programming

Activity/Event on Unit-V: Mini project on microcontroller real time data

Text Books:

1. ARM system developers guide, Andrew N Sloss, Dominic Symes and Chris Wright, Elsevier, Morgan Kaufman publishers, 2008.
2. ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000, Addison Wesley Professional.
3. Michael J Pont, “Embedded C”, Pearson Education, 2007.The indefinite guide to ARM CORTEX-M3

Course Code		L	T	P	Credits
1012173101	HUMAN COMPUTER INTERACTION (Elective-III)	3	1	0	3

Course Overview:

This course covers the principles of human-computer interaction and the design and evaluation of user interfaces. Topics include an overview of human information processing subsystems (perception, memory, attention, and problem solving); how the properties of these systems affect the design of user interfaces; the principles, guidelines, and specification languages for designing good user interfaces.

Course Objectives:

- Demonstrate an understanding of guidelines, principles, and theories influencing human computer interaction.
- Recognize how a computer system may be modified to include human diversity
- Design mock ups and carry out user and expert evaluation of interface
- Design mock ups and carry out user and expert evaluation of interfaces
- Carry out the steps of experimental design, usability and experimental testing, and evaluation of human computer interaction systems
- Use the information sources available, and be aware of the methodologies and technologies supporting advances in HCI.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Apply the basics of human and computational abilities and limitations	Understand	PO-1, PO-2, PO-3, PO-4
CO2	Have a capacity to analyze and design software systems, components to meet desired needs.	Understand	PO-1, PO-2, PO-3, PO-6, PO-7
CO3	Practice a variety of simple methods for evaluating the quality of a user interface, new theories, tools and techniques in HCI.	Analyze	PO-1, PO-2, PO-5, PO-6, PO-10, PO-12
CO4	Apply appropriate HCI techniques to design systems that are usable by people, fundamental aspects of designing and evaluating interfaces.	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-5, PO-12

Unit-I: Introduction to HCI & The graphical user interface

Introduction: Importance of user Interface, definition, importance of good design. Benefits of good design. A brief history of Screen design

The graphical user interface: Popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user –interface popularity, characteristics- Principles of user interface.

Unit-I Outcome:

1. Understand the basics of human and computational abilities and limitations
2. Understand basic theories, tools and techniques in HCI.

Activity/Event on Unit-1: Seminar and Class Test

Unit-II: Design process: Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, Understanding business junctions

Unit-II Outcome:

Have a capacity to analyze and design software systems, components to meet desired needs.

Activity/Event on Unit-II: Seminar and Class Test

Unit-III: Screen Designing : Design goals, Screen planning and purpose, organizing screen elements, ordering of screen data and content, screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully, information retrieval on web, statistical graphics, Technological consideration in interface design.

Unit-III Outcome:

Understand the fundamental aspects of designing and evaluating interfaces.

Activity/Event on Unit-III: Seminar and Class Test

Unit-IV: Windows: Windows new and Navigation schemes selection of window, selection of devices based and screen based controls.

Components: Components text and messages, Icons and increases, Multimedia, colors, uses problems, choosing colors.

Unit-IV Outcome:

Practice a variety of simple methods for evaluating the quality of a user interface

Activity/Event on Unit-IV: Seminar and Class Test

Unit-V: Software tools: Specification methods, interface, Building Tools.

Interaction Devices: Keyboard and function keys, pointing devices, speech recognition digitization and generation, image and video displays, drivers.

Unit-V Outcome:

Apply appropriate HCI techniques to design systems that are usable by people

Activity/Event on Unit-V: Seminar and Class Test

Text Books:

1. "The Essential Guide to User Interface Design", Wilbert O. Galitz, Wiley India Edition
2. "Sharps Interaction Design", Prece, Rogers, Wiley India.
3. "Designing the user interfaces", Ben Shneidermann, 3rd Edition, Pearson Education Asia.

Reference Books:

1. "User Interface Design" , Soren Lauesen, Pearson Education
2. "Essentials of Interaction Design", Alan Cooper, Robert Riemann, David Cronin ,Wiley
3. "Human Computer Interaction", Alan Dix, Janet Fincay, GreGoryd, Abowd, Russell, Bealg,Pearson Education

Course Code	REAL TIME OPERATING SYSTEMS (Elective-IV)	L	T	P	Credits
1019174205		3	1	0	3

Course Overview: This course is intended for practical programming and problem solving. After completing this course, student will have the knowledge to plan and set-up a real-time system both on paper and in practice. The course centers around the problem of achieving timing correctness in embedded systems, which means to guarantee that the system reacts within the real-time requirements.

Course Objectives: The objective of this course is to

- develop an understanding of various Real Time systems Application
- obtain a broad understanding of the technologies and applications for the emerging and exciting domain of real-time systems
- get in-depth hands-on experience in designing and developing a real operational system.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	On completion of this course, the students will be able to understand concepts of Real-Time Operating systems.	Understand	PO-1
CO2	On completion of this course, the students will be able to understand basic functions of RTOS and programming concepts of RTOS	Understand	PO-1,PO-3
CO3	On completion of this course, the students will be able to analyze different case studies	Analyze	PO-1,PO-2, PO-4
CO4	On completion of this course, the students will be able to create a new embedded software and can port it onto the board	Evaluate	PO-1, PO-2, PO-3

Unit-I: INTRODUCTION TO REAL-TIME OPERATING SYSTEM

OS Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File and IO Systems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls, Real- Time Operating Systems, Basic Design Using an RTOS, RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Metrics, OS Security Issues.

Unit-I Outcome:

- On completion of this, the students will be able to understand concepts of Real-Time Operating systems.

Activity/Event on Unit-1: Quiz

Unit-II:REAL-TIME OPERATING SYSTEM PROGRAMMING

Basic Functions and Types of RTOS for Embedded Systems, RTOS mCOS-II, RTOS Vx Works, Programming concepts of above RTOS with relevant Examples.
Programming concepts of RTOS Windows CE, RTOS OSEK, RTOS Linux 2.6.x and RTOS RT Linux.

Unit-II Outcome:

- On completion of this, the students will be able to understand basic functions of RTOS and programming concepts of RTOS

Activity/Event on Unit-II: Group Discussion

Unit-III:DESIGN EXAMPLES AND CASE STUDIES OF PROGRAM MODELING WITH RTOS

Case study of embedded system design and coding for an Automatic Chocolate Vending Machine (ACVM) Using Mucos RTOS, digital camera hardware and software architecture, Case Study of Communication, Robots, Embedded System in Automobile, Case Study of Embedded System for an Adaptive Cruise Control (ACC) System in Car, a Smart Card, Mobile Phone Software for Key Inputs.

Unit-III Outcome:

- On completion of this, the students will be able to analyze different case studies.

Activity/Event on Unit-III: Discussion about various Case studies.

Unit-IV: TARGET IMAGE CREATION

Off-The-Shelf Operating Systems, Operating System Software, Target Image Creation for Window XP Embedded, Porting RTOS on a Micro Controller based Development Board.

Unit-IV Outcome:

- On completion of this, the students will be able to create a new embedded software and can port it onto the board.

Activity/Event on Unit-IV: Discussion about various image creation methods.

Unit-V: PROGRAMMING IN LINUX

Overview and programming concepts of Unix/Linux Programming, Shell Programming, System Programming.

Unit-V Outcome:

- On completion of this, the students will understand Advanced shell programming and system programming.

Activity/Event on Unit-V: Practice of advanced commands in System programming and shell programming.

Text Books:

1. "Embedded Systems-Architecture, Programming and Design", Rajkamal, Tata McGraw Hill Publications, Second Edition, 2008.
2. "Embedded/Real-Time Systems" , Dr. K.V.K.K. Prasad, Dream Tech Publications, Black pad book.

Reference Books:

1. "Embedding system building blocks ",Labrosse, CMP publishers.
2." Real time Systems Development", Rob Williams, Butterworth Heinemann Publications.

Course Code	CRYPTOGRAPHY AND NETWORK SECURITY (Elective-IV)	L	T	P	Credits
1005174101		3	1	0	3

Course Overview: The objective of this course is to equip the students with principles and practice of cryptography and network security, Classical systems, symmetric block ciphers (DES, AES, other contemporary symmetric ciphers), Public-key cryptography (RSA, Discrete logarithms), Algorithms for factoring and discrete logarithms, cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes, Email and web security.

Course Objectives:

- Understanding the requirement of security in modern communication and information systems.
- Mastering the concept of security attack, services and mechanisms.
- Mastering concepts of confidentiality using cryptography with mathematical background.
- Mastering concept of authentication using hash algorithms and digital signature
- To be familiar with network security designs using available secure solutions (PGP, SSL, IPSec).

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the principles and practices involved in cryptography and network security	Understand/Remember	PO1
CO2	Understand the various symmetric and Asymmetric encryption algorithms.	Understand	PO1,PO2
CO3	Identifying cryptographic protocols, hash functions, authentication, key management, key exchange, signature schemes	Apply	PO2,PO3,PO4,PO12
CO4	Design of network security solutions for E-mail Security like PGP, S/MIME and web security like SSL, TLS.	Evaluate/Create	PO1,PO2,PO3,PO4,PO6, PO12

UNIT-I

Security attacks, services & mechanisms, fundamental security principles, A Model for Network Security, Symmetric Cipher Model, Substitution Techniques Transportation Techniques, Rotor Machines, steganography.

Outcome: Demonstrate a systematic and critical understanding of the theories, principles and practices of Cryptography and network security.

Activity: Implement a simple cryptographic function

UNIT-II

Secret Key Cryptography: Traditional Block Cipher Structure**,** Data Encryption Standard (DES), Block Cipher Design Principles, Triple DES, Blowfish, AES, Steam ciphers, RC4, Modes of Operation.

Outcome: Understand fundamentals of symmetric cryptographic algorithms like DES, AES, BLOWFISH etc.

Activity: Implement a AES algorithm in Python Language

UNIT-III

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, the Chinese Remainder Theorem, Discrete Logarithms.

Public Key Cryptography: Principles of Public Key Cryptosystems, RSA Algorithm, Diffie-Hellman Key Exchange, Introduction to Elliptic Curve Cryptography.

Outcome: Understand the asymmetric cryptography algorithms like RSA, Elliptical Cryptography etc

Activity: Bit coin and time stamp server

UNIT-IV:

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Secure Hash Algorithm (SHA), Message Authentication Codes - Message Authentication Requirements and Functions, HMAC, Digital signatures, RSA Digital Signature Scheme, NIST Digital Signature Schemes(DSA approach)

Outcome: Understand the Authentication functions the manner in which Message Authentication Codes and Hash Functions works.

Activity: Generate digital signature for a given message

Unit-V:

Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, Security at the Network Layer: IPSec, System Security

Outcome: Understand existing system security protocols like Kerberos, PGP, SSL and IPSEC

Activity: Develop a web page using a protocol HTTPS

TEXT BOOKS

1. Cryptography and Network Security, William Stallings, (7e) Pearson.
2. Cryptography and Network Security, Behrouz A Forouzan, DebdeepMukhopadhyay, (3e) Mc Graw Hill.

Reference Books:

1. Everyday Cryptography, Keith M.Martin, Oxford.
2. Network Security and Cryptography, Bernard Meneges, Cengage Learning.
3. Cryptography and Network Security: AtulKahate, Mc Graw Hill, 2nd Edition.

Course Code	WIRELESS SENSOR NETWORKS	L	T	P	Credits
1019174206	(Elective-IV)	3	1	0	3

Course Overview:

Wireless sensor networks (WSNs) are special type of networks made up of a large number of tiny sensor nodes, presenting severe resource constraints, such as, energy, processing capacity and communication capability. The WSN is an emerging area with potential applications in environmental monitoring, surveillance, military, health and security, with research challenges in energy efficiency, network lifetime and network reliability, etc. Recently, sensing and communication technology such as Internet of Thing (IoT) Paradigm has been designed for heterogeneous services. This course focuses on topics, such as, design of efficient protocols, algorithms and architectures in wireless sensor networks. The course content includes protocol design in MAC and network layer including clustering algorithms.

Course Objectives:

- After complete this course, students should be able to list various applications of wireless sensor networks, describe the concepts, protocols, and differences underlying the design, implementation, and use of wireless sensor networks. Also implement and evaluate new ideas for solving wireless sensor network design issues.

Course Outcomes:

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Understand the basis of Sensors with its applications	Understand	PO-1, PO-2, PO-12
CO2	To learn the networking technologies	Apply	PO-1, PO-2, PO-3
CO3	To learn protocols for wireless sensor networks	Analyze	PO-1, PO-2, PO-3, PO-4, PO-10
CO4	To analyze routing and congestion algorithms	Evaluate	PO-1, PO-2, PO-3, PO-4, PO-10
CO5	To learn the security protocols	Analyze	PO-1, PO-2, PO-3, PO-4, PO-10

Unit-I: OVERVIEW OF WIRELESS SENSOR NETWORKS: Key definitions of sensor networks, Advantages of sensor Networks, Unique constraints an challenges, Driving Applications, Enabling Technologies for Wireless Sensor Networks. **ARCHITECTURES**: Single-Node Architecture – Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

Unit-I Outcome:

- Understand the basis of Sensors with its applications

Activity/Event on Unit-1: Hangman

Unit-II: NETWORKING Technologies: Physical Layer and Transceiver Design Considerations, Personal area networks (PANs), hidden node and exposed node problem, Topologies of PANs, MANETs, WANETs.

Unit-II Outcome:

- To learn the networking technologies

Activity/Event on Unit-II: Building Card Towers

Unit-III: MAC Protocols for Wireless Sensor 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, MAC Protocols that use Directional Antennas, Other MAC Protocols

Unit-III Outcome:

- To learn protocols for wireless sensor networks

Activity/Event on Unit-III: Quiz Challenges

Unit-IV: 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, Proactive Routing.

Unit-IV Outcome:

- To analyze routing and congestion algorithms

Activity/Event on Unit-IV: A Divided Assignment

Unit-V: 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.

Unit-V Outcome:

To learn the security protocols

Activity/Event on Unit-V: What's Your Problem?

Text Books:

1. Ad Hoc Wireless Networks: Architectures and Protocols – C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – Jagannathan Sarangapani, CRC Press
3. "Protocols And Architectures for Wireless Sensor Networks", Holger Karl & Andreas Willig, John Wiley, 2005.

Reference Books:

1. "Wireless Sensor Networks- Technology, Protocols, and Applications", Kazem Sohraby, Daniel Minoli, & Taieb Znati, John Wiley, 2007.
2. "Wireless Sensor Networks- An Information Processing Approach", Feng Zhao & Leonidas J. Guibas, Elsevier, 2007.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh ,1 ed. Pearson Education.

Course Code	CELLULAR AND MOBILE COMMUNICATIONS (Elective-IV)	L	T	P	Credits
1004174101		3	1	0	3

Course Overview: This Course is to expose the students to the most recent technological developments in Mobile communication systems.. The Course considers the basic concepts of cellular system. Following this, various propagation effects and propagation models used in mobile communication are included in the course. This course deals with various methodologies to improve the received signal quality in mobile communication. The Course provides various multiple access techniques and Standards in Cellular mobile Communication.

Course Objectives:

- Demonstrate the applications of frequency reuse, cell splitting, etc., basic and operation of cellular system and digital cellular systems by applying the basics and concepts
- Enlighten different types of interferences influencing cellular and mobile communications.
- Explain the frequency management, channel assignment and various propagation effects in cellular environment.
- Compare types of handoffs and, architectures of GSM, 3Gand 4G cellular systems.

Course Outcomes:

After completion of the course students able to learn :

	Course Outcome	Cognitive level as per Bloom's Taxonomy	PO
CO1	Explain the concepts, characteristics, principles and operation of cellular systems. Submit Review report from Research journals with professional ethics, team work and self-learning	Understand Apply	PO-1, PO-2, PO-8, PO-9, PO-10, PO-12
CO2	Apply Concepts, principles to Co-channel interference Reduction factor, Desired C/I, directional Antenna system and Cell splitting. Submit Review report from Research journals with professional ethics, team work and self-learning	Apply Analyze	PO-1, PO-2, PO-8, PO-9,PO-10, PO-12
CO3	Analyze Point to point model, other cell coverage of signal and traffic, frequency and channel assignment strategies. Submit Review report from Research journals with professional ethics, team work and self-learning	Analyze	PO-1, PO-2, PO-8, PO-9,PO-10, PO-12
CO4	Analyze concepts of handoff and architectures of GSM, Technology comparison of 3G, 4G and 5G cellular systems. Submit Review report from Research journals with professional ethics, team work and self-learning	Analyze	PO-1, PO-2, PO-8, PO-9,PO-10, PO-12

Unit-I:

Introduction to Cellular Mobile Systems: A basic Cellular System, Performance Criteria, Uniqueness of Mobile Radio Environment, Operation of Cellular Systems, Planning and Cellular Systems, Analog-European Cellular Systems and Digital Cellular Systems

Unit-I Outcome:

Explain the operation of cellular systems with the concepts of mobile radio environment.

Activity/Event on Unit-I: Case Study: Submit Review report from Research journals with professional ethics, team work and self-learning

Unit-II:

Elements of Cellular Radio System Design: General description of the problem, Concept of Frequency Reuse Channels, Co-channel interference Reduction factor, Desired C/I from a normal case in an Omni directional Antenna system, Cell splitting.

Unit-II Outcome:

Apply Concepts to cell splitting, interference Reduction factor, and Desired C/I

Activity/Event on Unit-II: Case study: Submit Review report from Research journals with professional ethics, team work and self-learning

Unit-III:

Interference: Introduction to Co-channel interference, Real time Co-channel interference, Design of Antenna system – Omni directional antenna system in the worst case, Directional Antenna System, Diversity Receiver, Types of Non-Co-channel Interference- Adjacent channel Interference, Near – Far – end Interference, Long distance interference, UHF TV Interference.

Unit-III Outcome:

Compare co channel and non-co channel interference, antenna system design antenna parameters.

Activity/Event on Unit-III: Case Study: Submit Review report from Research journals with professional ethics, team work and self-learning.

Unit-IV:

Frequency Management and Channel Assignment: Frequency management, Fixed Channels assignment, Non - Fixed Channel assignment, Traffic and Channel Assignment.

Cell Coverage for Signal and Traffic: General introduction, Obtaining the Mobile Point - to - Point model, Propagation over water or flat open area, Foliage loss, Point - to - Point predication model – characteristics.

Unit-IV Outcome: Compare fixed and nonfixed channel assignment and **e**xplain cell coverage for signal & traffic systems.

Activity/Event on Unit-IV: Case study: Submit Review report from Research journals with professional ethics, team work and self-learning.

Unit-V:

Hand Offs and Dropped Calls: Why Hand-Off, Initiation of a Hand Off, Two Types of Hand-Off , Delaying ,Forced ,Queuing, Power Difference , MAHO, Cell Site and Inter Systems Handoffs, Introduction to Dropped call rates.

Cell Site Antennas and Mobile Antennas: Antennas at Cell site, Mobile Antennas. Digital Cellular Systems – Global system for Mobile – GSM Architecture

Unit-V Outcome: Analyse handoff, architectures of GSM, summarisation of 3G, 4G and 5G systems.

Activity/Event on Unit-V: Case Study: Submit Review report from Research journals with professional ethics, team work and self-learning.

Text Books:

1. Mobile Cellular Telecommunications, W.C.Y. Lee, McGraw Hill International., 2nd Edn.
2. Wireless Communications – Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.

Reference Books:

1. Mobile Cellular Communication, Gottapu Sasibhushana Rao, Pearson Education, 2012
2. Wireless Digital Communications by Dr. Kamilo Feher, PHI. 1995
3. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004

Course Code		L	T	P	Credits
	INTERNSHIP				
1019174281		**0**	**0**	**0**	**12**

Internship: Internships help students to acquire in depth knowledge about a particular topic related to the program of study. Such extensive work is expected to create a platform for a job or further research in the chosen area. Interested students may opt for a full semester Internship during the fourth year second semester. Such students shall be exempted for equivalent theory course credits during that semester and the corresponding credits are awarded through the Internship. A self-study report, duly authorized by the industry supervisor / guide, shall be submitted at the end of the fourth year second semester. Internship report is evaluated for 400 marks in total. Internal assessment is done by the academic supervisor/guide for 100 marks based on the work and presentation of the internship report. The assessment for 300 marks is evaluated and awarded by a panel of members consisting of Head of the Department, Senior Faculty and Industry Expert.

Course Code	TECHNICAL SEMINAR	L	T	P	Credits
1019174251		0	3	0	2

Technical Seminar: For Technical seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his/her understanding over the topic, and submit to the department, which shall be evaluated by the Departmental Committee consisting of Head of the Department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar

Course Code		L	T	P	Credits
	COMPREHENSIVE VIVA				
1019174261		**0**	**0**	**0**	**2**

Comprehensive Viva: The Comprehensive Viva aims to assess the students' understanding in various subjects he / she studied during the B.Tech course of study. Comprehensive Viva is conducted for a total of 50 marks. It shall be conducted in IV Year II Semester. The Comprehensive Viva–Voce will be conducted by a Committee consisting of Head of the Department, & senior faculty members of the Department.

Course Code		L	T	P	Credits
	MAIN PROJECT				
1019174231		**0**	**0**	**0**	**10**

Main Project: Out of total 200 marks for the project work, 80 marks shall be for Internal Evaluation and 120 marks for the external assessment. The Internal Evaluation shall be on the basis of two mid-term project reviews conducted during the progress of the project. The End Semester Examination (Viva-Voce) shall be conducted by the committee consists of an External Examiner, Head of the Department (internal examiner) and a senior faculty of the Department. The evaluation of project work shall be conducted at the end of the IV year.