AR – 18

ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

for

B.TECH. FOUR YEAR DEGREE PROGRAMME

(Applicable for the batches admitted from 2018 - 2019)

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AUTONOMOUS)

Approved by AICTE,

Recognised under 2(f) 12(B) of UGC,

Permanently Affiliated to JNTU Kakinada.

K.Kotturu, Tekkali, Srikakulam – 532201, Andhra Pradesh.

Vision of the Institute

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

Mission of the Institute

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis..

Vision of the Department

To become a pioneer in providing high quality education and research in the area of computer science and engineering.

Mission of the Department:

M1: Enrich society and advance computer science and engineering by preparing graduates with the knowledge, ability, and skill to become innovators and leaders who are able to contribute for the aspirations of the country and society.

M2: Benefit humanity through research, creativity, problem solving, and application development.

M3: Share knowledge and expertise to benefit the country, the region, and beyond while inspiring people to engage in computing fields.

The **Programme Educational Objectives (PEOs)** for our Computer Science and Engineering program are to produce graduates who will:

PEO1.	Be employed as a practicing engineer in fields such as design, development, testing and research or undertake higher studies.
PEO2.	Engage in lifelong self-directed learning, a capacity that is vital for success in today's global and rapidly changing engineering environment.
PEO3.	Create new methods / processes to meet the society needs with their knowledge.
PEO4.	Conduct themselves as ethical and responsible professionals with good communication skills and demonstrate leadership skills

PROGRAM OUTCOMES (POs):

Engineering Graduates will be able to:

1. **Engineering Knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/Development Of Solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct Investigations Of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern Tool Usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The Engineer and Society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and Sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and Team Work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project Management and Finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-Long Learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Computer Science program the student will be able to:

PSO1. Apply mathematical foundations, algorithmic principles, and theoretical computer science in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

PSO2. Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.

PSO3. Use knowledge in various domains to identify research gaps and hence to provide solution to new ideas and innovations.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT (AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC, Recognized under 2(f) and 12(B) of UGC
Permanently Affiliated to JNTUK, Kakinada.
K.Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh

Academic Regulations 2018 (AR18) for B. Tech.
(Effective for the students admitted into I year from the **Academic Year 2018-2019** and onwards)

1. Award of B.Tech., Degree:

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

(i) Pursued a course of study for not less than four academic years and not more than eight academic years.
(ii) Registered for **160** credits and he/she must secure total **160** credits.

Students, who fail to complete their Four years Course of study within **8** years or fail to acquire the 160 Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Courses of study:

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

Sl. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology

And any other course as approved by the authorities of the University from time to time.

3. Credits (Semester system from I year onwards):

Sl. No	Course	Credits
1	Theory Course	2/3/4
2	Interdisciplinary Electives	02
3	Laboratory Course	1.5
4	Internship	1.5
5	Employability skills	1.5
6	Minor Project	2/3
7	Project	07

4. Interdisciplinary Electives:

There is one Interdisciplinary elective in each semester from 2-2 Semester to 4-1 semester. The student can choose one Interdisciplinary elective of respective semester. The pattern of Midterm examinations and end examinations of these courses is similar to regular theory courses and the valuation is purely internal.

5. MOOCs:

Explore all possibilities to run at least one subject in every semester from 2-1 semester onwards as a MOOCs.

6. Evaluation Methodology:

The performance of a student in each semester shall be evaluated subject wise with a maximum of **100** marks for theory course, laboratory and other courses. The project work shall be evaluated for **200** marks.

6.1 Theory course:

For theory courses the distribution shall be **40** marks for internal midterm evaluation and **60** marks for the External End Examinations. Out of **40** internal midterm marks: **25** marks are allotted for descriptive exam, **10** marks for two assignments or one case study (group wise), and **5** marks for objective test.

Pattern for Internal Midterm Examinations (30 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **30** marks with the duration of **90** minutes.

For final calculation of internal marks, weightage of **70%** will be given to the student who performed well either in first Midterm or second Midterm and **30%** weightage will be given to other Midterm examinations.

Midterm paper contains three descriptive type questions with internal choice. Each question carries **10** marks (3×10=30M) and scale down to **25** marks. The first Midterm examination to be conducted usually after 8 weeks of instruction or after completion of 50 percent syllabus, the second Midterm examination to be conducted usually at the end of instruction after completion of remaining 50 percent syllabus.

Pattern for External End Examinations (60 marks):

The question paper shall have descriptive type questions for **60** marks. There shall be one question from each unit with internal choice. Each question carries **12** marks. Each course shall consist of five units of syllabus. The student should answer total **5** questions. (5x12M=60M)

6.2 Laboratory Course:

(i) For practical subjects there shall be continuous evaluation during the semester for **40** internal marks and **60** semester end examination marks. Out of the **40** marks for internal: **25** marks for day to day work, **5** marks for record and **10** marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

(ii) For the course Engineering Graphics and Design, the distribution shall be **40** marks for internal evaluation (**20** marks for day–to–day work, and **20** marks for internal tests) and 60 marks for end examination.

For award of marks for internal tests weightage of **70%** will be given to the student who performed well either in first test or second test and **30%** weightage will be given to other test.

6.3 Minor Project:

Out of a total of **100** marks for the Minor project work **40** marks shall be for internal evaluation and **60** marks for end semester examination. The end semester examination (Viva-Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the department and supervisor of the Minor project. The internal evaluation shall be made on the basis of seminar given by each student on the topic of his/her project, which was evaluated by internal committee. Out of **40** internal marks **10** marks allotted for literature survey, **15** marks for results and analysis and **15** marks for seminar.

6.4 Project:

Out of a total of 200 marks for the Project, **80** marks shall be for Project Internal Evaluation and **120** marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project shall be made at the end of the IV year. The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee. Out of **80** internal marks - **20** marks allotted for literature survey, **30** marks for results and analysis, **15** marks for first seminar (usually after 8 weeks) and **15** marks for second seminar (at the end of semester).

6.5 Mandatory Courses:

Mandatory course is one among the compulsory courses and does not carry any Credits. The list of mandatory courses is shown below:

- Induction Program
- Constitution of India
- Environmental sciences

6.6 Employability Skills:

Employability skills shall be evaluated for **100** marks. **40** marks for day-to-day evaluation and **60** marks on the basis of end (internal) examination. There is no external examination for employability skills. It will be evaluated in IV-I semester.

6.7 Internship:

All the students shall undergo the internship period minimum of **4** weeks and the students have an option of choosing their own industry which may be related to their respective branch. A self study report for the internship shall be submitted and evaluated during the IV year II-Semester and will be evaluated for a total of **100** marks consists of **40** marks for internal assessment and **60** marks for end examination.

Internal assessment for **40** marks shall be done by the internship supervisor. Semester end examination (Viva – Voce) for **60** marks shall be conducted by committee consists of Head of the Department, internal supervisor and an external examiner.

For a few merit students, internship for six months will be allowed based on their performance in academics. Those who want to go for internship for six months are required to intimate the same to the college through proper channel at the end of III-II semester and they require completing all the subjects of IV B.Tech. either in IV-I Semester or IV-II Semester. However, project will be evaluated only in IV-II Semester.

7. Attendance Requirements:

(i) A student shall be eligible to appear for End Semester examinations, if he/she acquires a minimum of **75%** of attendance in aggregate of all the subjects.
(ii) Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below **75%**) in each semester with genuine reasons and shall be approved by a committee duly appointed by the college. The condonation approved otherwise it can be reviewed by the College academic committee.
(iii) A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.
(iv) Shortage of Attendance below **65%** in aggregate shall in NO case be condoned.
(v) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
(vi) A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

8. Minimum Academic Requirements:

8.1 Conditions for pass and award of credits for a course:

(i) A candidate shall be declared to have passed in individual course if he/she secures a minimum of **40%** aggregate marks i.e **40** out of **100** (Internal & Semester end examination marks put together), subject to a minimum of **35%** marks i.e **21** marks out of **60** in semester end examination.
(ii) On passing a course of a programme, the student shall earn assigned credits in that Course.

8.2 Method of Awarding Letter Grades and Grade Points for a Course:

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

Table: Grading System for B.Tech Programme

Percentage	Grade Points	Letter Grade
95-100%	10	O
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^+
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 40%	0	F (Fail)

8.3 Calculation of Semester Grade Points Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$SGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR}$$ (for all courses passed in semester)

Where CR = Credits of a Course
GP = Grade points awarded for a course
*SGPA is calculated for the candidates who passed all the courses in that semester.

8.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for entire programme:

The CGPA is calculated as below:

$$CGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad \text{(For entire programme)}$$

Where CR = Credits of a course

GP = Grade points awarded for a course

Table: Award of Divisions:

CGPA	DIVISION
≥ 7.5 (with single attempt)	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and <6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	Fail

Equivalence percentage = (CGPA -0.5) × 10 %

8.5 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

8.6 Conditions for Promotion:

(i) A student will be promoted to second year, if he/she put up the minimum attendance requirement.

(ii) A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if number credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.

(iii)A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

9. Course pattern:

(i) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(ii) A student is eligible to appear for the end examination in a subject, but absent for it or failed in the end examinations may appear for that subject's **supplementary** examinations, when offered.

(iii)When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold good with the regulations he/she first admitted.

10. Minimum Instruction Days:

The minimum instruction days for each semester shall be **95** clear instruction days.

11. **There shall be no branch transfer after the completion of admission process**.

12. **General:**

(i) Where the words “he” “him” “his”, occur in the regulations, they include “she”, “her”, “hers”.
(ii) The academic regulation should be read as a whole for the purpose of any interpretation.
(iii) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.
(iv) The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT: TEKKALI
SRIKAKULAM-532201, Andhra Pradesh (India)
Academic Regulations 2018 (AR18) for B. Tech. (Lateral Entry Scheme)
(Effective for the students admitted into II year from the **Academic Year 2019-2020** and onwards)

1. Award of B. Tech. Degree:

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

(i) Pursued a course of study for not less than three academic years and not more than six academic years.
(ii) Registered for **all** the credits of 2^{nd}, 3^{rd} and 4^{th} year of respective branches and he/she must secure total credits of 2^{nd}, 3^{rd} and 4^{th} year of respective branches.

Students, who fail to complete their three year Course of study within six years or fail to acquire the total credits for the award of the degree within **6** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Promotion Rule:

(i) A lateral entry student will be promoted to II year to III year if he puts up the minimum required attendance in II year.
(ii) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations , whether the candidate takes the examinations or not.

3. Minimum Academic Requirements:

3.1 Conditions for pass and award of credits for a course:

(i) A candidate shall be declared to have passed in individual course if he/she secures a minimum of **40%** aggregate marks i.e **40** out of 100 (Internal & Semester end examination marks put together), subject to a minimum of **35%** marks i.e **21** marks out of **60** in semester end examination.
(ii) On passing a course of a programme, the student shall earn assigned credits in that Course.

3.2 Method of Awarding Letter Grades and Grade Points for a Course:

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

Table: Grading System for B.Tech Programme

Percentage	Grade Points	Letter Grade
95-100%	10	O
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^{+}
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 40%	0	F (Fail)

3.3 Calculation of Semester Grade Points Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$\text{SGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(for all courses passed in semester)}$$

Where CR = Credits of a Course
GP = Grade points awarded for a course
*SGPA is calculated for the candidates who passed all the courses in that semester.

3.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme:

The CGPA is calculated as below:

$$\text{CGPA} = \frac{\Sigma(\text{CR} \times \text{GP})}{\Sigma\text{CR}} \quad \text{(for entire programme)}$$

Where CR = Credits of a course
GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	DIVISION
≥ 7.5(with single attempt)	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and < 6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	Fail

Equivalence percentage = (CGPA -0.5) × 10 %

4. **All other regulations as applicable for B. Tech. Four- year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**

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DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1	If the student possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or students in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.
3	If the student impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student 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 student 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 subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5	If the student uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	If the student refuses to obey the orders of the Chief Superintendent/Assistant -Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students 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 student leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the student possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student 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 subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. 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 student comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.

ADITYA INSTITUTE OF TECHNOLOGY & MANAGEMENT, TEKKALI – 532201
(An Autonomous Institution)
COMPUTER SCIENCE AND ENGINEERING
B.Tech COURSE STRUCTURE (AR18)

I YEAR I SEMESTER						
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**18MCT101**	Induction program	3 weeks			0.0
2	**18HST101**	English	2	0	0	2.0
3	**18BST101**	Linear Algebra and Calculus	3	1	0	4.0
4	**18BST108**	Chemistry	3	1	0	4.0
5	**18EST102**	Programming for Problem Solving	3	0	0	3.0
6	**18HSL101**	Language Proficiency Lab	0	0	3	1.5
7	**18BSL102**	Chemistry Lab	0	0	3	1.5
8	**18ESL102**	Programming for Problem Solving Lab	0	0	3	1.5
9	**18ESL104**	Engineering Graphics & Design	0	0	4	2.0
Total			**11**	**2**	**13**	**19.5**

I YEAR II SEMESTER						
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**18BST103**	Differential Equations	3	1	0	4.0
2	**18BST106**	Applied Physics	3	1	0	4.0
3	**18CST101**	Data Structures and Algorithms	3	0	0	3.0
4	**18EST101**	Basic Electrical Engineering	3	1	0	4.0
5	**18BSL101**	Physics Lab	0	0	3	1.5
6	**18CSL101**	Data Structures and Algorithms Lab	0	0	3	1.5
7	**18ESL101**	Basic Electrical Engineering Lab	0	0	3	1.5
8	**18ESL103**	Workshop and Manufacturing Practice	0	0	3	1.5
9	**18MCT103**	*Constitution of India*	3	0	0	0.0
Total			**15**	**3**	**12**	**21**

II YEAR I SEMESTER						
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**18CST202**	Discrete Mathematics	3	1	0	4.0
2	**18CST203**	Object Oriented Programming	3	0	0	3.0
3	**18CST204**	Free Open Source Software	2	0	0	2.0
4	**18EST206**	Digital Logic Design	3	0	0	3.0
5	**18BST209**	Biology	3	0	0	3.0
6	**18CSL202**	Object Oriented Programming Through Java Lab	0	0	3	1.5
7	**18CSL203**	Free Open Source Software Lab	0	0	3	1.5
8	**18ESL205**	Digital Logic Design Lab	0	0	3	1.5
9	**18MCT202**	Environmental Sciences	3	0	0	0.0
Total			**17**	**1**	**9**	**19.5**

II YEAR II SEMESTER						
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**18BST205**	Probability and Statistics with R	3	0	0	3.0
2	**18CST205**	Computer Organization & Architecture	3	0	0	3.0
3	**18CST206**	Operating Systems	3	0	0	3.0
4	**18CST207**	Database Management Systems	3	0	0	3.0
5	**18CST208**	Design & Analysis of Algorithms	3	0	0	3.0
6	**XXXXXX**	**Interdisciplinary Elective – I**	2	0	0	2.0
7	**18BSL203**	Probability and Statistics with R Programming	0	0	3	1.5
8	**18CSL204**	Operating Systems Lab	0	0	3	1.5
9	**18CSL205**	Database Management Systems Lab	0	0	3	1.5
Total			**17**	**0**	**9**	**21.5**

CODE	***Offered By Dept.***	**Interdisciplinary Elective – I**	***Offered for Dept.***
18IET211	**BS&H**	Transform Theory	MECH/CIVIL
18IET212	**BS&H**	Numerical Methods	ECE/EE
18IET213	**BS&H**	Introduction to Number Theory	CSE/IT
18IET214	**CIVIL**	Water Shed Management	MECH
18IET215	**CIVIL**	Computer aided engineering drawing	ECE/EEE/CSE/IT
18IET216	**EEE**	Introduction to Mathematical Simulation and Modeling	ECE/MECH/CIVIL/CSE/IT
18IET217	**MECH**	Fundamentals of Material Science	ECE/EEE/CIVIL
18IET218	**MECH**	Engineering Optimization Techniques	CSE/IT
18IET219	**ECE**	Introduction to Electronic Measurements	EEE/MECH/CIVIL/CSE/IT
18IET21A	**CSE**	UNIX Utilities	ECE/EEE/MECH/CIVIL/IT
18IET21B	**IT**	IT systems Management	ECE/EEE/MECH/CIVIL/CSE

III YEAR I SEMESTER						
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**18CST309**	Computer Networks	3	0	0	3.0
2	**18CST310**	Formal Languages & Automata Theory	3	0	0	3.0
3	**18CST311**	Software Engineering	3	0	0	3.0
4	**18CST312**	Artificial Intelligence & Machine Learning	3	0	0	3.0
5	**XXXXXX**	**Professional Elective – I**	3	0	0	3.0
6	**XXXXXX**	**Interdisciplinary Elective -II**	2	0	0	2.0
7	**18HSL302**	Professional Communication Skills Lab	0	0	3	1.5
8	**18CSL306**	Computer Networks Lab	0	0	3	1.5
9	**18CSP301**	Minor Project – I	0	0	4	2.0
Total			**17**	**0**	**10**	**22**

Professional Elective – I		
S.No	**CODE**	**COURSE**
i)	**18CSE311**	Graph Theory
ii)	**18CSE312**	Advanced Computer Architecture
iii)	**18CSE313**	Social Networks
iv)	**18CSE314**	Computer Graphics

CODE	***Offered By Dept.***	**Interdisciplinary Elective – II**	***Offered for Dept.***
18IET321	**BS&H**	Fundamentals of Fuzzy Logic	All
18IET322	**CIVIL**	Fundamentals of building planning	MECH
18IET323	**CIVIL**	Remote Sensing	ECE/EEE/CSE/IT
18IET324	**EEE**	Renewable energy sources	ECE/MECH/CIVIL/CSE/IT
18IET325	**MECH**	Principles of Mechanical Measurements	ECE/EEE/CIVIL
18IET326	**MECH**	Linear programming and its applications	CSE/IT
18IET327	**ECE**	Principles of communications	EEE/MECH/CIVIL/CSE/IT
18IET328	**CSE**	JAVA Programming	ECE/EEE/MECH/CIVIL
18IET329	**IT**	PYTHON Programming	ECE/EEE/MECH/CIVIL/CSE
18IET32A	**TPC**	Advanced Coding – I	CSE/IT
18IET32B	**TPC**	Competitive Programming – I	ECE/EEE/MECH/CIVIL

III YEAR II SEMESTER						
S.No.	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**18CST313**	Complier Design	3	0	0	3.0
2	**18CST314**	Data Mining	3	0	0	3.0
3	**18CST315**	UNIX Internals	3	0	0	3.0
4	**XXXXXX**	**Professional Elective – II**	3	0	0	3.0
5	**XXXXXX**	**Interdisciplinary Elective – III**	2	0	0	2.0
6	**18HST302**	Human Values	2	0	0	2.0
7	**18CSL307**	Complier Design Lab	0	0	3	1.5
8	**18CSL308**	UNIX Internals Lab	0	0	3	1.5
9	**18CSP302**	Minor Project – II	0	0	6	3.0
Total			**16**	**0**	**12**	**22**

Professional Elective – II		
S.No	**CODE**	**COURSE**
i)	**18CSE321**	Advanced Algorithms
ii)	**18CSE322**	Distributed Systems
iii)	**18CSE323**	Advanced Machine Learning
iv)	**18CSE324**	Cryptography and Network Security

CODE	*Offered By Dept.*	Interdisciplinary Elective – III	*Offered for Dept.*
18IET331	**MBA**	HRD & Organizational behavior	All
18IET332	**CIVIL**	Environmental impact assessment	ECE/EEE/MECH
18IET333	**CIVIL**	GPS & Survey Methods	CSE/IT
18IET334	**EEE**	Energy audit conservation and management	ECE/EEE/MECH/CSE/IT
18IET335	**MECH**	Elements of workshop technology	ECE/EEE/CIVIL/CSE/IT
18IET336	**ECE**	Introduction to Signal Processing	EEE/MECH/CIVIL
18IET337	**ECE**	Fundamentals of Signals & Systems	CSE/IT
18IET338	**CSE**	Simulation and Modeling	ECE/EEE/MECH/CIVIL/IT
18IET339	**IT**	Fundamentals of Image Processing	ECE/EEE/MECH/CIVIL/CSE
18IET33A	**TPC**	Advanced Coding – II	CSE/IT
18IET33B	**TPC**	Competitive Programming – II	ECE/EEE/MECH/CIVIL

IV YEAR I SEMESTER						
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**18CST416**	Web Technologies	3	0	0	3.0
2	**18CST417**	UML & Design Patterns	3	0	0	3.0
3	**XXXXXX**	**Professional Elective-III**	3	0	0	3.0
4	**XXXXXX**	**Professional Elective-IV**	3	0	0	3.0
5	**XXXXXX**	**Interdisciplinary Elective – IV**	2	0	0	2.0
6	**18CSL409**	Web Technologies Lab	0	0	3	1.5
7	**18CSL410**	UML & Design Patterns Lab	0	0	3	1.5
8	**18CSL411**	Sci Lab	0	0	3	1.5
9	**18HSL406**	Employability Skills	0	0	3	1.5
Total			**14**	**0**	**12**	**20**

Professional Elective – III		
S.No	**CODE**	**COURSE**
i)	**18CSE431**	Parallel and Distributed Algorithms
ii)	**18CSE432**	Advanced Operating Systems
iii)	**18CSE433**	Speech and Natural Language Processing
iv)	**18CSE434**	Image Processing

Professional Elective – IV		
S.No	**CODE**	**COURSE**
i)	**18CSE441**	Simulation & Modeling
ii)	**18CSE442**	Internet of Things
iii)	**18CSE443**	Soft Computing Techniques
iv)	**18CSE444**	Cloud Computing

CODE	*Offered By Dept.*	Interdisciplinary Elective – IV	*Offered for Dept.*
18IET441	**MBA**	Project Management	ECE/EEE/CIVIL/CSE/IT
18IET442	**MBA**	Industrial Engineering and Management	MECH
18IET443	**MBA**	Entrepreneurial Development	ECE/EEE/MECH/CIVIL/CSE/IT
18IET444	**CIVIL**	Geographical Information Systems	ECE/EEE/MECH/ CSE/IT
18IET445	**EEE**	Power quality management	ECE/MECH/ CIVIL/CSE/IT
18IET446	**MECH**	Fundamentals of ROBOTICS	ECE/EEE/ CIVIL/CSE/IT
18IET447	**ECE**	Basics of Mobile Communications	EEE/MECH/ CIVIL
18IET448	**ECE**	Introduction to Wireless Networks	CSE/IT
18IET449	**CSE**	Introduction to Cloud Computing	ECE/EEE/MECH/ CIVIL/IT
18IET44A	**IT**	Introduction to DBMS	ECE/EEE/MECH/ CIVIL
18IET44B	**IT**	Embedded Systems	CSE

IV YEAR II SEMESTER						
S.No	**CODE**	**COURSE**	**L**	**T**	**P**	**Credits**
1	**XXXXXX**	**Professional Elective – V**	3	0	0	3.0
2	**XXXXXX**	**Professional Elective – VI**	3	0	0	3.0
3	**18CSP403**	Internship	0	0	0	1.5
4	**18CSP404**	Project Work	0	0	14	7.0
Total			**6**	**0**	**14**	**14.5**

Professional Elective – V		
S.No	**CODE**	**COURSE**
i)	**18CSE451**	Information Theory and Computation
ii)	**18CSE452**	Ad-hoc and Sensor Networks
iii)	**18CSE453**	Data Analytics
iv)	**18CSE454**	Cyber Security

Professional Elective – VI		
S.No	**CODE**	**COURSE**
i)	**18CSE461**	Quantum Computing
ii)	**18CSE462**	Software Testing Methodologies
iii)	**18CSE463**	Artificial Neural Networks & Deep Learning
iv)	**18CSE464**	Human Computer Interaction

English

Subject Code: 18HST101 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

- To enable students build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To aid students acquire appropriate and adequate letter writing skills
- To get students produce written texts using appropriate vocabulary and expression, coherence devices and logical arguments

Course Outcomes

1. Students will be able to comprehend printed texts of different genres more easily and they will be able to make appropriate word choice.
2. Students will be able to write short texts masterly.
3. Students will be able to construct grammatically correct sentences.
4. Students will be able to communicate through letters and emails effectively.
5. Students will be able to comprehend unfamiliar passages, and will be able to write *précis and essays.*

Unit – I

Father's Help by R K Narayan

Vocabulary Building: Word Formation—Root Words—Prefixes and Suffixes—Synonyms and Antonyms—Idioms —Phrasal Verbs—One-word Substitutes—Standard Abbreviations

Unit – II

My Early Days by A P J Abdul Kalam

Basic Writing Skills: Tense— Voice— Reported Speech—Degrees of Comparison —*If* Clauses— Simple, Compound, Complex Sentences—Punctuation—Correction of Sentences

Unit – III

Politics and the English Language by George Orwell

Identifying Common Errors in Writing: Subject-Verb Agreement—Noun-Pronoun Agreement—Misplaced modifiers—Articles—Prepositions—Redundancies—Clichés

Unit–IV

Sacrifice by Rabindranath Tagore

Writing Practice: Letter Writing—Email Writing

Unit–V

Stopping by Woods on a Snowy Evening by Robert Frost

Writing Practice: Comprehension—*Précis Writing*— Essay Writing

Text Books

1. *On Writing Well.* William Zinsser. Harper Resource Book. 2001
2. *Practical English Usage*. Michael Swan. Oxford University Press. 1995.
3. *Remedial English Grammar.* F.T. Wood. Macmillan. 2007.
4. *Step by Step*. K. Nirupa Rani and others. Pearson. Delhi. 2013.
5. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

Linear Algebra and Calculus

Subject Code : 18BST101 **External Marks: 60**
Credits : 4.0 **Internal Marks : 40**

Course Objectives

- The application of the essential tool of matrices and linear algebra including linear transformation, eigen values, diagonalization and orthogonalization.
- The application of Taylor's and Maclaurin's series to calculate maxima and minima of two variable functions.
- The application of integration to length, surface area and volume.
- The mathematical tools needed in evaluating multiple integrals and their usage.
- The essential tool of vector differentiation to calculate gradient, divergence, curl and apply Green's, Stokes and Gauss Divergence theorems in converting one integral form to another.

Course Outcomes
The student will be able to:

1. To calculate rank, eigen values, eigen vectors of matrices, solve linear system of equations including diagonalization and orthogonalization.
2. To estimate maxima and minima of functions of two variables
3. To apply single integrals to estimate length, surface area and volume.
4. To evaluate multiple integral in both Cartesian and polar coordinates and estimate area and volume.
5. To calculate gradient, divergence, curl of a scalar and vector point functions; line, surface and volume integrals and apply Green's, Stokes and Gauss Divergence theorems to convert from single to double or double to triple integrals.

Unit – I
Matrices: Matrices – Rank - Systems of linear equations - linear dependence and independence –Eigen values, eigenvectors, symmetric, skew-symmetric, orthogonal matrices -Diagonalization. Vector Space – Basis - Dimension, rank and nullity - Inner product spaces- Gram-Schmidt orthogonalization.

Unit – II
Differential Calculus *:*Functions of single Variables: Rolle's, Lagrange's, Cauchy's mean value theorems (without proof) - Taylor's and Maclaurin's Series.Functions of several Variables: Limits and continuity for two variables - Partial derivative - Total derivative- Taylor's and Maclaurin's Series (without proof) - Maxima, minima of functions without constraints and functions with constraints (Lagrange method of undetermined multipliers).

Unit – III
Single Integrals: Definite Integrals, Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates.

Unit – IV

Multiple Integrals:Double integral (Cartesian and polar form) -Change of order of integration - Change of variables (Cartesian to polar)- area by double integration. Triple integrals – Change of variables (Cartesian to spherical/cylindrical) - Volume by triple integration.

Unit – V

Vector Calculus: Scalar and vector point functions- Vector differentiation - Directional derivatives - Gradient, Curl and Divergence –Vector Integration -Line, Surface, Volume Integrals - Green, Stokes and Gauss divergence theorems (without proofs) .

Text Books

1. B.V. Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi, 2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **G.B. Thomas and R.L. Finney**, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. **Veerarajan T**., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. **D. Poole**, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. **N.P. Bali and Manish Goyal**, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

Chemistry

Subject Code : 18BST108 **External Marks: 60**
Credits : 4.0 **Internal Marks : 40**

Course Objectives:

The students will become familiar and understand about:

- Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalize reference electrodes and science of corrosion.
- Rationalize organic reactions such as addition, substitution, elimination, rearrangement reactions and polymerization.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Course Outcomes:

The course will enable the student to:

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
3. Rationalise reference electrodes and science of corrosion.
4. Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions and polymerization.
5. Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Unit – I

Atomic Structure and Chemical Bonding: Types of Hybridisation-valency shell electron pair repulsion theory (VSEPR) -Molecular orbital theory(MOT) –Energy Level diagrams of diatomic molecules (O_2, CO) - Atomic and ionic sizes - ionization energies - electron affinity and electronegativity – variable oxidation states - coordination numbers and geometries.

Unit – II

Spectroscopy: Spectroscopy - Electronic spectroscopy-types of Electronic transitions and selection rules – Definition of Chromophore – Definition of Auxochrome – Absorption and intensity shifts. Principle of Fluorescence and Phosphorescence. Introduction to I.R. Spectroscopy –Fingerprint region–I.R.Values for Functional groups (-Carbonyl, -alcohol, -nitryle, -amino)- Introduction to NMR – Principle - equivalent and non-equivalent protons - Chemical shift& Splitting – Coupling Constant

Unit – III

Electrochemistry & Corrosion: Introduction to Electrochemistry - EMF of the cell or Cell potential-Electrochemical series and its importance–Reference electrodes (SHE and Calomel

electrode). Corrosion (chemical and electrochemical theory of corrosion) –Galvanic series. Factors effecting the rate of corrosion – Controlling of corrosion (Proper designing, Modifying the environment, Cathodic protections – Sacrificial Anodic and Impressed Current Cathodic Protection).

Unit – IV

Organic Reactions& Introduction to Polymers: Types of Organic reactions: Addition - electrophilic, nucleophilic and free radical - Substitution - electrophilic, nucleophilic (SN^1 and SN^2) and free radical – Elimination(E_1 and E_2) (E_{CB}- Examples) – Rearrangement Reactions (Claisen, Pinacol pinacolone rearrangement) – Diels-Alder reaction - Isomerism (Cis- Trans) Definition of Polymer - Polymerisation(Addition and Condensation) – Functionality – Degree of Polymerisation–Classification of Polymers – Zeiglar Natta Catalysis.

Unit – V

Green Chemistry & Energy: Introduction to green chemistry – Definition and 12 principles of green chemistry.Types of energy sources – Renewable & Non-Renewable - Introduction to solar energy – harnessing of solar energy – photo voltaic cells – Concentrated Solar power plants. Introduction of Energy storage devices: Principle& mechanism of Batteries&Supercapacitors, Types of Batteries (Alkaline & Lead-Acid) - Difference between Batteries and Supercapacitors.

Text Books:

1. University chemistry, by B. H. Mahan
2. Elementary organic spectroscopy: principles and applications, by Y. R. Sharma
3. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
4. "Engineering Chemistry", P. C. Jain and Monica Jain, Dhanpat Rai Publications, Co., New Delhi, 2004, 16th Edition

Reference books:

1. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
3. Physical Chemistry, by P. W. Atkins
4. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
5. Concise Inorganic Chemistry: Fifth Edition by J.D. Lee

Programming for Problem Solving
(Common to all Branches)

Credits : 3 **Internal Marks: 40**
Course Code: 18EST102 **External Marks: 60**

Course Objective

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes

1. Understand the fundamentals of C programming
2. Choose the loops and decision making statements to solve the problem
3. Make use of pointers to access arrays, strings and implements different operations on arrays, and work with textual information, characters and strings.
4. Apply programming to write modular programs, user defined functions to solve real time problems and allocate memory using dynamic memory management functions.
5. Create user defined data types including structures and unions to solve problems and implement file operations in C programming for a given application.

Unit - I
Introduction to Programming: Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Structure of C program, Basic I/O statements, Operators, Operator precedence.

Unit - II
Control Structures: Decision statements: if, if-else, nested if and switch,
Iterative Statements: for, while, do while and nested loops **Branching:** Break, continue, goto.

Unit - III
Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.
Functions: Definitions, Declaration, Types of Functions, Parameter passing, Passing Arrays to functions, Recursion, library functions and Storage classes,

Unit - IV
Pointers: Definition, Declaration, Initialization, Pointer arithmetic, Pointer to pointer, functions and pointers, arrays and pointers, Dynamic memory allocation

Unit - V

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, passing structure to function, nested structures, and unions.

Files: Definition, types of files, Opening modes, file IO Functions, Random access functions, Preprocessor directives.

Text Books

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. A Structured Approach Using C by Behrouz A. Forouzan, Richard F. Gilberg 3rd Edition

References

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.
3. https://www.tutorialspoint.com › Cprogramming › C – Home
4. https://www.programiz.com/c-programming

Language Proficiency Lab

Subject Code: 18HSL101 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives

- To enable students develop neutralized accent
- To assist students utter words intelligibly
- To help students converse aptly as the context demands
- To get students acquire perceptive abilities in professional conversations
- To aid students grasp and interpret information provided in graphs and tables

Course Outcomes

1. Students will be able to recognize differences among various accents and speak with neutralized accent.
2. Students will be able to pronounce words accurately with the knowledge of speech sounds and use appropriate rhythm and intonation patterns in speech.
3. Students will be able to generate dialogues for various situations.
4. Students will be able to communicate perceptively and concisely.
5. Students will be able to comprehend and interpret data provided in graphs and tables.

Course Syllabus

Unit – I

Listening Comprehension of Audio and Video clips of different accents

Unit – II

Pronunciation—Intonation—Stress—Rhythm

Unit – III

Situational Dialogues

Unit – IV

Poster Presentation

Unit – V

Interpretation of Data in Graphs and Tables

Text Books

1. *Communication Skills*. Sanjay Kumar and Pushpa Lata. OUP. 2011.
2. *Practical English Usage.* Michael Swan. OUP. 1995.
3. *Speak Well*. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
4. *Strengthen Your Communication Skills*. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
5. *Strengthen Your Steps*. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
6. *Technical Communication*. Meenakshi and Sangeetha. OUP. New Delhi. 2013.

Chemistry Lab

Subject Code: 18BSL102 **External Marks: 60**
Credits : 1.5 **Internal Marks: 40**

Course Objectives:
The students will become familiar and understand about:

- Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc
- Measure molecular/system properties such as surface tension, viscosity, pH, conductance of solutions, redox potentials, etc
- Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, iron by colurimeter etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colurimeter), partition coefficient, adsorption of acetic acid by charcoal etc.

Course Outcomes:
The students will learn to:

1. Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc.
2. Measure molecular/system properties such as surface tension, viscosity, pH, conductance of solutions, redox potentials, etc
3. Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, iron by colurimeter etc.
4. Synthesize a small polymer molecule and analyze a salt sample.
5. Estimate iron (by colurimeter), partition coefficient, adsorption of acetic acid by charcoal etc.

List of Experiments

Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Hardness of water sample by EDTA Method.
3. Conductometric estimation of Acid by Base.
4. Conductometric estimation of mixture of acids by base.
5. Potentiometric Titrations.
6. Synthesis of a polymer/drug.
7. Determination of acid value of an oil
8. Chemical analysis of a salt

9. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method
10. Colurimetric estimation of iron
11. pH metric titrations
12. Determination of the partition coefficient of a substance between two immiscible liquids
13. Adsorption of acetic acid by charcoal Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg
14. Thin layer chromatography.
15. Determination of Chloride content present in given water sample.
16. Determination of kinematic viscosity of given lubricating oil.

Text Books:

1. "Practical Engineering Chemistry" by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2. "Lab Manual on Engineering Chemistry" by Sudharani, Dhanpat Rai Publications, Co., New Delhi., (2009).

Reference Books

1. "Engineering Chemistry Lab Manual" by Shuchi Tiwari (2010), SCITECH Publications.
2. "Vogel's Text Book of Quantitative Chemical Analysis", 6th Edition by G. J. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3. "A Text Book of Engineering Chemistry" by R. N. Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4. "A Text Book on experiments and calculations Engineering" by S.S. Dara, S.Chand & Company Ltd. (2003).
5. "Instrumental methods of Chemical Analysis", Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

Programming for Problem solving Lab

Credits : 1.5 **Internal Marks: 40**
Course Code: 18ESL102 **External Marks : 60**

Course Objectives:

- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

Course Outcomes:

At the end of the course students will be able to

1. Solve the given problem using the syntactical structures of C language.
2. Design programs involving decision structures and loops.
3. Apply programming to solve different operations on arrays and strings.
4. Develop modularity concept using functions and write programs for allocating memory dynamically.
5. Construct C program that uses structures and unions and implement file operations on given application.

List of Experiments

1. Write the C programs to calculate the following
   a) Area of triangle when sides are given.
   b) Program for Type Casting.
   c) Interchanging values of two variables.

2. Write the C programs to perform the following
   a) Read lower case character and convert into upper case.
   b) Find maximum of 3 values using conditional operator.
   c) Calculate area and perimeter of circle.

3. Write C programs for the following using decision making statements
   a) Program to find roots of quadratic equation.
   b) Find the Largest among 3 values.
   c) Calculate the grades of a student.

4.
   a) Arithmetical operations using switch-case.
   b) Read a number and display in reverse.
   c) Check for Armstrong number property

5.
   a) Check for strong number property
   b) Generate Fibonacci series.
   c) Generate Prime numbers between two numbers.

6. Implement the following using arrays
    a) Largest and smallest from a list of elements.
    b) Program for Linear Search.
    c) Program for Bubble Sort.

7. Implement the following using arrays
    a) Matrix addition.
    b) Matrix Multiplication.
    c) Program using string handling functions.

8. Implement C Program using any Numerical methods

9. a) Factorial using recursion and non recursion.
    b) GCD using recursion and non recursion.

10. a) Find the sum and average of list of elements using DMA Functions
    b) Implementation of call by reference and call by valve.

11. a) Implementation of array of structure.
    b) Demonstration of Union.

12. a) Copy the contents of one file into another.
    b) Count the number of characters, words and lines in a file.

Text Books

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. A Structured Approach Using C by Behrouz A. Forouzan, Richard F. Gilberg 3rd Edition

References

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed.. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.
3. https://www.tutorialspoint.com › Cprogramming › C – Home
4. https://www.programiz.com/c-programming

Engineering Graphics & Design

Subject Code: 18ESL104 **External Marks : 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

- Able to develop drawing skills.
- To draw orthographic views from the given isometric view and vice verse
- To understand the fundamentals of computer aided design and drafting

Course Outcomes

1. Draw projection of points and straight lines in first angle projection.
2. Project plane surfaces and simple solids inclined to one reference plane.
3. Convert orthographic views into isometric projections and vice-versa.
4. Draw basic lines and profiles with commonly used operations in drafting software.
5. Generate 2D drawings along with dimensioning in drafting software.

List of Exercises

Part-A: Conventional Engineering drawing

1 Projections of points
2 Projections of straight lines inclined to one reference plane only.
3 Projections of planes inclined to one reference plane only.
4 Projections of simple solids inclined to one reference plane only.
5 Conversion of isometric views into orthographic views
6 Conversion of orthographic views into isometric views.

Part-B: Basic Computer aided engineering drawing (2-D drawings)

1. Commands – Axes, Coordinate points, Creation of lines, Polylines, Square, Rectangle, Polygons, Spines, Circles, Ellipse, Text.
2. Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curves.

Note: Six Exercises are to be completed by using AutoCAD software

Text Books

1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

Reference Books:

1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

Differential Equations

Subject Code : 18BST103 **External Marks: 60**
Credits : 4.0 **Internal Marks : 40**

Course Objectives:

- To solve the first order Ordinary Differential equations and apply to Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
- To solve second and higher order ordinary differential equations.
- To develop series solutions to Legendre's and Bessel's differential equations including properties.
- The effective mathematical tool for the solution of first order linear Partial differential equation and non-linear Partial differential equation (standard types).
- The effective mathematical tool for the solution of homogeneous and non-homogeneous Partial differential equations of higher order with constant coefficients.

Course Outcomes:

The student will be able to:

1. Apply the mathematical tool for the solution of Ordinary Differential equations, Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
2. Evaluate higher order homogenous and non-homogenous linear differential equations with constant coefficients.
3. Estimate power series solutions for Legendre's and Bessel's differential equations including the recurrence relations.
4. Frame Partial differential equation and evaluate first order linear and non-linear Partial differential equation (standard types).
5. Apply mathematical tool for the solution of homogeneous and non-homogeneous Partial differential equation of higher order with constant coefficients.

Unit – I

Ordinary differential equations of first order: Linear - Bernoulli–Exact - Equations reducible to exact.- Orthogonal Trajectories-Newton's law of cooling - Law of Growth and Decay.

Unit – II

Ordinary differential equations of higher order :Higher order homogenous and non-homogenous linear differential equations with constant coefficients- Particular integrals for the functions of type sin(ax+b)/cos(ax+b), x^m, e^{ax} , e^{ax} V(x) - Method of variation of parameters.

Unit – III

Special Functions Legendre's and Bessel's Differential equations – Solutions in power series – Orthogonality property and recurrence relations.

Unit – IV

Partial Differential Equations of first order: Partial differential Equations - Formation of partial differential equations – solutions of first order linear (Lagrange) equation and non-linear (standard type) equations.

Unit – V

Partial Differential Equations of higher Order Homogenous and non homogeneous partial differential equations of higher order with constant coefficients - Particular integrals for the functions of type e^{ax+by}, sin(ax+by)/cos(ax+by), $x^m y^n$,, e^{ax+by} .V(x,y).

Text Books

1. B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

Applied Physics

Subject Code : 18BST106 **External Marks: 60**
Credits : 4.0 **Internal Marks : 40**

Course Description:
This course encompass Fundamental Concepts of Physics that include

- Wave Optics
- Fiber Optics
- Modern Physics
- Electro Magnetic Theory
- Semiconductor Physics

that are inevitable for any Engineering student so that these prerequisites aid the student to readily understand Day to Day Engineering Problems with Pragmatic Approach.

Course Objectives

- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Fiber Optics
- To define the shortcoming of classical physics and describe the need for modifications to classical theory
- To analyze the interaction of electromagnetic fields
- To understand the properties and importance of materials based on band diagrams

Course Outcome

Will be able to

1. Apply the principles of optics in designing optical devices
2. Outline the Principles of Fiber Optics
3. Resolve the discrepancies in classical estimates through quantum principles
4. Analyze the interaction of electromagnetic fields.
5. Summarize the characteristics of semiconductor materials.

Unit – I
WAVE OPTICS:
Interference - Introduction, Huygen's Principle, Principle of Superposition of Waves, Interference of Light by Division of Wavefront – Young's Double Slit Experiment, Interference of Light by Division of Amplitude - Newton's Rings under Reflected Light
Diffraction - Introduction, Fraunhofer Diffraction due to Single Slit – Fraunhofer Diffraction due to Double Slit, Diffraction Grating

Unit – II
Fiber Optics
Principles of Optical Fiber - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle
Types of Fibers - Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Fiber Optic Communication System and Applications

Unit – III

Modern Physics

Quantum Mechanics - Wave Particle Duality, De-Broglie Hypothesis of Matter Waves, Heisenberg's Uncertainty Principle, Physical Significance of Wave Function

Review of Quantum Theory: Planck's Hypothesis**,** Schrödinger Time independent wave equation and Particle in One Dimensional Potential Box

Unit – IV

Electromagnetic Theory

Electromagnetism – Concept of Electric Field, Point Charge in Electric Field, Gauss Law and it's Applications, Magnetic Field - Magnetic Force on Current Carrying Coil

Magnetostatics – Ampere's Law, Biot-Savart Law, Faraday's Law of Induction, Lenz's Law, Maxwell's Equations and Applications

Unit – V

Semiconductors Physics

Introduction - Intrinsic and Extrinsic Semiconductors, Dependence of Fermi Level on Carrier Concentration and Temperature, Diffusion and Drift Currents, Direct and indirect Band Gap Semiconductors

Applications – Hall Effect –Mobility, Sign of Charge Carriers, Conductivity, Resistivity and Continuity Equation

Text Books

1. A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers
2. Fundamentals of Physics by Resnick, Halliday and Walker
3. Modern Physics by Arthur Beiser

Reference Books

1. University Physics by Young and Freedman
2. Solid State Physics by S. O. Pillai, New Age International Pubishers
3. Engineering Physics, Volume-I&II, P.K.Palani Swamy, Scitech Publications Hyderabad
4. Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
5. Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

Data Structures and Algorithms

Credits : 3.0 **Internal Marks: 40**
Course Code: 18CST101 **External Marks : 60**

Course Outcomes
On completion of this course, the student will be able to:

1. Derive the time and space complexities and justify the correctness of a given algorithm.
2. Compare the performances of various Searching and Sorting techniques.
3. Create the ADTs and Demonstrate the applications of Stacks and Queues.
4. Demonstrate the advantages of dynamic memory allocation via linked lists.
5. Illustrate about different types of Trees & Graph structures and implement search and traversal algorithms.

Unit – I
Introduction: Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off.

Unit – II
Searching, Sorting and Hashing: Searching**,** Linear Search, Binary Search Techniques and their complexity analysis.
Sorting and Hashing: Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance Comparison among all the methods; Hashing: types.

Unit – III
Stacks and Queues: Stacks: ADT Stack and its operations: Applications of Stacks: Expression Conversion and evaluation. **Queues:** ADT Queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each type of Queues.

Unit – IV
Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion, Deletion of elements; Linked representation of Stack and Queue;
Doubly linked list; Circular Linked Lists: Various Operations

Unit – V
Trees and Graphs: Trees: Basic Tree Terminologies; Different types of Trees, definitions : Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree; Tree operations on Binary Search Tree;
Graph: Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

Text Books:

1. **"Data Structures and Algorithm Analysis in C++",** Mark Allen Weiss , Fourth Edition , Pearson.

2. **"Data Structures and Algorithm Analysis in C++",** Michel T. Goodrich, Roberto Tamassia, David Mount, 2nd Edition, John Wiley & Sons, Inc.

References:

1. "**Fundamentals of Data Structures**", Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press.
2. **"Data Structure And Algorithms In C++",** Adam.Drozdek , 4th edition, Cengage.

Basic Electrical Engineering

Credits : 4.0 **Internal Marks: 40**
Course Code: 18EST101 **External Marks : 60**

Course objectives

- To introduce the basic knowledge of electric circuits
- To illustrate knowledge with AC circuits.
- To become familiar with DC Machines.
- To understand the concept of transformers.
- To provide knowledge on three phase induction motors.

Course outcomes

1. Able to summarize different electrical circuits.
2. Able to outline the basics of AC circuits.
3. Able to examine DC Machines.
4. Able to demonstrate working of transformers.
5. Able to generalize three phase induction motors.

Unit – I
Introduction to Electric Circuits: Basic definitions, Electrical circuit elements (R, L and C), Ohm's Law, voltage and current sources, Series & Parallel circuits, Kirchhoff's Laws, Star-delta and delta-star transformations, simple problems with dc excitation.

Unit – II
AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, sample problems.

Unit – III
DC Machines : Generator-Principle of Operation, construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator. Motor-principle of operation, Torque equation, Speed Control Methods, Operation of 3 point starter.

Unit – IV
Transformers: Operation of a Single Phase Transformer, EMF equation, losses, Regulation and Efficiency of a single phase transformer, O.C and S.C Tests. sample problems.

Unit –V
Three Phase induction Motor: Principle of Operation of 3-Φ induction motor, power and torque equations, Speed-Torque Characteristics of 3- Φ induction Motor.

TEXT BOOKS
1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

REFERENCE BOOKS .

1. Basic Electrical Engineering Dr.K.B.Madhu Sahu scitech publications (india) pvt.ltd.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.
3. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill,2010.

Physics Lab
(Common for all Branches)

Subject Code : 18BSL101 **External Marks: 60**
Credits : 1.5 **Internal Marks: 40**

Course Description:
This Laboratory course is intended to apply the scientific method to expedite experiments the include

- Error analysis
- Waves Fundamentals
- Wave Optics
- Lasers and Fiber Optics
- Semiconductor devices

So that student can verify theoretical ideas and concepts covered in lecture through host of analytical techniques, statistical analysis and graphical analysis.

Course Objectives:

- To operate optical systems and design Instrumentation with precision measurements to estimate error for targeted accuracy
- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To understand the phenomenon of Interference and Diffraction using Travelling Microscope and Spectrometer.
- To attain ability to use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To characterize semiconducting material devices.

Course Outcomes:
Will be able to

1. demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy
2. infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
3. Apply the knowledge of Optics to calculate geometrical parameters of thickness of thin object and radius of curvature of a lens
4. illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
5. Evaluate characteristics of semiconducting material devices.

List of Experiments

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing
3. Determination of Rigidity Modulus of the Material of Wire using Torsional Pendulum
4. Determination of Acceleration due to Gravity (g) using Compound Pendulum
5. Newton's Rings – Determination of the Radius of Curvature of a given Plano Convex Lens
6. Determination of Thickness of Thin Object using Wedge Method
7. Determination of Wavelength of Monochromatic Source using LASER Diffraction
8. Determination of width of a single slit using LASER
9. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
10. Determination of Energy Band Gap using the given Semiconductor

Manual / Record Book

1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.
2. Lab Manual of Engineering Physics by Dr.Y. Aparna and Dr. K. Venkateswara Rao (VGS books links, Vijayawada)

Data Structures & Algorithms Lab

Credits : 3 **Internal Marks: 40**
Course Code : 18CSL101 **External Marks : 60**

Course Outcomes:
Upon completion of the Course, students will be able to: Appraise the features of C++ programming language through basic routine problems.

1. Demonstrate different strategies to solve the most common sorting problems.
2. Design programs that use data structures such as arrays, linked lists, stacks, queues, and solve applications like Infix-to-Postfix conversion.
3. Develop programs for implementing various operations on binary search trees.
4. Solve traversal problems on graphs using BFS, DFS.

List of experiments:

1. Write a C++ program to demonstrate various types of Constructors.
2. Write a C++ program to demonstrate the difference between Inline function and macro.
3. Write a C++ program to demonstrate Operator Overloading.
4. Write C++ programs for implementing the following sorting methods:
   a) Merge Sort b) Heap Sort
5. Write a C++ program to implement Queue ADT using array.
6. Write a C++ program to implement Stack ADT using array.
7. Write a C++ program to demonstrate application of Stack & Queues.
   a. Conversion of an Infix expression to Postfix expression.
   b. Evaluation of a Postfix expression.
8. Write a C++ program to implement the List ADT for operations on a singly linked list.
9. Write a C++ program to implement Queue ADT using a singly linked list.
10. Write a C++ program to implement Stack ADT using a singly linked list.
11. Write a C++ program to implement Binary Search Tree ADT.
12. Write C++ programs for the implementation of BFS and DFS for a given graph

TEXT BOOKS:

1. **"Data Structures and Algorithm Analysis in C++",** Mark Allen Weiss , Fourth Edition , Pearson.
2. **"Data Structures and Algorithm Analysis in C++",** Michel T. Goodrich, Roberto Tamassia, David Mount, 2nd Edition, John Wiley & Sons, Inc.

REFERENCES:

1. "Effective C++: 55 Specific Ways to Improve Your Programs and Designs", Scott-Meyers, Addison-Wesley Professional Computing Series.
2. **"Data Structure And Algorithms In C++",** Adam.Drozdek , 4th edition, Cengage.

Basic Electrical Engineering lab
(Common for all Branches)

Subject Code : 18ESL101 **External Marks: 60**
Credits : 1.5 **Internal Marks: 40**

Course Objective:

To introduce the student to study different electrical components and to verify the basic laws related to electrical engineering, Speed control of D.C. motor, testing of transformer, electrical wiring system through study, practice, and experiments.

Course Outcomes:

Students will be able to

1. Label various types of electrical components.
2. Demonstrate various basic electrical laws.
3. Demonstrate speed control DC motor & testing of transformer.
4. Experiment with lamps.
5. Examine electrical wiring system

List of Experiments:

1. Study of electrical components.
2. To verify Ohm's law.
3. To verify (a) Kirchhoff's current law (b) Kirchhoff's voltage law.
4. To verify the total resistance of the series and parallel connected circuits.
5. Find armature resistance, field resistance and filament Lamp Resistance using V-I method.
6. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
7. OC and SC tests on single phase transformer.
8. Fluorescent tube connection.
9. (a) One way control of lamp
   (b) Two way control of lamp
10. Fan wiring.

Additional Experiments:

11. Soldering and bread board precautions.
12. To find voltage current relationship for series RL circuit and determine power factor.

Workshop and Manufacturing Practice
(Common for all Branches)

Subject Code : 18ESL103 **External Marks: 60**
Credits : 1.5 **Internal Marks: 40**

Course Objectives

- The Engineering Workshop Practice for engineers is a training lab course spread over entire semester. The modules include training on different trades like Fitting, Carpentry, Black smithy etc… which makes the students to learn how various joints are made using wood and other metal pieces.

Course Outcomes

1. Make half-lap, mortise & tenon, corner dovetail or bridle wooden joints.
2. Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
3. Forge MS rod from round to square cross-section, or into L- or S- bend.
4. Fabricate MS pieces into either a straight, square, dovetail or V-fit.
5. Connect a staircase or a tube light house-wiring electrical circuit.

I. Wood Working Technology - Familiarity with different types of wood and tools used in wood Working technology.
Tasks to be performed:

1) Half – Lap joint
2) Mortise and Tenon joint
3) Corner Dovetail joint
4) Briddle joint.

II. Sheet Metal Working – Familiarity with different types of tools used in sheet metal working, developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.
Tasks to be performed:

1) Square Tray
2) Taper side Tray
3) Conical Funnel
4) Elbow Pipe.

III. Forging Technology – Familiarity with different types of tools used in forging technology. Knowledge of different types of furnaces like coal fired, electrical furnaces etc...
Tasks to be performed:

1) round M.S rod to square bar
2) L bend in given M.S. Rod.
3) S bend in given M.S. Rod.
4) heat treatment tests like annealing, normalizing etc...

IV. Fitting Technology – Familiarity with different types of tools used in fitting technology.
Tasks to be performed:

1) V" – fitting
2) square fitting
3) Dovetail fitting
4) Straight fitting

V.HOUSE WIRING

1) Tube light connection
2) Staircase connection

Note: Any two jobs from each trade must be performed by the student.

The Constitution of India
(Common for CSE, IT, CIVIL)

Subject Code : 18MCT103 **External Marks: 00**
Credits : 0.0 **Internal Marks: 00**

Course Objectives

1. To help Students regulate their behavior in a social environment as Engineering Professionals.
2. To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
3. To understand the political and constitutional parameters in work environment.
4. To understand the need and strengths of our nation and adopt their knowledge for future career.

Course Outcomes

By the end of this course the student will be able to: \

1. Realize the rigidness of our Indian Politics and Administrative aspects.
2. A Student can understand our nation federalism.
3. Can assess different types of risks involved in misadministration.
4. Can create competitive advantage.
5. Summarizes the legal, Administrative, Political and Financial aspects for betterment of the National building.

Unit – I

Introduction: Historical perspective of the constitution of India - Salient features of The Indian Constitution - Amendment Procedure of The Indian Constitution.42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

Unit – II

Important Features Of Constitution: Fundamental Rights(Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 - Articles 19 - Article 21

Unit – III

Parliamentary form of Govt. In India:
President of India - Emergency provisions -National Emergency – Article 352
President Rules – Article 356 - Financial Emergency – Article 360
Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary)

Unit – IV

Indian Federalism:
Union – State relations; - Legislative , Administrative and Financial relations.
Local self Govt. – Constitutional Schemes in India (73 & 74 Constitutional amendments)

Unit – V

Parliamentary Committees:
Public Accounts Committee - Estimates Committee - Committee on Public Undertakings. - Election commission of India (Article -324) - Comptrollar and Auditor General (CAG) of India

(Article – 148 to 150) - Finance Commission (Article – 280) - Neethi Aayog (Planning Commission) and - Political Parties.

Text Books:

1) D.D Basu – Indian Constitution.
2) Dr. D. Surannaidu – Indian Political System.
3) Madhav Khosla – The Indian Constitution.

Discrete Mathematics

Subject Code : 18CST202 **External Marks: 60**
Credits : 4.0 **Internal Marks : 40**

Course Objective

- Understand the theory and techniques of logic, set theory, graphs and trees
- Apply the knowledge and skills obtained to investigate and solve a variety of discrete mathematical problems
- Communicate mathematical ideas

Course Outcomes

Students will be able to:

1. Apply, equivalence formula, tautological implications in finding normal forms, theory of inference and differentiate propositional logic and predicates.
2. Explain the basic properties of relations (POSETS, LATTICES and apply the same in solving the problems) and functions.
3. Identify the basic properties of graphs and related structures and solve the related problems.
4. Describe the basic properties of Planar graphs, Trees and solve minimum cost spanning tree problems.
5. Solve and formulate, generating functions and recurrence relations.

Unit – I

Propositional and first order logic : Proposition logic, logical connectives, truth tables, Tautologies, Contradiction , **Logical Equivalence:** Law of Duality, Normal forms(Conjunctive and Disjunctive), Converse, Inverse, Contrapositive, Rules of Inferences, **Predicate Calculus:** predicate logic, statement functions, variables and quantifiers, free and bound variables.

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Unit – II

Relations: Properties of Relations, Equivalence relations, partial orders, Lattices, properties of Lattices, Special types of Lattices(Proofs not required). **Functions:** Types Functions, The pigeonhole principle, Invertible functions (Proofs not required)

Unit – III

Graph Theory I:

Graph terminology, Types of graphs, Vertex degree and Handshaking property, Matrix representation of graphs: Adjacency Matrices, Incidence Matrices, Connected graphs, Isomorphism of graphs, Subgraphs, Euler graph, Hamiltonian path and circuits,

Unit – IV

Graph Theory II:

Planar and Non Planar graphs:- Euler's formula, Dual of planar graph, Graph coloring, (Chromatic number),Map coloring

Trees: Definition and properties, Tree traversing (preorder, inorder, postorder),Graph traversal techniques, Minimum cost spanning trees(Prim's & Kruskal's)

Unit – V

Combinatorics: Generating Function of Sequences, Calculating coefficient of Generating function, Partial Fractions, Recurrence relations: First order and second order Linear Homogeneous and Non-Homogeneous recurrence relations, Method of generating functions

Text Books

1. J.P.Tremblay & R. Manohar, "Discrete Mathematical Structure with Applications to Computer Science" Mc.Graw Hill, 2004.
2. Kolman, Busby Ross, "Discrete Mathematical Structures", PHI,5th Edition,2003.
3. D.S.Chandrasekharaiah, "Mathematical Foundation of Computer Science" Prism Publications 2009

Reference Books

1. V. Krishnamurthy, "Combinatories:Theory and Applications", East-West Press.
2. Seymour Lipschutz, M.Lipson, "Discrete Mathemataics" Tata Mc Graw Hill, 2005.
3. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Mc.Graw Hill, 2002.

Object Oriented Programming

Subject Code : 18CST203 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objective

- The objective of the course is to teach the basic concepts and techniques which form the object oriented programming paradigm.
- Well equipped with Java SDK environment to create, debug and run simple Java programs

Course Outcomes

After completion of this course, the student will be able to:

1. Knowledge of the structure and model of the Java programming language,(knowledge)
2. Use the Java programming language for various programming technologies (understanding)
3. Develop software in the Java programming language, (application)
4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis)
5. Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem (synthesis)

Unit – I

INTRODUCTION TO JAVA: Evolution of Java, Java Buzzwords, The Java Virtual Machine, An overview of Java- Simple Java Program, Naming Conventions in Java, Data types, Variables, Expressions, Automatic type Conversion, Operators, Control Statements , Arrays, Strings. **[Chapters [1,3,4,5]- Text Book 1]**

Unit -II

CLASSES & OBJECTS: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java, Overloading Methods and constructors, Static Methods, Recursion, final keyword, this keyword, garbage collection, finalize() method. **[Chapters [6, 7] - Text Book 1]**

Unit -III

INHERITANCE: Inheritance Basics, Types of Inheritance, The Keyword ‘super’, Final with inheritance.

POLYMORPHISM: Method Overriding, Dynamic Method Dispatch, Abstract Classes.

INTERFACES: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces.

[Chapters [8, 9] - Text Book 1]

Unit -IV

PACKAGES: Packages, Different Types of Packages, Access Protection, Importing Packages.

EXCEPTION HANDLING: Exception-handling fundamentals, throw Clause, throws Clause,

Types of Exceptions: Built-in Exception, User Defined Exception.
[Chapters [9, 10] - Text Book 1]

Unit -V

THREADS: Java Thread Model, Main Thread, Creating a Thread and Running it, terminating the Thread, Creating Multiple Threads, Thread Synchronization, Thread Priorities.
APPLETS: Applet Basics, Applet Life Cycle, A Simple Applet, HTML applet tag, Applet Parameters.
[Chapters [11, 13] - Text Book 1]

Text Books

1. Herbert Schildt, *"Java The complete reference"*, 8th Edition, McGrawHill, 2011.
2. Timothy budd, *"An introduction to object-oriented programming"*, 3rd Edition, Pearson Education, 2009.

Reference Books

1 E.Balaguruswamy, *"Programming with Java A Primer"*, 4th Edition, TataMcGraw-Hill, 2009.

2. Y. Daniel Liang, "*Introduction to Java programming"*, 9th Edition, Pearson education, 2012

Reference Link

1. http://en.wikibooks.org/wiki/Java_Programming - Java Learning WikiBook
2. http://www.javabeginner.com - Java Beginner Tutorial

Free Open Source Software

Subject Code : 18CST204 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objective

The student will be able to:

- Obtain information regarding free open source software's (FOSS).
- Analyze the difference between FOSS, commercial software and open source software.
- Gain basic and practical knowledge of Python and Perl language.
- Write beginner level programs both in Python and Perl.

Course Outcomes

1. Understand the features and necessity of FOSS, features of Python, Python operators, syntax for writing Python statements
2. Understand the debug Python programs using the fundamental control structures, data types like numbers and strings and respective built-in functions
3. demonstrate Python programs to the practical usage of data types like Lists, Tuples, Dictionaries, functions and file handling .
4. Understand the features of Perl and able to write Perl programs demonstrating the usage of Perl variables and control structures
5. Analyze the usage of subroutine, pass parameters to a subroutine and call it. Able to implement file operations

Unit – I

Introduction to FOSS: Introduction to Free & Open source softwares, Need of foss
Introduction to Python: History, Features, Installing Python, Running Python, Operators, Statements and Expressions.

Unit – II

Control Structures: Conditional Statements, Loops
Data Types: Mutable vs immutable data type, Numbers and built-in functions, String and string handling functions

Unit – III

Data Types: Lists, Tuples, Dictionaries and their built-in functions.
Functions: Definitions, Declaration, Parameter passing, calling functions
File Handling: creating a file, opening a file, I/O with file (read, write, append), closing a file

Unit – IV

PERL: Features, Components, Syntax and Parsing Rules, Perl variable (Scalars, Arrays, Hashes) Statements and Control Structures

Unit – V

Perl operators, Subroutines, Working with Files

Text Books

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, Prentice Hall.
2. Martin C. Brown "Perl: The complete Reference", 5th Edition, McGraw-Hill

References Books

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.
2. David Beazley and Brian K. Jones “Python Cookbook “O’Reilly.

Web Links

1. https://docs.python.org/3/tutorial/index.html
2. http://perldoc.perl.org/perlintro.html

Digital Logic Design

Subject Code : 18EST206 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

The course is designed with the objective to:

- To solve a typical number base conversions
- To optimize logic gates for digital circuits using various techniques
- To apply knowledge of adders for higher order digital circuits.
- To develop advanced sequential circuits
- To identify new areas for applying the knowledge of flip-flops

Course Outcomes

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

1. Distinguish different number systems and digital codes.
2. Design different arithmetic logic gates.
3. Distinguish different combinational logic circuits and design logic circuits using these combinational circuits
4. Design logic circuits using PLDs.
5. Distinguish different sequential logic circuits and design logic circuits using these sequential circuits.

Unit – I

Number Systems: Binary, Octal, Decimal, Hexadecimal Number Systems. Conversion Of Numbers from One Radix to another Radix, r's Complement and (r-1)'s Complement Subtraction Of Unsigned Numbers, Problems, Signed Binary Numbers, Weighted and No-weighted codes.
Logic Gates and Boolean Algebra: Basic Gates: NOT, AND, OR, Boolean Theorems, Universal Gates, Ex-OR and Ex-NOR Gates, Compliment and dual of logic functions. Minimizations Of Logic Functions, Multilevel Realization Of Logic Functions.

Unit – II

Gate-Level Minimization: Karnaugh Map Method (K-Map): Minimization Of Boolean Functions upto four variables, POS and SOP Simplifications with don't care conditions using K map Combinational Arithmetic Logic Circuits: Design Of Half Adder, Full Adder, Half Subtractor, Full Subtractor, Ripple Adders and Subtractors, Ripple Adder/Subtractor, Carry Look Ahead Adder, Binary Multiplier.

Unit – III

Combinational Logic Circuits: Design of Decoders, Encoders, Multiplexers, Demultiplexers, Higher Order Demultiplexers and Multiplexers, Realization Of Boolean Functions Using Decoders and Multiplexers, Priority Encoders, Code Converters, Magnitude Comparator.

Unit – IV

Programmable Logic Devices: PLA, PAL, PROM. Realization of Switching Functions Using PROM, PAL and PLA. Comparison of PLA, PAL and PROM. Programming Tables of PLA, PAL and PROM.

Unit – V

Introduction to Sequential Logic Circuits: Classification, Basic Sequential Logic Circuits: Latch and Flip-Flop, RS- Latch. RS, JK, T and D Flip flops, truth tables & excitation tables. Conversion of Flip Flops. Flip Flops with Asynchronous Inputs (Preset and Clear). Registers and Counters: Design of Registers, Buffer Register, Control Buffer Registers, Bidirectional Shift Registers, Universal Shift Register, Design of Ripple Counters, Synchronous Counters and Variable Modulus Counters, Ring Counter, Johnson Counter.

Text Books

1. M.Morris Mano, Michael D Ciletti, Digital Design ,4/e, PEA

2. Roth, Cengage Fundamentals of Logic Design, 5/e.

Reference Books:

1. Kohavi, Jha, Switching and Finite Automata Theory,3/e, Cambridge.

2. Leach, Malvino, Saha,Digital Logic Design, TMH 3. Jaya Bhaskar, Verilog HDL primer, PEA

Biology

Subject Code : 18BST209 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Outcomes

After studying the course, the student will be able to:

1. Describe how biological observations of 18thCentury lead to major discoveries in the contemporary world.
2. Convey the classification of biology with respect to morphological, biochemical and ecological aspects, Identify and classify microorganisms.
3. Highlight the basic principles of Mendel's experiments during the passage of genetic material, convey that all forms of life have the same building blocks though the manifestations are diverse and Identify DNA as a genetic material in the molecular basis of information transfer.
4. Classify enzymes and differentiate different mechanisms of enzyme action, Analyze biological processes at the simpler level.
5. Apply thermodynamic principles to biological systems.

Unit – I

Introduction

Fundamental differences between science and engineering using live examples (Eye and Camera, Bird fly and Air craft etc.). Exciting and contemporary aspects of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples of Brownian motion and the origin of thermodynamics.

Unit – II

Classification of organisms and Microbiology

Introduction-Discuss classification based on (a) Cellularity- Unicellular or multicellular (b)Ultra structure- prokaryotes or eukaryotes (c) Energy and Carbon utilization -Autotrophs,heterotrophs, litho tropes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e)Habitat- aquatic or terrestrial (f) Molecular taxonomy- three major kingdoms of life.

Concept of single celled organisms, Concept of species and strains, Identification and classification of microorganisms, Ecological aspects of single celled organisms, Sterilization and media compositions, Growth kinetics.

Unit – III

Genetics, Bio-molecules and Information Transfer

Mendel's Laws-Concept of segregation and independent Assortment-Concept of Allele-Gene Interaction-Epistasis, Concepts of Recessiveness and Dominance of genes, Meiosis and Mitosis, Discuss about the single gene disorders in humans.

Molecules of life-monomeric units and polymeric structures, Discuss about sugars-starch and cellulose, Amino acids- Proteins and lipids, Nucleotides and DNA/RNA.

Molecular basis of information transfer-DNA as a genetic material, Hierarchy of DNA structure-from single stranded to double helix to nucleosomes, Concept of genetic code,Genetic recombination.

Unit – IV

Enzymes and Macromolecular analysis

Enzymology-Enzyme classification, General properties of Enzymes, Mechanism of enzyme action-examples, Enzyme kinetics and kinetic parameters

Protein Functions, Hierarchy in protein Structure-Primary, Secondary, Tertiary andQuaternary, Proteins as enzymes-transporters-receptors and structural elements

Unit – V

Metabolism

Thermodynamics as applied to biological systems. Exothermic and Endothermic versusEndergonic and Exergoinc reactions, ATP as an energy currency-breakdown of glucose toCO_2+ H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis),Energy yielding and Energy consuming reactions

Text Books

1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd.
2) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: P. S. Verma; V. K. Agarwal, S Chand and CO. Ltd, New Delhi-55.
3) A Text Book of Animal Physiology: A. K. Berry, EMKAY Publications, New Delhi-51.

Reference Books

1) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
2) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.
3) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher.
4) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers.

Object Oriented Programming through Java Lab

Subject Code: 18CSL202 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives

- To develop skills to design and analyze the applications with respect to java programming.
- To strengthen the ability to identify and apply the suitable object oriented concept for the given real world problem.

Course Outcomes

1. Able to write, compile and execute simple java programs.
2. Understand and apply Object Oriented features to solve well specified problems.
3. Able to make use of reusability on scenario based and define ADT for business problems.
4. Able to create user defined packages and handle exceptions at run time.
5. Apply Threading concept based on application requirement and design Applet programming.

List of Experiments

1. A) Write a java program that displays welcome to follow by user name. Accept user name from the user.
   B) Write a java program that prompts the user for an integer and then prints out all the prime numbers up to that integer.

2. A) Write a java program to create a class Rectangle. The class has attributes Length and Width. It should have methods that calculate Area and Perimeter of the Rectangle. It should have read Attributes () method to read Length and Width from the user.
   B) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are1 and 1. Every subsequent value is the sum of the two values preceding it.

3. A) Write a java program that uses both Recursive and Non-Recursive functions to find the factorial of a given number.
   B) Write a java program that checks whether the given string is Palindrome or not. Ex: MALAYALAM is a Palindrome.

4. A) Write a java program to illustrate method overloading and method overriding.
   B) a java program that illustrates how java achieved Run Time Polymorphism.

5. A) Write a java program to demonstrate the use of subclass.
   B) Write a java program for abstract class to find areas of different shapes.
6. Write a Java program to implement the concept of importing classes from user defined package and creating packages.

7 Write a java program to implement the concept of Exception Handling by using predefined and user defined exceptions.

8 Write a java program to implement the concept of Threading by Extending Thread class and by Implementing Runnable Interface.

9 Write a program using Applet to display a message in the Applet and for configuring Applets by passing parameters.

10 Write a java program to implement thread priorities

Text Books

1. Herbert Schildt: "Java The complete reference", 8th Edition, Tata McGraw Hill, 2011.
2. E.Balaguruswamy: "Programming with Java A Primer", 4th Edition, Tata McGraw Hill, 2009.

Reference Books

1. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Beginning in Java 2, Iver Horton, Wrox Publications.

Free Open Source Software Lab

Subject Code : 18CSL203 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objective

- To identify the difference between open sources vs free software
- To work in open source environment.
- To develop programs with the help of open source - Python
- To identify the importance of PERL
- To learn the file handling using open source technologies.

Course Outcomes

1. Able to recognize the benefits and features of Open Source Technology.
2. Perform basic level application deployment, Kernel configuration installation
3. Understand each open source technology and its importance.
4. Interpret, Contrast and compare open source products among themselves of Python, PERL etc,
5. Able to find differences between open sources Vs free software Vs commercial softwares

List of Experiments

1. Implement a Python program that obtains the name from the user and prints the message "Hello *Username* , Welcome to the Python World!".
2. Implement a Python program to check Armstrong Number
3. Implement a python program to check whether a string is palindrome or not
4. Implement a Python program to print all the prime numbers below n. n value should be taken from the user at the time of execution.
5. Write a python program to remove duplicates from the list
6. Implement Sorting Program in Python : Enter a list of numbers and sort the values in largest-to-smallest order.
7. Implement a Python program for finding the factorial of a given number.
8. Implement a STACK program by using PYTHON.
9. Implement a QUEUE program by using PYTHON.
10. Implement a Python Program for creating a dictionary and display its keys alphabetically.
11. Write a Python program to convert a list into a nested dictionary of keys.
12. Implement a Python Program that reads and displays the contents of a file
13. Implement a PERL program that creates sorting sub routine which sorts the Strings alphabetically
14. Implement a PERL Program to display the contents of a file

Text Books

1. Wesley J. Chun "Core Python Programming" 2nd Edition Prentice Hall
2. Martin C. Brown "Perl: The complete Reference" 2nd Edition McGraw-Hill

Reference Books

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.

Digital Logic Design Lab

Subject Code : 18ESL205 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives:

- Verify the truth tables of logic gates
- Design and verify the operation of combinational circuits.
- Design and verify the operation of code converters.
- Design and verify the operation of sequential circuits
- Verify the operation of Johnson/ring counter

Course Outcomes:

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

1. Distinguish logic gates for design of digital circuits
2. Design different types of Combinational logic circuits
3. Design different types of Code converters
4. Analyze the operation of flip-flops
5. Apply knowledge of flip-flops in designing of Registers and Counters

List of Experiments (At least ten experiments are to be done) :

1. Verification of logic Gates
2. Half/Full Adder/Subtractor
3. Binary-Gray & Gray-Binary Converter
4. MUX/DEMUX
5. Comparators
6. Encoder/Decoder
7. Flip-Flops
8. 4 Bit - Counter
9. Shift Registers
10. Johnson/Ring Counters
11. RAM

Environmental Sciences

Subject Code : 18MCT202 **External Marks: 60**
Credits : 0.0 **Internal Marks: 40**

Course Objectives:

- Memorize the knowledge of environment and status of different resources on earth.
- Identify the significance, arrangement, causes of annihilation and conservation of ecosystems and biodiversity.
- Discriminate causes, effects of a variety of pollutions and suitable control methods.
- Identify the hurdles of sustainable development; evaluate the different environmental management and legal issues.
- Describe the population growths, health problems and evaluate the environmental assets.

Course Outcomes

By Studying this Course Student will

1. Recognize and speaks well again on the general issues of environment and know how to Conserve resources for better usage.
2. Explain and demonstrate the ecosystems setup, assess the magnitude of diversity to upkeep.
3. Examine a range of pollution problems along with control and their eco-friendly disposal Methods.
4. Translate the sustainable development practice through clean development mechanisms.
5. Evaluate the changing trends of world population and compile the information in order to document the environmental assets.

Unit – I

Importance of Environmental Studies and Natural Resources: Definition of Environment – Importance - Need for Public Awareness

Forest Resources - Use and over exploitation - deforestation – consequences – case study

Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment

Food Resources – Food security concept - changes caused by agriculture and overgrazing - effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – concept of sustainable agricultural methods - case study

Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources

Unit – II

Ecosystems: Definition – Structure of ecosystem: producers - consumers – decomposers.
Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow – Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession

Biodiversity and its conservation: Definition of Biodiversity - Values of biodiversity - Bio-geographical classification of India - Hot Spots of India - Endangered and endemic species of India –Threats to biodiversity - Conservation of biodiversity

Unit – III

Environmental Pollution: Definition – causes - effects - control measures of Air pollution - Water pollution - Noise pollution – Marine Pollution - Nuclear hazards.
Solid waste Management: Causes - effects - disposal methods of urban waste – biomedical wastes - case studies
Disaster management: floods – earthquakes – cyclones

Unit – IV

Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Water conservation: Rain water harvesting- Watershed management - Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion -World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act -Forest (Conservation) Act

Unit – V

Human Population and the Environment: Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health

Text Books

1. Shashi Chawla. 2015, *A Text book of Environmental Studies*, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, *Environmental Studies*, Revised edition, TMH, New Delhi

Reference Books:

1. Odum, E.P, *Fundamentals of Ecology*, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.
2. P. D. Sharma, *Ecology and Environment*, Revised edition, Rastogi Publications (P) Ltd.
3. Cunningham, W.P., Cunningham, M.A., *Principles of Environmental Science*, TMH, New Delhi.
4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, Mc Graw – Hill International edition.
5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, Pearson Publications.

Probability and Statistics with R

Subject Code : 18BST205 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

- To describe Binomial, Poisson's distributions and concepts of curve fitting.
- To introduce the concept of a continuous random variable, its expectation and moment generating function and specifically for Normal distribution.
- To analyze sampling distributions and test the hypothesis by t- test, Chi-Square and F-test.
- To study types of errors, one tail and two tail tests, perform one way and two way ANOVA.
- To determine correlation and regression coefficients for given data.

Course Outcomes

On completion of this course, students will be able to

1. Estimate probability for a variable following Binomial, Poisson's, and fit a curve to the given data.
2. Calculate the expectation and moment generating function of a continuous random variable and probability of Normal distribution.
3. Conduct t- test, Chi-Square, F-test for a sampling distribution and their point estimations.
4. Analyze ANOVA for one way and two way classified data.
5. Determine correlation and regression coefficients for given data.

Unit – I

Discrete Random variables and Distributions

Introduction- Random variables- Discrete Random variable-Distribution function-Expectation-Moment Generating function.

Discrete distributions: Binomial, Poisson distributions and their fitting to data.

***Not to be examined**: Introduction to R software-Vectors-Matrices-Arrays-list-Data frames-Basic arithmetic in R-Importing data

Unit – II

Continuous Random variable and distributions

Introduction-Continuous Random variable - Distribution function- Expectation-Moment Generating function.

Continuous distribution: Normal distributions, Normal approximation to Binomial distribution

***Not to be examined:** Computing probability and moments using R-software

Unit – III

Sampling Theory

Introduction - Population and samples- Sampling distribution of means (σ known)-Central limit theorem- t-distribution- Sampling distribution of means (σ unknown)- Sampling distribution of variances - χ^2 and F-distributions- Point estimation- Maximum error of estimate - Interval estimation.

***Not to be examined:** Computing Probabilities with sampling distributions and confidence intervals

Unit – IV

Tests of Hypothesis

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- Tests concerning one mean and proportion, two means-Proportions and their differences- ANOVA for one-way and two-way classified data.

***Not to be examined:** Performing tests using t.test( ), chisq.test( ), anova( ) commands in R

Unit – V

Curve fitting and Correlation

curve fitting-Straight line, 2^{nd} degree parabola, power curve ($y=ax^b$), exponential curves ($y= ab^x$, $y = ae^{bx}$).

Concept of correlation–types of correlation-Karl-Pearson correlation coefficient method and its properties-Rank Correlation Coefficient. Regression-Linear regression and its properties

***Not to be examined:** Performing correlation regression using cor( ),lm( ), lnm( ), packages of R

Note: The student is required to do exercises in R-programming in the Lab as they have lab course in the same semester

Text Books

1. **Richards A Johnson, Irvin Miller and Johnson E Freund**. Probability and Statistics for Engineering, 9^{th} Edition, PHI.
2. **G. Jay Kerns**, Introduction to Probability and Statistics Using R, First Edition ISBN: 978-0-557-24979-4. (Free e-book from R software website)
3. **T.K.V. Iyengaret.al.,** Probability and Statistics, S Chand Publications

Reference Books

1. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists,8^{th} Edition, Pearson 2007.
2. **William Menden Hall, Robert J. Bever and Barbara Bever**, Introduction to probability and statistics, Cengage learning.2009
3. **Sheldon, M. Rosss**, Introduction to probability and statistics Engineers and the Scientists,
   4^{th} edition, Academic Foundation,2011
4. **Johannes Ledolter and Robert V.Hogg**, Applied statistics for Engineers and Physical Scientists, 3^{rd} Edition, Pearson,2010
5. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India

Reference Links

1. https://onlinecourses.nptel.ac.in/noc17_ma17/preview
2. https://onlinecourses.nptel.ac.in/noc17_ma17/preview
3. https://www.tutorialspoint.com/r/
4. https://www.r-tutor.com/elemntary-statstics

Computer Organization & Architecture

Subject Code : 18CST205 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

To expose the students to the following:

- How Computer Systems work & the basic principles
- Instruction Level Architecture and Instruction Execution
- The current state of art in memory system design
- How I/O devices are accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism and concept of advanced
- pipelining techniques

Course Outcomes

1. Draw the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Explain central processing unit and ability to implement different arithmetic operation on digital computer and know the design of arithmetic and logic unit.
3. Ability to understand different types of memory unit and page replacement policy.
4. Ability to understand input output device and their interconnection to CPU along mode of data transfer from I/O device to memory .
5. Given a CPU organization, assess its performance, and apply design techniques to enhance performance using pipelining, parallelism and RISC methodology

Unit – I

Functional blocks of a computer: CPU, memory, input-output subsystems, control unit. Instruction set architecture of a CPU – registers, instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.

Unit – II

Data representation: signed number representation, fixed and floating point representations, character representation. Computer arithmetic – integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication – shift-and add, Booth multiplier, array multiplier, etc. Division restoring and non-restoring techniques, floating point arithmetic.

Unit – III

Memory organization: Memory interleaving, concept of hierarchical memory organization, cache memory, cache size vs. block size, mapping functions, replacement algorithms, write policies.

Unit – IV

Peripheral devices and their characteristics: Peripheral device, Input-output interface I/O Bus and Interface Modules, I/O versus memory bus, Isolated versus memory-mapped I/O, Asynchronous data transfer, modes of transfer, priority interrupt and direct memory access.

Unit – V

Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards. **Parallel Processors**: Introduction to parallel processors, Concurrent access to memory and cache coherency.

Text Books

1. "Computer Organization and Design: The Hardware/Software Interface",5th Edition by David A. Patterson and John L. Hennessy, Elsevier.
2. "Computer System Architecture", Revised 3rd Edition by M.Morris Mano and Rajiv Mall, Pearson Education.

Reference books

1. "Computer Architecture and Organization", 3rd Edition by John P. Hayes,WCB/McGraw-Hill
2. "Computer Organization and Architecture: Designing for Performance", 10th Edition by William Stallings, Pearson Education.
3. "Computer System Design and Architecture", 2nd Edition by Vincent P. Heuring and Harry F. Jordan, Pearson Education.
4. "Computer Organization and Embedded Systems", 6th Edition by Carl Hamacher, McGraw Hill Higher Education.

Operating Systems

Subject Code : 18CST206 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives:

- Understand structures and functions of operating systems
- Learn about Processes, Threads and scheduling Algorithms
- Understand the principals of concurrency and Deadlocks
- Learn various memory management Schemes
- Study files system and Mass storage Devices.

Course Outcomes:

1. Explain the different structures of operating system and design various scheduling algorithms.
2. Propose solutions for achieving process synchronization and design deadlock prevention, detection, avoidance algorithms.
3. Compare and contrast various memory management schemes,
4. Design and implement file systems.
5. Familiarize with disk scheduling and device drivers.

Unit – I

Computer System and Operating System Overview: Overview of Computer Operating System, Operating systems functions, Types of operating systems, System calls.
Process Management: Process concept, Process scheduling, Operations, Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

Unit – II

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, synchronization examples.
Principles of deadlock: System model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock.

Unit – III

Memory Management: Swapping, Contiguous memory allocation, paging, structure of the page table, segmentation.
Virtual Memory Management: Virtual memory, demand paging, page replacement algorithms: FIFO, Optimal page replacement and LRU; Allocation of Frames, Thrashing.

Unit – IV

File System Interface: The concept of a file, Access Methods: Sequential Access, Direct Access and Indexed Access; Directory structure, files sharing, protection.
File System Implementation: File system structure, file system implementation, directory implementation, allocation methods: Contiguous allocation, Linked allocation and Indexed allocation; free-space management.

Unit – V

I/O management & Disk scheduling: I/O Devices, Organization of I/O functions, I/O Buffering Mass-storage structure, Disk structure, Disk attachment, Disk scheduling,

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne Operating System Principles- 7th Edition, John Wiley.
2. Stallings, 2005, Operating Systems – Internal and Design Principles Sixth Edition, Pearson education.

Reference Books:

1. D.M. Dhamdhere Operating systems-A concept based approach-, 2nd Edition, TMH
2. Crowley Operating System A Design Approach-, TMH.
3. Andrew S Tanenbaum Modern Operating Systems, 2nd edition Pearson/PHI.

Reference Links

1. http://nptel.iitm.ac.in/courses/Webcourse-contents-IISc-BANG/Operating%20Systems New_index1.html

Database Management Systems

Subject Code : 18CST207 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

- To introduce basic RDBMS concepts, SQL, Database Design and Query processing. And also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments, and various Data structures for External Data storage and efficient retrieval

Course Outcomes

Students will be able to:

1. Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
2. Interpret, Design and Implement an E-R Model.
3. Create /Modify the Structure and write optimized SQLQueries to extract and modify Information from Tables or Views.
4. Apply proper Techniques such as Normalization and analyze the applicability of a Specific Normal form in designing a Database.
5. Explain broad range of Database Management issues including Data integrity, Concurrency and Recovery and Compare various Indexing, Hashing and File Organization Techniques.

Unit – I

Database System Applications; Database Systems versus file Systems; View of Data : Data Abstraction, Instances and Schemas ; Data Models :The ER Model ,Relational Model, Other Data Models ;Database Languages: DDL , DML ,Database Access from Application Programs; Data base Users and Administrators; Transaction Management ;Database System Structure: Storage Manager, the Query Processor***.(Korth)***

Unit – II

Database Design and ER diagrams :Beyond ER Design;Entities,Attributes and Entity sets; Relationships and Relationship sets; Additional features of ER Model ;Conceptual Design with the ER Model ;Introduction to the Relational Model; Integrity Constraint Over relations ; Enforcing Integrity constraints; Querying relational data ; Logical database Design :ER to Relational. Introduction to Views: Destroying/Altering tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division ***(Ramakrishnan)***

Unit – III

SQL: Queries,Constraints,Triggers:Over view ;The Form of a Basic SQL Query ; Nested Queries: Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators; Aggregative Operators ; NULL values : Comparison using Null values; Logical connectives AND, OR, and NOT, Impact on SQL Constructs, Outer Joins ,Disallowing NULL values; Complex Integrity Constraints in SQL; Triggers and Active Data bases. ***(Ramakrishnan)***

Unit – IV

Schema refinement and Normal forms: Problems Caused by Redundancy, Decompositions, Problem related to Decomposition; Functional Dependencies; Reasoning about FDS ; FIRST,

SECOND, THIRD Normal Forms, BCNF ;Properties of Decompositions: Lossless join Decomposition, Dependency preserving Decomposition ; Schema refinement in Database Design.***(Ramakrishnan)***

Transaction Concept; Transaction State; Implementation of Atomicity and Durability; Concurrent Executions ; Serializability; Recoverability; Lock –Based Protocols :Locks, Granting of locks,2PL,implementation of locking ; Timestamp Based Protocols***.(Korth)***

Unit – V

Recovery System: Failure classification; Log – Based Recovery; Shadow Paging; Recovery with Concurrent Transactions ; Buffer Management; Failure with loss of nonvolatile storage; **(Korth)**

Data on External Storage; File Organization and Indexing: Cluster Indexes, Primary and Secondary Indexes; Index Data Structures: Hash Based Indexing, Tree based Indexing; Comparison of File Organizations; B+ Trees :A Dynamic Index Structure **(Ramakrishnan)**

Text Books

1. Raghurama Krishnan, Johannes Gehrke: Database Management Systems.TATA McGrawHill , 3rd Edition
2. Silberschatz, Korth :Database System Concepts. McGraw hill,5th Edition – 2006.

Reference Books

1. https://www.coursera.org/course/db
2. Peter Rob ,Carlos Coronel: Data base Systems design Implementation and Management. Cengage Learning, 7th Edition
3. Elmasri, Navrate:Fundamentals of Database Systems. Pearson Education,6th Edition-2010
4. C.J.Date: Introduction to Database Systems. Pearson Education,4th Edition-2005.

Design & Analysis of Algorithms

Subject Code: 18CST208 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

- Analyze the asymptotic performance of algorithms.
- Write rigorous correctness proofs for algorithms.
- Demonstrate a familiarity with major algorithms.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcomes

1. Measure the performance and calculate the Time & Space complexities of algorithms.
2. Design effective algorithms based on Divide and Conquer and Greedy methods.
3. Discuss various problems suitable to Dynamic programming.
4. Construct a state space tree to solve different problems using Backtracking technique.
5. Find an optimal solution by applying different Branch and Bound techniques and illustrate Non-deterministic algorithms.

Unit – I

Introduction: Areas of Study of Algorithms; Pseudo-code Conventions; Performance Analysis, Asymptotic notations, Amortized analysis.

Unit – II

Divide and conquer: General method, Applications: Binary search, Quick sort, Merge sort, Strassen's Matrix multiplication.

Greedy method: General method, Applications: Job sequencing with deadlines, Knapsack problem, Minimum cost spanning trees, Single source shortest path problem

Unit – III

Dynamic Programming: Principle of Optimality, Applications: Matrix chain multiplication, Optimal Binary Search Trees (OBST), 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem.

Unit – IV

Graph traversals: DFS & BFS, Connected components, Articulation point & Bi-Connected components.

Backtracking: General method, Applications: n-Queens problem, Sum of subsets problem, Graph Coloring, Hamiltonian cycles.

Unit – V

Branch and Bound: Least Cost (LC) Search, FIFO Branch and Bound & LC Branch and Bound, Applications: 0/1 knapsack problem, Travelling sales person problem.

NP-Hard and NP-Complete problems: Basic concepts, Non-deterministic algorithms, Cook's theorem.

Text Book:

1) Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Second Edition, Universities Press, India, 2010.
2) Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson Education, Fourth Edition, India, 2009

Reference Books

1. Anany Levitin, ―Introduction to the Design and Analysis of Algorithms‖, Third Edition, Pearson Education, 2012.
2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, ―Introduction to Algorithms‖, Third Edition, PHI Learning Private Limited, 2012.
3. Harsh Bhasin, ―Algorithms Design and Analysis‖, Oxford university press, 2016.

Probability and Statistics with R Programming

Subject Code : 18BSL203 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives

- To introduce basic R operations and estimate the probabilities of a Binomial, Poisson's, Normal distribution using R programming.
- To determine the probabilities of sample mean using central limit theorem. And to estimate confidence interval using R programming.
- To analyze z-test and t-test for sampling distribution using R - programming.
- To perform F-test and ANOVA for analysis of variance and χ^2-test for testing goodness of fit or independence of attributes.
- To determine correlation and regression coefficients for given data using R programming

Course Outcomes

On completion of this course, students will be able to

1. Estimate the mean, variance of a random variable and probabilities of a Binomial, Poisson's, Normal distribution using R programming.
2. Calculate mean, variance of Normal distribution and confidence interval of a discrete or continuous distribution using R.
3. Perform t – test and z – test for sampling distributions using R programming.
4. Analyze tests of significance using F test, χ^2-test and ANOVA using R programming.
5. Determine the coefficient of correlation and regression equations for given data using R commands.

List of Experiments

1. Write the commands on R console to calculate the probability for Binomial distribution functions.
2. Write the commands on R console to calculate the probability for Poisson's distribution functions.
3. Write the commands on R console to calculate the probability for Normal distribution functions.
4. Write the commands on R console to calculate probability of sample means using central limit theorem.
5. Write the commands of R console to calculate confidence intervals for proportions and means.
6. Write the commands on R console to perform z-test for testing the Null Hypothesis for single proportion and difference of proportions at α level of significance.
7. Write the commands on R console to perform z-test for testing the Null Hypothesis for single mean and difference of means at α level of significance.
8. Write the commands on R console for the following:
   Perform t-test for testing the Null Hypothesis for single mean and difference of means at α level of significance.

9. Write the commands on R console for the following: Perform F-test for testing the Null Hypothesis for variance at α level of significance.
10. Write the commands on R console for the following:
    a) Perform χ^2-test for testing the goodness of fit.
    b) Perform χ^2-test for independence of attributes.
11. Write the commands on R console for the following:
    a) Perform ANOVA (one way classification) to test on the basis of sample observations whether the means of 3 or more populations are equal or not.
    b) Perform ANOVA (two way classification) to test on the basis of sample observations whether the means of 3 or more populations are equal or not based on two different factors.
12. Write the commands on R console for the following:
    a) Analyze the correlation between two variables using Karl Pearson's coefficient of correlation
    b) Calculate the regression equations for two and three variables.

Text Books

1. **Miller and John E. Freund's:** Probability and Statistics for Engineers, Prentice Hall of India.By Richard A. Johson. 9th Edition Prentice Hall of India.
2. **G. Jay Kerns**, Introduction to Probability and Statistics Using R, First Edition ISBN: 978-0-557-24979-4. (Free e-book from R software website)

Reference Books:

1. **Robert I. Kabacoff,** R in Action, Second Edition, Data analysis and graphics with R ISBN: 9781617291388, Printed in the United States of America.
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India
3. **T.K.V. Iyengar et al.,** Probability and Statistics, S Chand Publications.
4. **Jay L. Devore,** Probability and Statistics for Engineering and Sciences, 8th Edition, Cengage Learning. ISBN 13: 978-81-315-1839-7.

Reference links

1. https://onlinecourses.nptel.ac.in/noc17_ma17/preview
2. https://onlinecourses.nptel.ac.in/noc17_ma17/preview
3. https://www.tutorialspoint.com/r/
4. https://www.r-tutor.com/elemntary-statstics

Operating Systems Lab

Subject Code: 18CSL204 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives

- To understand the design aspects of operating system.
- To study the process management concepts & Techniques.

Course Outcomes

1. Choose the best CPU scheduling algorithm for a given problem
2. Describe and analyze the memory management and its allocation policies.
3. Identify the performance of various page replacement algorithms
4. Develop algorithm for deadlock avoidance, detection.
5. Design and implement file allocation techniques

List of Experiments

1) Simulate the following CPU scheduling algorithms
   a) FCFS b) SJF
2) Simulate the following CPU scheduling algorithms
   a) Round Robin b) Priority
3) Simulate Bankers Algorithm for Dead Lock Avoidance
4) Simulate Bankers Algorithm for Dead Lock Detection
5) Simulate MVT and MFT
6) Simulate all page replacement algorithms
   a) FIFO b) LRU c) Optimal
7) Simulate Paging Technique of memory management.
8) Simulate all file allocation strategies
   a) Sequential b) Indexed c) Linked

Text Books

1 Abraham Silberchatz, Peter B. Galvin, Greg Gagne Operating System Principles- 7th Edition, John Wiley.
2 Stallings, 2005, Operating Systems – Internal and Design Principles Sixth Edition, Pearson education.

Reference Books

1. http://nptel.iitm.ac.in/courses/Webcourse-contents-IISc-BANG/Operating%20Systems New_index1.html
2. D.M. Dhamdhere Operating systems-A concept based approach-, 2nd Edition, TMH
3. Crowley Operating System A Design Approach-, TMH. Andrew S Tanenbaum Modern Operating Systems, 2nd edition Pearson/PHI.

Database Management Systems Lab

Subject Code : 18CSL205 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objective

- To teach defining Logical Database schema, Query writing to retrieve required information from single/multiple tables , Creation and manipulation of views. Implementing Operations on relations (Tables) using PL/SQL,Writing Triggers for implementing automatic operations and constraints, Writing Cursors, Functions and Procedures for various tasks on tables, Exception handling and Packages.

Course Outcome

After completion of this course, the Students will be able to:

1. Create tables with required attributes, data types and constraints.
2. Compose complex Queries to retrieve required information from Database and manipulate data in the Database.
3. Devise Triggers to implement various complex Database Constraints
4. Compose PL/SQL Procedures using Cursors
5. Design Procedures, Functions and Packages for required Database tasks.

List of Experiments

1. **Execute DDL and DML commands**
   Execute single line and group functions on a table.
2. Create tables for various relations in SQL with necessary integrity constraints, keys, data types. Verify messages by violating the constraints
   Perform various join operations like Equi and non-equi, outer join, self join on two tables and show the results.
3. Execute DCL and TCL Commands.
   Write a PL/SQL program for accepting a number and indicate whether it is odd or even.
4. Write a PL/SQL program to find the largest of three integers.
   Write a PL/SQL program to find the factorial of a given integer and store the integer with it's factorial in a table .
5. Write a PL/SQL program to display the sum of digits of given number.
   Write a PL/SQL program to display the reverse of given number.
6. Write a PL/SQL program to accept two numbers N1 and N2 and perform division operation. And also handle the exception "Divide by zero "when N2 is zero.
   Write a PL/SQL program to accept the customer id from the user and display the corresponding customer name and address from customer table. Raise user defined exception "invalid- id" when customer id is <=0 and catch built in exceptions "no data found " and display suitable messages for each exception.
7. Write a PL/SQL program using Cursors to update the salaries of Employees as follows. And also count and display the no. of records have been updated.*/
   if sal<1000 then update the salary to 1500.
   if sal>=1000 and <2000 then update the salary to 2500.
   if sal>=2000 and <=3000 then update the salary to 4000.
8. Write a PL/SQL program using triggers to automatically store all the deleted records from employee table in a separate table called "employees history " along with date of deletion,user-id of the person who deleted.

9. Write a PL/SQL program to which computes and returns the maximum of two values using a function.
   Write a PL/SQL procedure to display all the records of employee table in a neat format.
10. Write a PL/SQL program to create a Package to group logically related variables, types and sub programs and use the package elements later.

Reference Books

1. SQL, PL/SQL the Programming Language of Oracle by Ivan Bayross, BPB Publications, 4th Edition

Introduction to Number Theory
(Interdisciplinary Elective – I)

Subject Code : 18IET213 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives
Student will be able to

- Identify importance of divisibility, prime and composite numbers in engineering field.
- Understand the process of congruence and solve linear congruence using their properties.
- Gain knowledge and importance of Euler-Fermat Theorem, Wilson Theorem, Chinese Remainder Theorem.
- Know the application of Mobious function and Euler totient function in their relevant problems.
- Calculate Quadratic Residues and use Quadratic reciprocity law in engineering subjects.

Course Outcomes
Student is able to

1. Solve the divisibility problems, GCD, LCM, Bracket function.
2. Solve congruence problems, solutions of linear congruence equations.
3. Apply Euler-Fermat Theorem, Wilson and Chinese Remainder Theorems in engineering problems
4. Apply Euler-totient function and solve engineering relevant problems.
5. Estimate the reciprocity of a number.

Unit – I
Divisibility
Divisibility, Statement of Division Algorithm, GCD, Prime, Composite numbers, Statement of Fundamental theorem of Arithmetic, LCM, Bracket function, Properties.

Unit – II
Congruence
Congruence, linear congruence, properties and their solutions

Unit – III
Euler-Fermat Theorem, Wilson Theorem, The Chinese Remainder Theorem
Statement of Euler's Theorem, Fermat Theorem, Wilson Theorem, the Chinese Remainder Theorem, properties and problem.

Unit – IV
Euler's Function
Mobius function $\mu(n)$, Euler's totient function $\emptyset(n)$, product formula.

Unit – V
Quadratic Residues and the Quadratic Reciprocity Law
Quadratic residues, Legendre's symbol and its properties, Evolution of (-1/p) and (2/p), Gauss' lemma, the Quadratic Reciprocity law, application of the reciprocity law, the Jacobi symbol.

Text books

1. Tom M, Apostol: Introduction to Analytic Number theory (Springer International Student Edition). Naroda Publishing House, Springer Publisher -8th reprint.ISBN: 81-85015-12-0.
2. Abhijit das: Computational number theory, CRC Press, A Chapman & Hall Book.(Online edition)

Reference Books

1. Theory of Numbers by Prakash Om, Laxmi Publications (p) LTD, New Delhi.

Computer Aided Engineering Drawing
(Interdisciplinary Elective – I)

Subject Code : 18IET215 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

Students will have

- To practice the computer aided drafting which include points, lines, curves, polygons and dimensioning
- To practice the types modeling which include object selection commands – edit, zoom, cross hatching, pattern filling, utility commands
- To practice computer aided solid modeling which include Isometric projections, orthographic projections of isometric projections
- To practice isometric projections, Orthographic projections and solids using AutoCAD.
- To practice computer aided solid modeling in 3D learn about 3D wireframe by using AutoCAD

Course Outcomes

Students will get ability

1. Draw points, lines, curves, polygons, dimensioning etc., using Drawing tools by AutoCAD.
2. Draw object by using object selection commands to edit the drawing, 2D wire framing in AutoCAD.
3. Draw the object applying utility and modified commands by AutoCAD.
4. Draw isometric projections, Orthographic projections and solids using AutoCAD.
5. Draw simple solids in 3D learn about 3D wireframe by using AutoCAD.

Unit – I

INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, Dimensioning.

Unit – II

TYPES OF MODELING: Object selection commands – edit, zoom, cross hatching, pattern filling. Rotate, text, Mtext and 2D wire frame modeling.

Unit – III

COMMANDS: Utility commands- limits and shortcuts all commands, and modified commands – join, break, break point, trim, move, extend, mirror, offset, array, and stretch.

Unit – IV

COMPUTER AIDED SOLID MODELING: Isometric projections, orthographic projections of isometric projections.

Unit – V

3D MODELING: 3D wire frame modeling, modeling of simple solids.

Text Books

1. Text book of Engineering Graphics, K.C. john, PHI Publications
2. Machine Drawing, K.L.Narayana ,P. Kannaiah and K.Venkata reddy, fourth edition / New age International publishers.

Reference Books

1. Engineering Graphics with Auto CAD, Revised edition,Text Book by D.M.Kulkarni, A.P.Rastogi, A.K.Sarkar PHI learing Pvt.Limited NewDelhi
2. Text book of Engineering Drawing with Auto-CAD, second edition, K.venkata reddy/B.S. Publications.
3. Engineering drawing by N.D Bhatt , Charotar publications.

Introduction to Mathematical Simulation and Modeling
(Interdisciplinary Elective – I)

Subject Code : 18IET216 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

By the end of this course, students in this class will understand the basic principles of programming and implementing mathematical concepts in MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations. The ultimate goal is to motivate the students for their profession and for future courses in curriculum.

Course Outcomes:

1. Translate mathematical methods to MATLAB code.
2. Generalize results and represent data visually.
3. Apply computer methods for solving a wide range of engineering problems.
4. Utilize computer skills to enhance learning and performance in other engineering and science courses.
5. Demonstrate professionalism in interactions with industry.

Unit – I

Introduction to MATLAB: Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Clearing Operations, Commands, Data types, Operators.

Unit – II

Data and Data Flow In MATLAB: Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Functions.

Unit – III

MATLAB Programming: Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

Unit – IV

MATLAB Advanced: Plotting graphs, Creating Plot & Editing Plot, MATLAB-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

Unit – V

SIMULINK :

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Introduction to scilab.

Text Books:

1. Getting Started With Matlab: A Quick Introduction for Scientists and Engineers (English) by Rudra Pratap, OXFORD University Press.
2. Matlab Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication

Reference Books:

1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang , Wenwu Cao, Tae- Sang Chung, John Morris.

Engineering Optimization Techniques
(Interdisciplinary Elective – I)

Subject Code : 18IET218 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- To formulate linear programming problem and solve linear programming problem by using graphical procedure.
- To understand computational procedure of simplex method and artificial variable technique.
- To understand the step wise procedure in obtaining optimum solution to transportation problem and Hungarian method for assignment problem.

Course Outcomes:

On completion of this course, students should be able to

1. Formulate and solve linear programming problem by using graphical method.
2. Solve the linear programming problem using simplex method and artificial variable technique.
3. Solve both balanced and unbalanced transportation problem.
4. Solve both balanced and unbalanced assignment problems.
5. Solve single variable and multi variable optimization problems using classical optimization techniques.

Unit – I

Linear programming: Formation of linear programming problem, Graphical solution to linear programming problem, simplex method, Big-M method.

Unit – II

Transportation Problem: Formulation, Optimal solution, unbalanced transportation problems

Unit – III

Assignment Problem: Formulation, Optimal solution, Traveling salesman problem.

Unit – IV

Network Models: Project network, CPM and PERT, Critical path scheduling, Cost considerations in project scheduling.

Unit – V

One dimensional Optimization methods: Fibonacci, Golden Section methods, Gradient of a function, steepest descent method

Genetic algorithm: working principle, reproduction, crossover, mutation, draw backs of GA.

Text Books:

1. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
2. Operations Research, S.D. Sharma, Kedarnath Ramanadh Pub.
3. Optimization for Engineering Design by K.Deb, PHI

References Books:

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Operations Research by P. Rama Murthy, New Age Pub.
3. CPM & PERT, L.S. Srinath, Affiliated East West Press

Introduction to Electronic Measurements
(Interdisciplinary Elective – I)

Subject Code : 18IET219 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

- Study of performance characteristics of different electronic measuring instruments.
- Subject introduces Signal Generator and Wave Analyzers for analysis of EM spectrum.
- Deals about Oscilloscopes and internal circuitry for measurement of electronic parameters.
- Brief discussion about all AC bridges, design methods and its applications.
- This subject includes transducers for the measurement of non electrical parameters and its signal conditioning techniques using electronic circuitry

Course Outcomes

1. Identify electronic instruments, their Characteristics and use.
2. Describe various signal generators, wave analyzers for distortion measurements.
3. Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
4. Design the AC bridges for measurement of resistance, inductance, capacitance for frequency changes.
5. Explain various types of transducers and their applications for measuring non- electrical parameters.

Unit – I

Performance characteristics of instruments: Static characteristics, accuracy, resolution, precision, expected value, error and sensitivity. Errors in measurement and dynamic characteristics: speed of response, fidelity, lag and dynamic error., **Voltmeters:** Multirange, range extension. **Ammeters:** Shunt and thermocouple type ammeter. **Ohmmeters**: Series type and shunt type.

Unit – II

Signal Generators - standard and AF sine and square wave signal generators, function Generators, Wave Analyzers, Harmonic distortion analyzers .

Unit – III

Cathode Ray Oscilloscopes: CRT features, Block Diagram of CRO, Dual beam CRO, measurement of amplitude and frequency, Dual trace oscilloscope, Digital storage oscilloscope.

Unit – IV

AC Bridges:

Measurement of inductance: Maxwell's bridge, Anderson bridge., Measurement of capacitance: Schearing bridge. Wheatstone bridge and Wien Bridge

Unit – V

Transducers: Classification of Transducers**,** Linear Variable Differential Transformer, Thermocouples, thermistors, sensistors, Digital Data acquisition systems.

Text Books:

1. Electronic instrumentation – H.S.Kalsi, Tata McGraw Hill, 2004, 2/e.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 2002, 5/e.

Reference Books:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2003, 2/e.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2004, 2/e.

IT Systems Management
(Interdisciplinary Elective – I)

Subject Code : 18IET21B **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

- Provides extensive theoretical knowledge of IT infrastructure.
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for a business environment.
- Builds upon the essential core Network Security and storage management with greater emphasis.

Course Outcomes

1. Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario.
2. Analyze and evaluate the impact of new and current ICT services to an organization.
3. Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.
4. Characteristics of the network Security that affect user operations.
5. Define, track, and maintain data and data resources and recent trends in IT.

Unit – I
IT Infrastructure: Overview
Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit – II
Software Management
SDLC, The Waterfall Model, Advantages, Disadvantages, Conventional Software Management performance, Software Economics.

Unit – III
Current computing environment
Complexity of current computing, multiple technologies.
IT system Management: Common tasks in IT system management, approaches for organization IT management systems context diagram, patterns for IT system Management, Service level management, Financial Management, Capacity Management, availability management.

Unit – IV
Security Management
Computer Security, Internet Security, Physical Security, Identity Management, Access control System, Intrusion Detection. Emerging trends in IT: E-commerce, GSM.

Unit – V
Storage Management
Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery. Space management, Hierarchical storage management.

Text Books

1. IT Infrastructure & Its Management, By Phalguni Gupta, Tata McGraw-Hill Education. (Unit 1,3,4,5)
2. Software Project Management , Walker Royce: pearson Education,2005.(Unit 2)

Reference Books

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009.
2. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

Computer Networks

Subject Code : 18CST309 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

Upon completing the course, the student will:

- Explain Data Communications System and its components, different types of network topologies and protocols.
- Demonstrate different layers of ISO and TCP/IP models and illuminate its function.
- Apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
- Analyze main protocols such as HTTP, FTP, SMTP, TCP, UDP, IP.

Course Outcomes

After completing this course, the student must be able to:

1. Identify and enumerate different types of network topologies, protocols and the layers of the OSI and TCP/IP models and explain the functions of each layer.
2. Explain the protocols of Data Link Layer and MAC Sublayer and illustrate how a network can detect and correct transmission errors.
3. Classify and compare the major routing and congestion control algorithms and understand how a packet is routed over the internet.
4. Describe how TCP and UDP function, its uses and summarize the differences between them.
5. Analyze the features and operations of various Application layer protocols such as http, DNS, and SMTP.

Unit – I

Introduction: Data Communication, Components, Data Representation, Data Flow; **Networks**: Physical Structures, Categories of Network, Interconnection of Networks; **The OSI models**: Layered architecture, peer-to-peer process, Encapsulation, Layers in OSI model, TCP/IP protocol suite, **Addressing**: Physical Address, Logical Address, Port Address, Specific Address. (**Text Book-2**)

Unit – II

Data Link Layer: Design Issues, Services Provided to Network Layer, Framing, Error Control and Flow Control, Elementary Data Link Protocols, Sliding Window Protocols, Examples Data Link Protocols- HDLC; **The Medium Access Control Sublayer:** Multiple Access Protocol-ALOHA, Carrier Sense Multiple Access Protocols. (**Text Book-1**)

Unit – III

The Network Layer: Network Layer Design Issues-Services Provided to Transport Layer, Implementation of Connection Less Service, Implementation of Connection Oriented Service, Virtual-Circuit and Datagram Subnets, **Routing Algorithms:** The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, **Congestion Control Algorithms:** General Principles of Congestion Control, Congestion

Prevention Policies, **The Network Layer in Internet**-The IP Protocol, IP Address-IPV4, IPV6. (**Text Book-1**)

Unit – IV

The Transport Layer: Process-to-Process Deliver, Client/Server Paradigm, Multiplexing, Connectionless verses Connection Oriented Services, Reliable verses Unreliable; **UDP:** Well-known Ports for UDP, User Datagram, Checksum, UDP Operations and Uses of UDP; **TCP:** TCP Services, TCP Features, TCP Segment, a TCP Connection- Connection Establishment, Data Transmission, Connection Termination. (**Text Book-2**)

Unit – V

The Application Layer: DNS- Domain Name System- The DNS Name Space, Resource Records, Name Servers, SNMP, Electronic Mail- Architecture and Services, The User Agent, Message Format, Message Transfer, Final Delivery, **The World Wide Web-** Architectural Overview, Static Web Document, Dynamic Web Document; Hyper Text Transfer Protocol (HTTP). (**Text Book-1**)

Text Books:

1) Andrew S. Tanenbaum, Computer Networks, 5th Edition, Pearson Education, 2016.
2) Behrouz A Forouzan, Data Communications and Networking, 4th Edition, McGraw-Hill, 2006.

Reference Books:

1) S Keshav, An Engineering approach to computer Networking, 2nd Edition, Pearson Education.
2) J.F.Kurose, K.W.Ross, Computer Networking a Top-Down approach featuring the internet, 2nd Edition, Pearson Education.
3) http://nptel.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Computer%20networks/New_index1.html

Formal Languages & Automata Theory

Subject Code : 18CST310 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives:

To introduce students the fundamental concepts in theoretical computer science, and the formal relationship among machines, languages, grammars and computational problems.

Course Outcomes:

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

1. Design finite automata with & without output.
2. Convert finite automata into regular expression and vice versa.
3. Design grammars for regular and context free languages.
4. Explain the equivalence between CFG and PDA & equivalence between acceptances by final state and acceptance by empty stack of PDA
5. Design Turing Machines and determine the decidability of computational problems

Unit – I:

Finite Automata: Strings, Alphabet, Language, Operations, Finite state machine, languages, deterministic finite automaton and non deterministic finite automaton, computational problems. NFA with Epsilon transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without Epsilon transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

Unit – II:

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

Unit – III:

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, sentential forms. Right most and leftmost derivation of strings, Ambiguity in context free grammars, minimization of Context Free Grammars. Chomsky normal form, Greibach normal form, Enumeration properties of CFL (proofs omitted).

Unit – IV:

Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty stack and its equivalence. Equivalence of CFL and PDA, interconversion (Proofs not required).

Unit – V:

Turing Machine & Computability Theory: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages, counter machine, types of Turing machines (proofs not required). Chomsky hierarchy of languages, linear bounded automata and context sensitive language, Universal Turing Machine, post correspondence problem.

Text Books:

1. Hopcroft, J. E., Motwani, R., and Ullman, J. D., (2007), *Introduction to Automata Theory, Languages, and Computation*, Pearson
2. Daniel I.A. Cohen, John Wiley Introduction to Computer Theory 2nd edition

Reference Books:

1. John C Martin, Introduction to languages and the Theory of Computation, TMH
2. Lewis H.P. & Papadimition "Elements of Theory of Computation", C.H. Pearson /PHI.
3. Mishra and Chandrashekaran, Theory of Computer Science – Automata languages and computation -2nd edition, PHI.
4. Sipser ,Introduction to Theory of Computation –2nd edition Thomson

Web Reference:

http://nptel.iitm.ac.in/courses/webcourse-contents/IIT-%20 Guwahati/afl/index.htm

Software Engineering

Subject Code : 18CST3011 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Outcomes:

1. Understand software requirements that form the background to develop complex software systems.
2. Apply an effective software engineering process, based on knowledge of widely used development models.
3. Translate requirements specification into an implementable design.
4. Identify a testing strategy for a software system, employing techniques such as black box and white box testing strategies.
5. Evaluate the quality of the requirements, analysis and design work during the module.

Unit – I

Introduction to Software Engineering: The evolving role of software, Changing Nature of Software, software myths **Software Requirements:** Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document. **Requirements engineering process:** Feasibility study, Requirement Elicitation and analysis, Requirements validation and Requirements Management. **[Text Book1 & 2]**

Unit – II

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process**,** Agile Process Model (Scrum) **[Text Book-1]**
System Models: Context Models, Behavioral models, Data models, Object models.**[Text Book-2]**

Unit – III

Design Engineering: Design process and Design quality, Design concepts, the design model.
Creating an architectural design: Software architecture, Data design, Architectural styles and patterns, Architectural Design. **Performing User interface design:** Golden rules, User interface analysis and design, interface analysis, Interface design steps. **(Text Book-1)**

Unit – IV

Testing Strategies: Verification and Validation, Unit Testing, Integration Testing, Validation testing, System testing, the art of Debugging, White-Box Testing: Basis Path Testing, Control Structure Testing, Black-Box Testing: Equivalence Class Partitioning ,Boundary Value Analysis, Orthogonal Testing, Combinatorial Testing, Pair-Wise Testing.

Unit – V

Product metrics: Software Quality, Metrics for Analysis Model, Architectural Design Metrics Metrics for source code **Empirical Estimation:** COCOMO II Model **(Text Book-1)**

Quality Management: Quality concepts, Software Quality Assurance(SQA), Software Reviews, Formal Technical Reviews(FTR), Statistical Software Quality Assurance(SSQA) ,Software Reliability.**(Text Book1)**

Text Books

1. Roger S Pressman-Software Engineering, 8th Edition, Tata McGraw Hill Education 2017
2. Sommerville, Software Engineering, 7th Edition, Pearson Education, 2005

Reference Books

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering: Chandramouli Subramanian, Saikat Dutt, Chandramouli Seetharaman, B G Geetha- Pearson Education

Reference Link:

http://nptel.ac.in/courses/106101061/

Artificial Intelligence & Machine Learning

Subject Code : 18CST312 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objective

The student will be able to:

- Achieve basic knowledge of artificial intelligence.
- Analyze the different search strategies to understand their practical applications.
- Gain basic and practical knowledge of game playing and knowledge representation.
- Learn how to plan, design, and implement learning components.
- Learn basic machine learning algorithms.

Course Outcomes

1. Understand the scope, problems and approaches to artificial intelligence and various search strategies.
2. Apply algorithm techniques for game playing and CSP to solve problems.
3. Apply and analyze various knowledge representation techniques.
4. Construct how to plan, design, and implement learning components.
5. Analyze basic classification algorithms .

Unit – I

Introduction: Historical Perspective, Turing test, Scope of AI, Problems and Approaches to AI, **Search Strategies:** State space search, Uninformed Search, Depth-first Search, Breadth-First Search, Iterative Deepening; Informed Search: Best First Search, Heuristic Search, Hill climbing, Simulated Annealing; Evaluate search algorithms on Complexity (Time and Space), Completeness and Optimality

Unit – II

Game Playing: Minimax, Game trees, Alpha-Beta Pruning, Constraint Satisfaction Problems (Backtrack, 8-queens, coloring problem)
Logic, Inference and Predicate Calculus: Propositional Logic, Predicate calculus, First Order Logic, Inference in First Order Logic, Unification, Resolution, Conversion to Normal Form

Unit – III

Knowledge Representation and Reasoning: Rule-based Systems, Semantic Networks, Frame Systems, Ontologies, Knowledge Representation for the web - Semantic Web

Unit – IV

Introduction: Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning. Concept learning and the general to specific ordering – Introduction, A concept learning task, Concept learning as search, Find- S: finding a maximally specific hypothesis.

Unit – V

Decision Tree learning: Introduction, Decision Tree representation, Appropriate problems for Decision Tree Learning, basic decision tree learning algorithm, Inductive bias, Issues

Bayesian Learning: Introduction, Bayes Theorem, Naïve Bayes classifier

Text Books

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition,TMH.
2. Machine Learning ,Tom M. Mitchell, MGH

References:-

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI.
2. Ethem Alpaydin, "Introduction to Machine Learning", PHI, 2004

Reference Links

1. https://towardsdatascience.com/beginners-guide-to-machine-learning-with-python-b9ff35bc9c51
2. https://elitedatascience.com/machine-learning-projects-for-beginners

Graph Theory
(Professional Elective – I)

Subject Code : 18CSE311 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

- Know some important classes of graph theoretic problems;
- Understand to formulate and prove central theorems about trees, matching, connectivity, Colouring and planar graphs;
- Understand for min-cost spanning trees.
- Describe and apply some basic algorithms for graphs;
- Use graph theory as a modeling tool.

Course Outcome

On completion of the course, the student should be able to:

1. Understand some important classes of graph theoretic problems.
2. Formulate and prove central theorems about trees, matching, connectivity, colouring and planar graphs.
3. Apply minimum cost spanning trees to real problems.
4. Describe and apply some basic algorithms for graphs.
5. Use graph theory as a modeling tool.

Unit – I

Introduction: Basic graph theoretical concepts: paths and cycles, connectivity, trees, spanning subgraphs, bipartite graphs, Hamiltonian and Euler cycles

Unit – II

Some special Simple graphs-Isomorphism of graphs, Eulerian graphs.
Algorithms for shortest path—Warshall's , Single source shortest path problem.

Unit – III

Spanning trees, Tree traversal methods, and Minimum cost spanning trees— prim's, Kruskal's methods.

Unit – IV

Matching theory. Planar graphs. Colouring. Flows in networks, the max-flow min-cut theorem

Unit – V

Structural properties of large graphs: degree distributions, clustering coefficients, preferential attachment, characteristic path length and small world networks. Applications in biology and social sciences.

Text Books

1. *Graph Theory with Applications***. J.A. Bondy and U.S.R. Murty. 2007**
2. A Textbook of Graph Theory R. Balakrishnan, K. Ranganathan

Reference Books

1. 1.Douglas B. West, *Introduction to Graph Theory*, Second Edition, Prentice-Hall

Advanced Computer Architecture
(Professional Elective – I)

Subject Code : 18CSE312 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objective

This Course helps to

- Gain the knowledge on system performance dependence attributes and calculation of system throughput.
- Learn memory hierarchy concepts and different ways to improve the performance of cache memory.
- Learn coherence, inclusion and locality properties are satisfied in memory hierarchy.
- Understand the linear and nonlinear scheduling processes in pipelining, various message passing techniques in Multiprocessor and Multi Vector computers.

Course Outcome

Upon the completion of the course the students will be able to

1. Identify the architectural trends in the processors.
2. Familiarize with memory hierarchy and optimizing the performance of cache memory to increase cache band with.
3. Distinguish between Linear and Non-Linear Pipeline Processors.
4. Design the interconnection structure of the Multiprocessor and Multi Vector computers.
5. Analyze Cache Incoherence, coherence protocols and learn various message routing mechanisms.

Unit – I

Parallel Computer: State of computing, Elements of modern computer, Flynn's classification of parallel processors, System attributes to performance, Multiprocessors and Multicomputer, Shared memory multiprocessors, Distributed memory multiprocessors

Unit – II

Memory Hierarchy Design: Basic memory hierarchy, Optimization of cache performance, Small and simple first level cache to reduce hit time and power, Way prediction to reduce hit time, Pipelined cache access to increase cache band width

Unit – III

Linear and Non-Linear Pipeline Processors: Asynchronous and synchronous models, Clocking and timing control, Speedup, Efficiency and Throughput, Non-Linear Pipeline Processors- Reservation and latency analysis problems, Collision free scheduling problems, Instruction execution phases.

Unit – IV

Multiprocessors and Multivector Computers: Inter connection structure-Crossbar switch and multiport memory, Multistage and combining network routing Multivector computers-Vector processing principles, Vector instruction types, Vector access Memory schemes

Unit – V

Cache coherence and Message Passing Mechanisms: Cache coherence problems-Two protocol approach, Snoopy protocol, Directory based protocol, Message Passing Mechanisms-Message routing schemes, Deadlock virtual channels, Flow control strategies, Multicast routing algorithm.

Text Books

1. Kai Hwang and Naresh Jotwani, "Advanced Computer Architecture-parallelism, Scalability, Programmability" 3rd Edition McGraw-Hill Publications. 2016.

Reference Books

1. John L Hennessey and David A Patterson, "Computer Architecture A Quantitative Approach", Morgan Kaufmann/ Elsevier, Sixth Edition, 2012.

Social Networks
(Professional Elective – I)

Subject Code : 18CSE313 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives

The student should be made to

- To understand Social web.
- To understand the role of ontology and inference engines in semantic web.
- Will be able to differentiate social web from other.
- Will be able to use ontology and inference engines in semantic web development.
- Understand human behaviour in social web and related communities, Learn visualization of social networks.

Course Outcomes

Upon completion of the course, the student should be able to:

1. Interpret social Network basics, architecture and technologies.
2. Exhibit knowledge using ontology.
3. Predict human behavior in social web and related communities.
4. Analyze and describe how technical changes affect the social aspects of web based computing.
5. Describe the capabilities and limitations of semantic web technology for social networks.

Unit – I

Introduction: Introduction to Semantic Web: Limitations of current Web, The Semantic solution Development of Semantic Web, The Emergence of the Social Web.

Text Book: "Social Networks and the Semantic Web" by Peter Mika.

Unit – II

Social Network Analysis: Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.

Text Book: "Social Networks and the Semantic Web" by Peter Mika.

Unit – III

Knowledge Representation Of The Semantic Web : Ontology's and their role in the Semantic Web– Ontology Language for Semantic web

- Text Book: "Social Networks and the Semantic Web" by Peter Mika.

Unit – IV

Developing Social Semantic Applications: Building Semantic Web applications with social network features, Flink- the social networks of the Semantic Web community, Open academia: distributed, semantic-based publication management.

Text Book: "Social Networks and the Semantic Web" by Peter Mika.

Unit – V

Evolution Of WEB Based Social Networks Extraction: Differences between Survey Methods and electronic data Extraction, Data Collection, Preparing the data, Optimizing Goodness of fit.
Text Book: "Social Networks and the Semantic Web" by Peter Mika.

Text Books:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1 st Edition, Springer, 2010

Reference Books:

1. Liyang Yu, "A Developer's Guide to the Semantic Web", Springer, First Edition, 2011.
2. John Hebeler, Matthew Fisher, Ryan Blace and Andrew Perez-Lopez, "Semantic Web Programming",Wiley, First Edition, 2009.
3. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.

Reference Link:

1. Burt, R. S. (1984). Network items and the General Social Survey. Social Networks 6, 293-340. **https://en.wikipedia.org/wiki/Social_Semantic_Web.**

Computer Graphics
(Professional Elective – I)

Subject Code : 18CSE314 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives:

The objective of this course is to :

- Enlighten the working principles of display devices, understand the fundamental data structures and algorithms used for output primitives.
- Design graphics programmes using mathematical and theoretical foundations.
- Hypothesize 3D models of objects.
- Understanding and generation of animations.

Course Outcomes:

After successfully completing this course, the student will be able to:

1. Demonstrate routines for generating different output primitives including: drawing lines, conic sections, polygons, other routines for polygon filling.
2. Apply 2D transformations like translate, rotate, and scale to manipulate images and perform clipping.
3. Generate 3D computer graphics using interpolation and approximation functions and develop Projections.
4. Detect visible surfaces using various routines, thus hiding back faces in 3D graphics
5. Organize steps and plan for generation Computer Animation.

Unit – I

Primitives: Display system architecture: Random and Raster Scan; Output primitives – Line, Circle and Ellipse drawing algorithms; Polygon filling algorithms: Scan-line, Flood fill, Boundary Fill.

Unit – II

Geometric transformations: 2D Geometric transformations – translation, Scaling, Rotation; 2D viewing; 2D Clipping – Line & Polygon: Cohen-Sutherland, Cyrus-beck & Sutherland-Hodgeman algorithms.

Unit – III

3D Concepts: 3D Object representation – Polygons, Curved lines, Splines – B-Spline; 3D transformations- translation, Scaling, Rotation; 3D Viewing; Projections - Parallel and Perspective

Unit – IV

Visible Surface Detection: VSD classification; Algorithms: Back-face detection, Z-buffer algorithm, Scan-line algorithm, Depth-Sorting algorithm, Area-subdivision, BSP Tree, Octree method

Unit – V

Animations & Overview of Ray Tracing: Animations – Steps in design sequence, Animation languages, Raster Animation, Keyframe systems; Ray Tracing: Intersecting rays with other primitives – Reflections and Transparency – Boolean operations on Objects.

Text Books:

1. Donald Hearn and M Pauline Baker, "Computer Graphics C Version", Pearson Education,2014

References:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Computer Graphics, Steven Harrington, TMH.
3. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

Professional Communication Skills Lab

Subject Code: 18HSL302 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives

- To assist students acquire effective and adequate presentation skills
- To get students learn to collect comprehensive data for a project report
- To help students master techniques of being successful in group discussions
- To improve communication skills of students by making them participate in different language activities
- To prepare students for facing interviews self-assuredly

Course Outcomes

1. Students will be able to present and interpret data on select topics using pre-existing slides.
2. Students will be able to collect data extensively on a social issue and make it public for the sake of enlightening populace.
3. Students will be able to contribute proactively and extrapolate in group discussions.
4. Students will be able to make extempore speeches
5. Students will be able to prepare Job Application and Résumé / CV of their own, and face interviews confidently.

Course Syllabus

Unit I: Power Point Presentation

Unit II: Project Reports on Social Issues

Unit III: Group Discussion

Unit IV: Debate—Public Speaking—JAM

Unit V: Job Application and Résumé / CV Writing— Mock Interviews

Suggested Readings:

1. *Advanced Communication Skills Lab*. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.
2. *Communication Skills*. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2011.
3. *Speak Well*. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
4. *Strengthen Your Communication Skills*. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
5. *Strengthen Your Steps*. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
6. *Technical Communication*. Meenakshi and Sangeetha. OUP. New Delhi. 2013.

Computer Networks Lab

Subject Code: 18HSL306 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Outcomes

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

1. Familiar with network tools and network programming.
2. To apply knowledge of different framing techniques of data link layer.
3. To apply knowledge of different techniques of error detection and correction to detect and solve error bit during data transmission.
4. Familiarity with the basic protocols of computer networks, and how they can be used to assist in network design and implementation.
5. To explain the congestion control algorithms and understand how a packet is routed.
6. Understand the skills of IP address masking.

List of Experiments

1) Study of different networking components
2) Implementation of different data link framing methods
3) Implementation of error detection techniques
4) Implementation of routing algorithms
5) Implementation of congestion control algorithms
6) Implementation of IP address masking

Text Books:

1) Andrew S Tanenbaum, Computer Networks, 5th Edition, Pearson Education, 2016.

2) Behrouz A Forouzan, Data Communications and Networking, 4th Edition, McGraw-Hill, 2006

Reference Books:

1) S Keshav, An Engineering approach to computer Networking, 2nd Edition, Pearson Education.

2) J.F.Kurose, K.W.Ross, Computer Networking a Top-Down approach featuring the internet, 2nd Edition, Pearson Education.

Fundamentals of Fuzzy Logic
(Interdisciplinary Elective – II)

Subject Code : 18IET321 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives
The student will be able to

- Understand the concepts of fuzzy sets, membership functions and their operations.
- Frame linguistic variables and analyze the fuzzy quantifiers.
- Frame simple fuzzy sets.
- Fuzzify any desired area of classical Mathematics using Fuzzy controllers.
- Apply the concepts of Defuzzification.

Course Outcomes
Student is able to

1. Perform different fuzzy operations on fuzzy sets or membership functions.
2. Construct linguistic variables and estimate the fuzzy quantifiers as per the requirement.
3. Construct a simple Fuzzy set.
4. Develop simple Fuzzy expert system to Fuzzify any desired area with suitable controllers using different inference rules.
5. Apply defuzzification process to convert a Fuzzy set to a crisp value.

Unit – I

Fuzzy set Theory: Crisp Sets- an overview, Fuzzy sets – membership functions -types of membership functions-Triangular, Trapezoidal, Gaussian-examples. Basic Fuzzy set operations-union, intersection, complement. Properties of Fuzzy Sets, Fuzzy relations – Cartesian product, operations on fuzzy relations.

Unit – II

Fuzzy Logic: Classical Logic – an overview, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference.

Unit – III

Construction of Fuzzy sets: Methods of construction –an overview, Direct methods with one expert, Direct methods with multiple experts, constructions from Sample data –examples.

Unit – IV

Fuzzy Expert System – Fuzzification: Fuzzy Controllers, Fuzzy Expert System- Fuzzification-Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules.

Unit – V

Fuzzy Expert System- Defuzzification: Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method-examples.

Text books:

1. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George. J. klir / Bo Yuan, Prentice-Hall of India Pvt Limited.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms, S.Rajasekharan, G.A.Vijayalakshmi Pai, PHI.

Reference Books

1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, 3rd edition, John wiley & sons Ltd.

Remote Sensing
(Interdisciplinary Elective – II)

Subject Code : 18IET323 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

The objective of the course is to
- Study the basics of remote sensing.
- Study the types platforms
- Study the types of Sensors & Resolutions
- Study the procedure of image analysis.
- Study the image classification procedure and know the use of Remote Sensing in various Applications.

Course Outcomes

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

1. Demonstrate about the basics of remote sensing.
2. Explain about types platforms
3. Explain about types of Sensors & Resolutions
4. Understand the procedure of image analysis.
5. Illustrate the image classification procedure and explain the use of Remote Sensing in various Applications.

Unit – I

Introduction: Definition, Basic components of remote sensing, Electromagnetic radiation, Electromagnetic spectrum, EMR interaction with atmosphere - EMR interaction with Earth Surface Materials.

Unit – II

Platforms: Introduction, Platforms- Ground borne, Airborne remote sensing, Space borne remote sensing; Orbital Characteristics, Type of Orbits

Unit – III

Sensors & Resolution: Introduction, Sensors- Passive sensors, Active sensors; Spatial Resolution, Spectral Resolution, Temporal Resolution, Radiometric Resolution.

Unit – IV

Image Analysis: Introduction, Digital Image processing, elements of visual interpretations, image enhancement techniques

Unit – V

Image classification: Introduction, Principles of Image classification, Process of image classification supervised classification, unsupervised classification

Applications: Land use/Land Cover, Agricultural Application and Forest Applications

Text Books

1. Remote Sensing and its applications by LRA Narayana University Press 1999.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy, BS Publications/BSP Books 2012.

References Books

1. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
2. Remote Sensing and Image Interpretation, by Lillesand, Kiefer, Chipman, Willy Publishers, 6th Edition 2011

Renewable Energy Sources
(Interdisciplinary Elective – II)

Subject Code : 18IET324 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objective:

- To Outline the concept regarding the physics of the sun
- To Outline the concept regarding the collection of solar energy and storage of solar energy
- To Outline the concept regarding different types of wind mills and different types of biogas digesters
- To Outline the concept regarding geothermal energy conversion
- To Outline the concept regarding direct energy conversion

Course Outcomes:

After completion of this course the student can able to

1. Define different kind of solar radiation
2. Utilize different methods of collection of solar energy and storage of solar energy
3. Classify different types of wind mills and biogas digesters
4. Classify different types of geothermal energy sources and and utilize different types of extracting techniques
5. Distinguish different kinds of direct energy conversion techniques

Unit – I

Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation.

Unit – II

Solar energy collection, storage and applications: Flat plate and concentrating collectors, Different methods of storage -Sensible, latent heat . Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

Unit – III

Wind and biomass energy: Sources and potentials, horizontal and vertical axis windmills. Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield, I.C.Engine operation and economic aspects.

Unit – IV

Geothermal and ocean energy: Resources, types of wells, methods of harnessing the energy. OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques,

Unit – V

Direct energy conversion(DEC): Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems. Fuel cells, principles, faraday's law's.

Text Books:

1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

Reference Books:

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

Linear programming and its applications
(Interdisciplinary Elective – II)

Subject Code : 18IET326 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- To formulate linear programming problem and solve linear programming problem by using graphical procedure.
- To understand computational procedure of simplex method and artificial variable technique.
- To understand the step wise procedure in obtaining optimum solution to transportation problem and Hungarian method for assignment problem.

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

1. Formulate and solve linear programming problem by using graphical method.
2. Solve the linear programming problem using simplex method and artificial variable technique.
3. Solve the linear programming problem using dual simplex method.
4. Solve both balanced and unbalanced transportation problem.
5. Solve both balanced and unbalanced assignment problems.

Unit – I
Formation of linear programming problem, Graphical solution to linear programming problem.

Unit – II
Simplex method artificial variable techniques.

Unit – III
Introduction to Dual Simplex method problems.

Unit – IV
Transportation Problem: Formulation, Optimal solution, unbalanced transportation problems

Unit – V
Assignment Problem: Formulation, Optimal solution, Traveling salesman problem.

Text Books:
1. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
2. Operations Research, S.D.Sharma, Kedarnath Ramanadh Pub.

References Books:
1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Operations Research by P. Rama Murthy, New Age Pub.
3. CPM & PERT, L.S. Srinath, Affiliated East West Press Pub.

Principles of communications
(Interdisciplinary Elective – II)

Subject Code : 18IET327 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

- Explain the fundamental concepts of modulation and demodulation of Amplitude modulation and Angle modulation schemes.
- Understand various pulse modulation schemes.
- Compare the different types of Digital communication systems
- Understand various Digital modulation schemes

Course Outcomes

1. Determine Modulation Index, Bandwidth and power of AM,DSB-SC and SSB-SC for the given specifications and also compare various Demodulation techniques of AM.
2. Compute Modulation parameters of FM and PM waves as per the given specifications and also compare FM and PM in terms of characteristics and applications.
3. Describe Sampling theorem and Compute Nyquist sampling rate for the given signal and also compute Modulation parameters of PAM,PWM and PPM for the given specifications.
4. Analyze the PCM,DM,ADM and ADPCM techniques with respect to baud rate bit error rate and also construct the above said signals as per given conditions.
5. Determine Modulation parameters of ASK,FSK,PSK and DPSK for the given data and also construct the wave forms for the given specifications.

Unit – I

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

Unit – II

Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM. Basic block diagram of super heterodyne receiver , capturing effect.

Unit – III

Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM

Unit – IV

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM.

Unit – V

Digital Modulation: ASK, FSK, PSK, DPSK, M -ary PSK.

Text Books:

1. Principle of Communications, Taub & Schilling, TMH, 2003.
2. Communication Systems Analog and Digital – R.P. Singh, SD Sapre, TMH, 20th reprint, 2004

Reference Books:

1. Communication Systems Engineering – John. G. Proakis, Masoud and Salehi, 2nd Ed. PHI/Pearson.
2. Electronic Communication Systems – Kennedy & Davis, TMH, 4th edition, 2004.

PYTHON Programming
(Interdisciplinary Elective – II)

Subject Code : 18IET329 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- Help students (who may /may not intend for CS&IT) to feel justifiably confident of their ability to write small programs.
- To provide the basic features of python programming language.
- To make students so that they can compete for jobs by providing competence & confidence in computational problem solving.
- Prepare students from other streams to make profitable use of computational methods in their chosen field.
- Prepare students who have prior programming experience or knowledge of computer science for an easier entry into computer science major.

Course Outcomes:

On successful completion of the course Students will be able to:

1. Understand PYTHON environment and basic data types.
2. Be fluent in the use of procedural statements, assignments, conditional statements, loops, method calls and arrays.
3. Identify or characterize a problem based on PYTHON sequences.
4. Design, code, and test small Python programs that can handle exceptions and files.
5. Understand the concepts of object-oriented programming as used in Python: classes, subclasses, properties, inheritance, and overriding.

Unit – I

Client /Server environment, Introduction to Python, History, features, python environment setup, Basic syntax, using command interpreter, Variable and Data Types, Basic data types in Python, script structure.

Unit – II

Conditional statements, Boolean expressions, Looping Control Structures, Control Statements: Break, Continue, Pass.

Unit – III

Python sequences: strings, Lists, Tuples, dictionaries, sets, string manipulation, functions, modules & import.

Unit – IV

Errors and Exceptions, Handling exceptions, Files, File input/output, Text processing, file functions.

Unit – V

Object oriented programming: Class, object, Object Oriented Programming concepts.

Text Books:

1. Wesley J. Chun “Core Python Programming”, Second Edition, Prentice Hall
2. Allen Downey, “Think Python”, Second Edition , Green Tea Press

Reference Books:

1. *Introduction to Computation and Programming Using Python, Spring 2013 Edition, By John V. Guttag.*
2. Programming in Python 3: A Complete Introduction to the Python Language (Developer's Library), by Mark Summerfield, 2nd Edition.

Advanced Coding – I
(Interdisciplinary Elective – II)

Subject Code: 18IET32A **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of Optimized solution for problem solving

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

1. Select appropriate container to organize data for problem solving.
2. Design solution using OOP principles
3. Analyze the problem using Mathematics
4. Implement solutions using Linear Data Structures.
5. Analyze time and space Complexity of Solution of a problem.

Unit – I
Python Essentials:
Basics: Basic Syntax, Variables, Data types, Operators, Input and output, Conditional Statements and loops, built in functions and user defined functions.
String Manipulation: Accessing Strings, String operation and String Slice
Inbuilt Data Structures: List, Tuple and Dictionaries
Problems to Practice: Missing Number ,Integer to English Words ,Integer to Roman, Roman to Integer, 2sum, 3sum,3sum closet,4sum,Remove duplicates in a list, Circular Array Loop, Fruit Into Baskets,, K-diff Pairs in an Array, Move Zeroes, Rotate Array, Flipping an Image, Circular Array Loop

Unit – II
OOP Principles:
Implementation of OOP principles in python and Exception Handling.

Unit – III
Algorithm Analysis:
Characteristics of algorithm, Algorithm Analysis-operation count , step counts,. asymptotic complexity, recurrence equations.

Unit – IV
Number Theory: Modular arithmetic, Modular exponentiation, Greatest Common Divisor, Extended Euclidean algorithm, Modular multiplicative inverse, Prime Number, Sieve of Eratosthenes
Problems to Practice: Factorial Trailing Zeroes, Happy Number, Ugly Number, Smallest Integer Divisible by K, Prime Arrangements, Poor Pigs, Check If It Is a Good Array, Rabbits in Forest

Unit – V
Linked List: Singly Linked List, Doubly Linked List and Circular Linked List and Josephus Circle problem

Problems to practice: Add Two Numbers, Swap Nodes in Pairs, Rotate List, Palindrome Linked List, Linked List Cycle, Remove Duplicates from Sorted List,

Stacks and Queues: Implementation in Array and Linked List and classic problem on Stacks and Queues.

Problems to practice : Min Stack, Valid Parentheses, Trapping Rain Water, Largest Rectangle in Histogram, Asteroid Collision, Simplify Path, Next Greater Element I, Online Stock Span, Implement Stack using Queues

Text Books:

1. Wesley J. Chun "Core Python Programming" Prentice Hall,2007
2. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Books:

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
3. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.

Reference Links

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106145/
3. https://www.spoj.com/problems

Compiler Design

Subject Code : 18CST313 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

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

- Describe the design of a compiler including its phases and components and basic understanding of grammars and language definition.
- Identify the similarities and differences among various parsing techniques and grammar transformation techniques.
- Describe the syntax analysis, intermediate code generation, type checking, the role of symbol table and its organization.
- Experiment with practical programming skills necessary for constructing a compiler.
- Articulate code generation and optimization schemes.

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

1. Apply knowledge of patterns, tokens & regular expressions for solving a problem.
2. Apply the knowledge of lex tool & yacc tool to develop a scanner & parser.
3. Write a new code optimization technique to improve the performance of a program in terms of speed & space.
4. Employ the knowledge of modern compiler & its features.
5. Experiment the tools and technologies used for designing a compiler.

Unit – I
Overview of Compilation: Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and phases of translation, interpretation, bootstrapping, LEX - lexical analyzer generator. (TextBook1 & 2)

Unit – II
Top down Parsing: Context free grammars, Top down parsing – Backtracking, LL (1), Recursive Descent Parsing, Predictive Parsing.
Bottom up Parsing: Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing, handling ambiguous grammar, YACC – automatic parser generator. (TextBook1 & 2)

Unit – III
Semantic analysis: Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Type checker.
Symbol Tables: Symbol table format, organization for block structures languages. Block structures and non block structure storage allocation: static, runtime stack and heap storage allocation. (TextBook1)

Unit – IV
Code optimization: Consideration for Optimization, Scope of Optimization, local optimization, loop optimization, frequency reduction, DAG representation.
Data flow analysis: Flow graph, global optimization, redundant sub expression elimination, Induction variable elements, live variable analysis, Copy propagation. (TextBook1)

Unit – V

Code generation: Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation. (TextBook1)

Text Books:

1. Alfred V. Aho, Ravi Sethi & Jeffrey. D. Ullman, "Compilers Principles, Techniques & Tools", Pearson Education, third edition, 2007.
2. Andrew N. Appel, "Modern Compiler Implementation in C", Cambridge University Press, 2004.

Reference Books:

1. John R. Levine, Tony Mason, Doug Brown, "lex & yacc", O'Reilly Media, Inc., 1992.
2. Kenneth C. Louden, Compiler Construction: Principles and Practice, Course Technology Inc; International edition, 1997
3. Reference link: https://www.holub.com/software/compiler.design.in.c.html

Data Mining

Subject Code : 18CST314 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives:

- Introduce basic concepts, principles, major techniques and algorithms in Data Warehousing and Data Mining. These include concepts and techniques for data preprocessing, OLAP, association rule mining, data classification, and data clustering.
- Discuss applications, Emerging Areas in Data Mining.

Course Outcomes:

1. Recognize types of Data, Data Quality, need of preprocessing and different measures of similarity and dissimilarity.
2. Differentiate between methods for modeling multidimensional data, design and implement Data Warehouse.
3. Explain in detail major techniques and algorithms involved in data mining, including techniques and algorithms for association rule mining, data classification, and data clustering.
4. Evaluate and increase the performance of a classifier.
5. Compare and contrast Partitioning, Hierarchical and Density based Clustering Algorithms.

Unit – I

Introduction to Data Mining: What is data mining, motivating challenges, origins of data mining, data mining tasks, Types of Data, Data Quality, Data Preprocessing, Measures of similarity and Dissimilarity. (**Text Book 1**)

Unit – II

Data Warehouse and OLAP Technology: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining, **Concept Description** - Characterization and Comparison: Data Generalization and Summarization-Based Characterization, Analytical Characterization: Analysis of Attribute Relevance, Mining Class Comparisons: Discriminating between Different Classes. (**Text Book 2**).

Unit – III

Mining Frequent Patterns, Associatios: Basic Concepts, Market Basket Analysis, Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Itemset Mining methods: Apriori Algoriyhm, Generating Association Rules from Frequent Itemsets, Improving the efficiency of Apriori, FP–Growth algorithm (**Text Book 2**)

Unit – IV

Classification and Prediction: What is classification? What is prediction? Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Prediction, Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor, Increasing the Accuracy, Model Selection (**Text Book 2**

Unit – V

Cluster Analysis:

Overview- types of clustering basic K–means, K-means – additional issues, bisecting k-means k-means and different types of clusters, strengths and weaknesses, k-means as an optimization problem, Agglomerative hierarchical clustering, basic agglomerative hierarchical clustering algorithm, DBSCAN, BIRCH, and CURE Algorithms (**Text Book 1**)

Text Books:

1. Pang-Ning Tan, Michael Steinbach and Vipin Kumar, "Introduction to Data Mining", Person Education, 2007.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

Reference Books:

1. G. K. Gupta, "Introduction to Data Mining with Case Studies", Eastern Economy Edition, Prentice Hall of India, 2006.
2. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.

UNIX Internals

Subject Code : 18CST314 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives:

Upon completion of this course, students will be able to:

- Understand the Unix file system, Unix commands, and shell programming concepts.
- State library functions and system calls in Unix.
- Explain the Unix process structure and various types of signals for handling of a process.
- Illustrate the Inter Process Communication (IPC) mechanisms used in Unix OS.

Course Outcomes:

1. Demonstrate the basic set of commands and utilities in Unix systems.
2. Ability to read, write and debug shell scripts.
3. Implement the important Unix library functions and system calls.
4. Describe process control and handle a process by using signals..
5. Implement Inter Process Communication (IPC) using pipes, shared memory, semaphores and message queues.

Unit I

Introduction to Unix file system, vi editor, file handling utilities, file permissions, process utilities, disk utilities, text processing utilities, backup utilities and networking commands. Detailed commands to be covered are date, cal, cp, mv, rm, cd, pwd, mkdir, rmdir, wc, ls, cat, tac, touch, head, tail, uniq, grep, egrep, fgrep, cut, paste, join, comm, cmp, diff , sort, nl, tee, more,pg, tr, ln, unlink,chmod, umask, ulimit, du,df, mount, umount, who, who am i,w, find, telnet, rlogin, awk, tar, cpio. **(TextBook 1 &2)**

Unit II

Shell Scripting : Unix system organization, What is shell, shell keywords, shell variables: User defined variables, system defined variables; shell responsibilities, pipes, redirection: input redirection, output redirection and error redirection; shell meta characters, shell commands, shell as a programming language, **c**onditional structures: if, if-else, if-elif-else and case; loop control structures: for,while and until; command line arguments. **(TextBook 1 &2)**

Unit III

System calls, System calls, library functions, low level file access, usage of open, create, read, write, close, lseek, stat, fstat, umask, dup and dup2, the standard I/O : fopen, fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar, fgets, gets ; formatted I/O, stream errors, streams and file descriptors, file and directory maintenance: chmod, chown, link, unlink, symlink, mkdir, rmdir, rename,remove,chdir, getcwd. **(TextBook 2)**

Unit IV

Process and Signals : Process and Signals : What is process, process identification, hierarchy of Unix processes, creating a new process, waiting for a process, zombie process, orphan process, process control, exec family functions, common signals, signal functions, reliable and unreliable signals, interrupted system calls, kill, raise, alarm, pause, abort, system, sleep functions.

(TextBook 2)

Unit V

Inter Process Communication: pipes, pipe Vs file, process communication in pipes, pipe system call, parent-child process, named pipes Vs name less pipes, semaphores, message queues and shared memory. **(TextBook 2)**

Text Books:

1. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2008
2. Sumitabha Das., Unix Concepts and Applications., 4thEdition., Tata McGraw Hill 2012

Reference Books:

1. Advanced UNIX Programming, Dr. N.B.Venkateswarlu, B.S.Publications,2 Edition.
2. Unix Internals the New Frontiers, U.Vahalia, Pearson Education

Advanced Algorithms
(Professional Elective – II)

Subject Code : 18CSE321 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Outcomes

1. Design algorithms and Summarize various methods for solving recurrence.
2. Identify appropriate data structures for a given applications.
3. Apply suitable algorithm design techniques to solve different computational problems.
4. Analyze various graph based algorithms.
5. Differentiate polynomial and non-deterministic polynomial algorithms.

Unit – I

Introduction - Role of algorithms in computing, Analyzing algorithms, Designing Algorithms, Growth of Functions.

Divide and Conquer- The maximum- sub array problem, The substitution method for solving recurrences, The recurrence-tree method for solving recurrence, The master method for solving recursions.

Unit – II

Review of Data Structures- Elementary Data Structures, Hash Tables, Binary Search Trees, Red-Black Trees.

Unit – III

Dynamic Programming - Elements of dynamic programming, Longest common subsequence.
Greedy Algorithms - Elements of the greedy strategy, Huffman codes.

Unit – IV

Graph Algorithms - Elementary Graph Algorithms, Minimal spanning trees, Single-Source Shortest Paths, Maximum flow.

Unit – V

NP-Complete & Approximate Algorithms- Polynomial time, Polynomial-time verification, NP-complete & approximation problems - Clique problem, Vertex cover problem, The traveling sales man problem, The subset-sum problem.

TEXT BOOKS:

1. T. Cormen, C. Leiserson, R. Rivest, and C. Stein, *Introduction to Algorithms*, Third *Edition*, 2009 PHI Publication.
2. "Data Structures and Algorithms in C++", M.T. Goodrich, R. Tamassia and D.Mount, Wiley India. 3rd Edition 2009.

REFERENCES:

1.Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaj Sahni, Sanguthevar, Rajasekaran, Second Edition, Galgotia Publication
2. Classic Data Structures, D. Samanta, 2nd edition, PHI.

Distributed Systems
(Professional Elective – II)

Subject Code: 18CSE322 **External Marks: 60**
Credits : 3.0 **Internal Marks: 40**

Course Objectives

- Provides an introduction to the fundamentals of distributed computer systems, assuming the availability of facilities for data transmission, IPC mechanisms in distributed systems, Remote procedure calls.
- Expose students to current technology used to build architectures to enhance distributed computing infrastructures with various computing principles

Course Outcomes

1. Describe important characteristics of distributed systems and the salient architectural features of Distributed systems.
2. Develop practical experience of inter-process communication in a distributed environment.
3. Identify the features and applications of important standard protocols which are used in distributed systems.
4. Develop a familiarity with distributed file systems.
5. Contrast process concurrency and synchronization

Unit – I

Characterization of Distributed Systems: Introduction, Examples of Distributed Systems, Resource Sharing and the Web, Challenges.

System Models: Introduction, Architectural Models- Software Layers, System Architecture, Variations, Interface and Objects, Design Requirements for Distributed Architectures, Fundamental Models- Interaction Model, Failure Model, Security Model.

Unit – II

Inter process Communication: Introduction, The API for the Internet Protocols- The Characteristics of Inter process communication, Sockets, UDP Datagram Communication, TCP Stream Communication; External Data Representation and Marshalling; Client Server Communication; Group Communication- IP Multicast- an implementation of group communication, Reliability and Ordering of Multicast.

Unit – III

Distributed Objects and Remote Invocation: Introduction, Communication between Distributed Objects- Object Model, Distributed Object Modal, Design Issues for RMI, Implementation of RMI, Distributed Garbage Collection; Remote Procedure Call, Events and Notifications, Case Study: JAVA RMI

Unit – IV

Distributed File Systems: Introduction, File Service Architecture; Peer-to-Peer Systems: Introduction, Napster and its Legacy, Peer-to-Peer Middleware, Routing Overlays. Coordination and Agreement: Introduction, Distributed Mutual Exclusion, Elections, Multicast Communication.

Unit – V

Transactions & Replications: Introduction, System Model and Group Communication, Concurrency Control in Distributed Transactions, Distributed Dead Locks, Transaction Recovery; Replication-Introduction, Passive (Primary) Replication, Active Replication.

Text Books

1. George Coulouris, Jean Dollimore, Tim Kindberg, "Distributed Systems- Concepts and Design", 5th Edition, Pearson Publication- 2011.
2. Ajay D Kshemkalyani, Mukesh Sighal, "Distributed Computing, Principles,Algorithms and Systems",Cambridge Reissue Edition 2011.

References Books

1. Distributed Systems, Principles and Paradigms, Andrew S. Tanenbaum, Maarten Van Steen, 2nd Edition, PHI.
2. Distributed Systems, An Algorithm Approach, Sukumar Ghosh, Chapman&Hall/CRC, Taylor & Fransis Group, 2007.
3. Distributed Computing, S.Mahajan and S.Shah, Oxford University Press.
4. Distributed Operating Systems Concepts and Design, Pradeep K.Sinha, PHI.
5. Advanced Concepts in Operating Systems, M Singhal, N G Shivarathri, Tata McGraw-Hill Edition.

Advanced Machine Learning
(Professional Elective – II)

Subject Code : 18CSE323 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Outcomes

On completion of the course the student should be able to

1. Understand the Key concepts, tools and approaches for pattern recognition on complex data sets
2. Demonstrate the working of different supervised learning algorithms and assess their suitability to a given problem.
3. Learn State of the art methods in Bayesian state estimation, parameter estimation and applications..
4. Demonstrate the working of different dimensionality reduction techniques on high dimensional data sets.
5. Apply Reinforcement Learning approach to applications like Bioinformatics and Personalized recommendation.

Unit – I

Key Concepts: Artificial neural Network,: Introduction, Neural Network Representation, Appropriate problems for Neural Network Learning, Perceptions, Multilayer Networks and back propagation algorithm. Generalization, Loss Functions and Generalization, Parametric Versus Non Parametric Methods, Probability theory, Elements of Computational Learning, Ensemble Learning- Bagging, Boosting, Random Forest(Text Book-2,3).

Unit – II

Kernel Methods-Introduction, Positive definite symmetric kernels, Kernel based algorithms, Negative definite symmetric kernels, Sequence kernels, Approximate kernel feature maps, Support Vector Machines (Text Book-1).

Unit – III

Bayesian Learning,Baysen Therom and Concept Learning, Navey Baysen Belief Networks, Graphical Models,EM Algorithm, Guassian Distribution(Text Book-4),

Unit – IV

Dimensionality Reduction- Feature selection, Feature extraction, Principal component analysis,(PCA), Linear discriminant analysis (LDA),Independent Component Analysis(ICA).(Text Book-1).

Unit – V

Reinforcement Learning: Introduction of Reinforcement Learning-Reinforcement Learning, Examples, And Elements of Reinforcement Learning, Limitations and Scope, An Extended Example:Tic-Tac-Toe.(Text Book-5) .

Text Books

1. "Foundations of Machine Learning ",Mehryar Mohri,Afshin Rostamizadeh ,Ameet Talwalkar, second edition 2018.
2. "Introduction to Machine Learning "Second Edition Ethem Alpaydın The MIT Press Cambridge, Massachusetts London, England, 2010.
3. "Bayesian Reasoning and Machine Learning" David Barber, 2016.
4. Reinforcement Learning: An Introduction Second edition, in progress, Richard S. Sutton and Andrew G. Barto , 2014, 2015.

Reference Books

1, "Introduction to Machine Learning" Alex Smola and S.V.N. Vishwanathan published by the press syndicate of the university of Cambridge The Pitt Building, Trumpington Street, Cambridge, United Kingdom, Cambridge University Press 2008.
2. Machine Learning: An Algorithmic Perspective, Stephen Marshland, Taylor & Francis
3."Machine Learning" ,Tom Mitchell.

Cryptography and Network Security
(Professional Elective – II)

Subject Code : 18CSE324 **External Marks: 60**
Credits : 3.0 **Internal Marks : 40**

Course Objectives:

The course is designed with the objective:

- To clearly recognize the different Security Attacks, Security Services and Security Mechanisms.
- To demonstrate the basic categories of Cryptographic Systems, different Conventional Encryption Algorithms and describe the important public-key cryptosystems.
- To analyze the authentication by studying different authentication applications.
- To describe the security approaches related to Electronic Mail and to express the overall structure of IPSec.

Course Outcomes:

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

1. Recall different Security Attacks, Services and Mechanisms.
2. Classify and explain categories of different encryption and decryption techniques.
3. Identify the authentication applications such as Kerberos and x.509 directory services and analyze the usage of PGP and S/MIME.
4. Familiar with the importance of IP Security and e-mail Security.
5. Exposed to viruses and related threats and different types of firewalls.

Unit – I

Introduction: Security Attacks, Security Services and Security Mechanisms, Network security model. **Software Vulnerabilities:** Buffer Overflow, Format String Attacks and SQL Injection. **Basics of Cryptography:** Substitution Techniques, Transposition Techniques, Block and Stream Ciphers.

Unit – II

Conventional Encryption and Message Confidentiality: Conventional Encryption Principles, Algorithms: DES, Triple DES, Blowfish, IDEA and AES, Cipher Block Modes of Operations.

Unit – III

Public-Key Cryptography and Message Authentication: Public Key Cryptography Principles, Algorithms: RSA, Diffie-Hellman Key Exchange, Digital Signatures, Approaches to Message Authentication, Secure Hash Functions(SHA-1).

Authentication Applications - Kerberos: Motivation, Requirements, Version 4, X.509 Authentication Certificate format.

Unit – IV

Electronic Mail Security - Pretty Good Privacy: Notation, Operational Description. **S/MIME:** RFC 822, Limitations of SMTP, MIME Overview, MIME Content Types, MIME Transfer Encodings, S/MIME Functionality.

IP Security: Overview, Architecture, AH, ESP Protocols.

Unit – V

Web Security: Considerations, **SSL:** Architecture, Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, **SET:** Overview, Dual Signatures, Payment Processing.

Viruses and Warms, **Firewalls:** Design Principles, Characteristics, Types of Firewalls.

Text Books:

1. Network Security Essentials: Applications and Standards, William Stallings, Pearson Education.
2. Cryptography and Network Security: Principles and Practice, William Stallings, Pearson Education.

Reference Books:

1. Cryptography and Network Security, 2nd Edition, Behrouz A. Fourouzan and Debdeep Mukhopadhyay, McGraw-Hill, 2010.
2. Principles of Information Security, Whitman, Thomson.
3. Introduction to Cryptography, Buchmann, Springer.

Reference Links

1. https://nptel.ac.in/courses/106105031/
2. https://nptel.ac.in/courses/106105162/

Human Values

Subject Code : 18HST302 **External Marks: 50**
Credits : 2.0 **Internal Marks : 25**

Course Objectives

- 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.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.
- To Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

Course Outcomes

1. Upon completion of this course students can aware of ethical behavior in the work place
2. To shapes the students by the end of this curriculum being harmony himself
3. To understand the human relationship and values
4. To understand the Nature and its existence of connectivity
5. Learn the importance of Human values and universal order

Unit – I

Understanding the need, basic guidelines, content and process for Value Education- Self Exploration - what is it?- Continuous Happiness and Prosperity Morals, Values and Ethics – Integrity – Work Ethics – Service Learning- Respect for others- Caring – Sharing – Honesty – Courage – Value time – Co-operation – Commitment Self-confidence – Spirituality

Unit – II

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'- Understanding the needs of Self ('I') and 'Body'- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

Unit – III

Understanding Harmony in the Family and Society Harmony in Human-HumanRelationship- Understanding harmony in the Family- the basic unit of human interaction Understanding values in human-human relationship- Trust (Vishwas) and Respect (Samman) as the foundational values of relationship- Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

Unit – IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence- Understanding the harmony in the Nature- Interconnectedness and mutual fulfillment among the

four orders of nature- recyclability and self-regulation in nature- Holistic perception of harmony at all levels of existence

Unit – V

Implications of the Holistic Understanding of Harmony- Natural acceptance of human values - Definitiveness of Ethical Human Conduct- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Reference Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics
2. "Professional Ethics and Human Values" by Prof. D.R. Kiran.
3. "Engineering Ethics & Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
4. A N Tripathy, 2003, Human Values, New Age International Publishers
5. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press
6. M Govindrajan, S Natrajan& V. S Senthilkumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Compiler Design Lab

Subject Code : 18CSL307 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives
The course aims are:

- Memorize the knowledge in various phases of compiler and its use, code optimization techniques, machine code generation, and use of symbol table.
- Understand the major concept areas of language translation and compiler design.
- Extend the knowledge of parser by parsing LL and LR parser.
- Give example programming skills necessary for constructing a compiler.

Course Outcome

1. Apply the knowledge of lex tool & yacc tool to devleop a scanner & parser.
2. Design and conduct experiments for Intermediate Code Generation.
3. Describe different translators.
4. Develop program to solve complex problems in compiler
5. Choose new code optimization techniques to improve the performance of a program in terms of speed and space.
6. Analyze new tools and technologies used for designing a compiler

List of Experiments:

1. Write a program to find the number of characters, words, digits, lines form the given input.
2. Design a Lexical analyzer. The lexical analyzer should ignore redundant spaces, tabs and newlines. It should also ignore comments.
3. Implement the lexical analyzer using either JLex, flex or lex or other lexical analyzer generating tools.
4. Write a program to compute FIRST function for the given grammar.
5. Write a program to compute FOLLOW function for the given grammar.
6. Write a program to implement a predictive parser.
7. Design LALR Bottom up Parser.
8. Convert the BNF rules into Yacc form and write code to generate abstract syntax tree.
9. Write program to generate machine code from the abstract syntax tree generated by the parser.

Text Books

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, “Compilers Principles, Techniques and tools”, Pearson Education Asia, 2003

Reference Book

1. Allen I. Houlb “Compiler Design in C”, Prentice Hall of India, 2003
2. C. N. Fischer and R.J. LeBalnc, “Crafitng a compiler with C ”, benjamin Cummings, 2003
3. J.P.Bennet,”Introduction to Compiler Techniques”, Second Edition, tata Mcgraw-Hills,2003.

UNIX Internals Lab

Subject Code : 18CSL308 **External Marks: 60**
Credits : 1.5 **Internal Marks : 40**

Course Objectives:
Upon completion of this course, students will be able to:

- Understand the basic Unix commands and shell programming concepts.
- Understand the library functions and system calls in Unix.
- Describe the Unix process structure and various types of signals for handling of process.
- Discuss the working mechanism of IPC using pipes, semaphores message queues and shared memory.

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

1. Run various Unix commands on a standard Unix Operating system
2. Develop shell scripts to automate common tasks.
3. Experiment with various library functions and system calls in Unix operating system
4. Write Programs related to process control and signal handling.
5. Implement IPC using pipes, semaphores, message queues and shared memory.

List of Experiments

1. Introduction to Unix Operating System and comparing it with Windows OS. Overview to Open Source Software. Writing and studying about how to execute C program in Unix environment using GCC compiler along with phases of compilation. Executing simple Hello World C program in UNIX environment using gedit editor.
2. Working with the vi editor: Creating and editing a text file with the vi text editor using the standard vi editor commands
3. UNIX for Beginners: Getting hands-on on basic UNIX commands
4. Some more UNIX commands: Working with directories, input-output redirection, Pipes, Processes
5. Work on awk script to execute simple queries by using database file and also execute simple logical programs.
6. The UNIX file system
7. Using the Shell
8. UNIX Shell Programming
9. Programming with standard I/O
10. Programming with process related system calls.
11. UNIX System Calls
12. Programming with IPC.

Text Books:

1. Advanced programming in the Unix environment, W.Richard Stevens, Stephen A.Rango, Addision-Wesley professional, 2 nd Edition.
2. Your unix the ultimate guide, Sumitabha Das, TMH, 2 nd Edition.

Reference Books:

1. Advanced UNIX Programming, Dr. N.B.Venkateswarlu, B.S.Publications,2 Edition.
2. UNIX Network Programming, Inter Process Communication, W.R. Stevens, PHI/Pearson, 2 nd Edition.
3. Unix Internals the New Frontiers, U.Vahalia, Pearson Education.
4. Brian W. Kernighan and Rob Pike, "The UNIX Programming Environment" Prentice Hall India (Edition available in LRC and in the form of E Book on student resource)
5. Sumitabha Das, "UNIX: Concepts and Applications" Tata McGraw Hill (Latest Edition)
6. Yashwant Kanetkar, "UNIX Shell Programming" BPB Publications (First Edition)
7. Jerry Peek and others, "Unix Power Tools" O'Reilly Publisher

HRD & Organizational behavior
(Interdisciplinary Elective – III)

Subject Code: 18IET331 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives: To introduce the concepts of Human Resource Development with its dynamics of importance, Management Development and work force programmes. Also provides the knowledge on Organisational behaviour and its implications for the effectiveness.

Course Outcomes:
Students will be able to

1. Demonstrate the concepts, with importance and evolution of HRD and narrate how it is useful for the professional working in the organisations.
2. Apply HRD activities in Management development in line with counselling and wellness services.
3. Demonstrate the dynamics of workforce with its diversity, impact and programmes for development.
4. Detail organisation Behaviour and the influence of individual psychological field elements on OB.
5. Narrate Organisation Change, Organisation Development, and Organisation Culture to evaluate Organisational effectiveness.

Unit – I
Human Resource Development – Evolution of HRD - Relationship with HRM - Human Resource Development Functions - Roles and Competencies of HRD Professionals - Challenges to Organization and HRD professionals - Frame work of Human Resource Development - HRD Processes - Assessing HRD Needs - HRD Model Designing Effective HRD Program - HRD Interventions- Creating HRD Programs - Implementing HRD programs - Training Methods

Unit – II
Management Development - Employee counselling and wellness services – Counselling as an HRD Activity - Counselling Programs - Issues in Employee Counselling - Employee Wellness and Health Promotion Programs - Organizational Strategies Based on Human Resources.

Unit – III
Work Force Reduction, Realignment and Retention - HR Performance and Bench Marking - Impact of Globalization on HRD- Diversity of Work Force - HRD programs for diverse employees - Expatriate & Repatriate support and development.

Unit – IV
Organizational Behavior: Nature, Individual Perspective – personality , Personality types– Perception – Motivation, Motivational Theories – Learning – Attitude – Leadership – styles and Techniques of leadership – Group, group Dynamics – conflict Management and Negotiation skills

Unit – V
Organization change, role of change agents– Learning of organisation culture, approaches and Measurement of OC – Organisation developments, OD Interventions – Organisation effectiveness, Nature and Importance

Reference Books

1. Werner &Desimone, HUMAN RESOURCE DEVELOPMENT, Cengage Learning, 2006 William E. Blank, HANDBOOK FOR DEVELOPING COMPETENCY BASED TRAINING PROGRAMMES, Prentice-Hall, New Jersey, 1982.
2. Uday Kumar Haldar, HUMAN RESOURCE DEVELOPMENT, Oxford University Press, 2009 SrinivasKandula, STRATEGIC HUMAN RESOURCE DEVELOPMNET, PHI Learning, 2001
3. Jerald Greenburg and Robert A Baron, BEHAVIOUR IN ORGANISATIONS, PH Learning Private Limited, New Delhi, 2009.
4. PareekUdai. UNDERSTANDING ORGANISATIONAL BEHAVIOUR, Oxford university Press, New Delhi, 2009

GPS & Survey Methods
(Interdisciplinary Elective – III)

Subject Code : 18IET333 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- To study basics and overview of plane surveying
- To study about leveling and apply its knowledge in contour survey.
- To study about theodolite and apply its knowledge in Trigonometrical leveling, traversing etc.
- To study the basic concepts of Global Positioning System.
- To study various characteristics of Geodetic Surveying

Course Outcomes:

Students will be able to

1. Describe basics and overview of plane surveying
2. Describe about leveling and apply its knowledge in contour survey.
3. Describe about theodolite and apply its knowledge in trigonometrically leaving Traversing etc
4. Demonstrate basic concepts of Global Positioning System.
5. Demonstrate basic concepts of Geodetic Surveying

Unit – I

Describe basic and overview of plane surveying

Introduction: Surveying objectives, plane surveying principles and classification

Chain Surveying: Principles, Equipment, Types of tapes and chains Compass Surveying: Measurement of directions and angles, types of compass, meridians and bearings, local attraction, magnetic declination.

Unit – II

Levelling and Contouring: Description of a point (position) on the earth's surface, instruments for leveling, principle and classification of leveling, bench marks, leveling staff, readings and booking of levels, contours, characteristics of contours, methods of contouring, uses of contour maps.

Unit – III

Theodolite and Tachometric Surveying: Principle of theodolite survey, Theodolite component parts, observations, fundamentals of Traversing, Trigonometrical Surveying, Tachometry, principle of tacheometry, methods of tacheometry.

Unit – IV

TOTAL STATION SURVEYING

Basic principle Classifications – Electro optical system, measuring principle, working principle, sources of errors. - Infrared and Laser Total station instruments. Care and maintenance of Total station instruments – Modern positioning systems- traversing

Unit – V

GPS SURVEYING

Basic concepts – Different segments – space, control and user segments –satellite configuration – signal structure – orbit determination and representation – Anti spoofing and selective availability- Task control of segment Hand held and Geodetic receiver's data processing – traversing and triangulation

Text Books

1. 'Surveying and Levelling' by R. Subramanian, Oxford University Press, New Delhi, 2 edition, 2012
2. A text book of Surveying' by C. Venkatramaiah, Orient Blackswan Private Limited - New Delhi; Second edition, 2011
3. 'Surveying Vol. II and Vol. III (Higher Surveying)' by Dr. B. C. Punmia, Ashok K. Jain and Arun K. Jain, Laxmi Publications Pvt. Ltd., New Delhi.
4. 'Advanced Surveying' by Satheesh Gopi, R. Sathikumar and N. Madhu, Pearson, New Delhi, 2007
5."Surveying (Vol – 1, 2 & 3), by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi
6 . Duggal S K, "Surveying (Vol – 1, 2 & 3), Tata McGraw Hill Publishing Co. Ltd. New Delhi.

Reference Books

1. 'Remote Sensing and its Applications' by L A R Narayan, Universities Press, New Delhi.
2. 'Geographical Information Science' by Narayan Panigrahi, Universities Press, New Delhi.
3. 'Basics of Remote Sensing and GIS' by Dr. S. Kumar, University Science Press, New Delhi.

Energy audit conservation and management
(Interdisciplinary Elective – III)

Subject Code : 18IET334 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objective:
To introduce basic principles of energy auditing and to know something about energy management. Also it provides immense knowledge about energy efficient motors, power factor improvement, and lighting and energy instruments. Finally economic aspects are analyzed.

Course Outcomes:
Students will be able to:
1. Apply principles of energy auditing and propose energy conservation schemes.
2. Demonstrate principle and organizing energy management program.
3. Demonstrate the operating principle of energy efficient motors.
4. Analyze power factor improvement methods, illumination methods and demonstrate the operation of various energy instruments.
5. Analyze and compute the economic aspects of energy consumption.

Unit – I
Basic principles of energy audit: Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes.

Unit – II
Energy management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

Unit – III
Energy efficient motors: Energy efficient motors , factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed , variable duty cycle systems, RMS hp-voltage variation-voltage unbalance- over motoring- motor energy audit.

Unit – IV
Power factor improvement, lighting and energy instruments : Power factor – methods of improvement, location of capacitors. Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

Unit – V
Economic aspects and analysis: Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis.

Text Books:
1. Energy Management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy Efficient Electric Motors by John. C. Andres, Marcel Dekker Inc. Ltd – 2nd Edition, 1995
3. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing Company Ltd, New Delhi.

Reference Books:

1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.

Elements of Workshop Technology
(Interdisciplinary Elective – III)

Subject Code : 18IET335 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- To provide knowledge about the different manufacturing processes
- To impart knowledge on carpentry tools, operations and joints
- To understand the fitting tools, operations and joints
- To provide knowledge on forging tools, operations and joints
- To impart knowledge on sheet metal work tools, operations and joints

Course Outcomes:

On completion of this course, students should be able to

1. Comprehend different manufacturing processes.
2. Explain the carpentry tools and applications of carpentry joints.
3. Explain the fitting tools and operations.
4. Explain the forging tools and operations.
5. Explain the sheet metal tools and operations and applications.

Unit – I

Methods of manufacturing processes, casting, forming, metal removal processes, joining processes, surface finishing processes, basic workshop process, carpentry fitting, hand forging, sheet metal work, cold and hot working of metals.

Unit – II

Carpentry:

Marking & measuring tools, Cutting Tools: Saws, Chisels, Planes, Boring Tools, Striking tools, Holding devices, Carpentry joints: Half lap joint, Mortise and tenon joint, bridle joint, dovetail joint.

Unit –III

Fitting:

Marking & measuring tools, Holding Devices, Cutting tools: Hacksaw, Files, Chisels, Drill bits, Reamer, Taps, Dies & sockets, striking tools, Holding devices and Fitting Operations: chipping, filing, sawing, marking, drilling, reaming, tapping, dieing.

Unit – IV

Forging:

Hand forging - Hand tools**:** Anvil, swage block, Tongs, hammers, Chisels, Swages, Fullers, flatters, set hammer, punches and drift, Forging operations: Upsetting, drawing down, setting down, punching and drifting, bending, welding, cutting, swaging, fullering and flattering.

Unit – V

Sheet Metal Work:

Metals used for sheet metal work, Sheet metal hand tools: snips, stakes, hand hammers, mallets and Sheet Metal Operations: Shearing, bending, drawing, squeezing, Sheet metal joints-Hem joint, seam joint.

Text Books:

1. Elements of Workshop Technology S. K. Hajra Choudhury, A. K. Hajra Choudhury.
2. Workshop Technology B. S. Raghuwanshi Dhanpat Rai & Co.,

References Books:

1. Workshop Technology by Virender Narula Pub: S.K.Kataria & Sons.

Fundamentals of Signals & Systems
(Interdisciplinary Elective – III)

Subject Code : 18IET337 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives

- Describe signals and systems in mathematical framework.
- Discuss the fundamental concepts of signals in Fourier domain.
- Demonstrate an understanding of the fundamental properties of Linear Time Invariant systems.
- Acquire knowledge on need of sampling, convolution and correlation concepts.
- Determine stability of given systems using Laplace and Z- Transform techniques

Course Outcomes

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

1. Classify various types of signals and systems.
2. Calculate the Fourier series and Fourier transform of a given signal.
3. Calculate convolution and correlation of given signals.
4. Determine Nyquist sampling rate of a given signal.
5. Compute Laplace and Z transforms of given signals.

Unit – I

Signal Analysis: Introduction to signals and systems, classification of signals and systems, exponential and sinusoidal signals, elementary signals.

Unit – II

Fourier series: Representation of Fourier series, properties of Fourier series, Dirichlet's conditions, trigonometric and exponential Fourier series.

Fourier Transform: Fourier transform of arbitrary signals and standard signals, properties of Fourier transforms.

Unit – III

Convolution and Correlation of Signals: Concept of convolution in time domain and frequency domain, cross correlation and auto correlation, properties of correlation.

Unit – IV

Laplace Transform: Review of Laplace transforms, Laplace Transforms of typical signals, properties of LT, Region of convergence (ROC) and constraints on ROC. Inverse Laplace transforms.

Z – Transform: Introduction to z-transform, ROC and its properties.

Unit – V

Sampling of Signals: Sampling theorem, Impulse sampling, Natural and Flat top sampling, effect of under sampling – Aliasing.

Text Books

1. Signals, Systems and Communications – B.P. Lathi, BS Publications, 2003.
2. Signals and Systems – A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2/e.
3. Signals and Systems – K. Dheerga Rao, Publisher: BIRKHAUSER BOSTON INC, 2018

Reference Books

1. Signals & Systems – Simon Haykin and Van Veen,Wiley, 2/e.
2. Fundamentals of Signals and Systems – Michel J. Robert, MGH International Edition, 2008.
3. Charles L.Phillips, John M. Parr, Eve A. Riskin, "Signals, Systems, and Transforms", Pearson Publications, 4th Edition.

Fundamentals of Image Processing
(Interdisciplinary Elective – III)

Subject Code : 18IET339 **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- To study the need of image processing and their fundamentals.
- To study the image enhancement techniques
- To study the image compression procedures.
- To study image restoration procedures.
- To study image segmentation and edge techniques.

Course Outcomes:

1. Understand the need for basic relationship between pixels, sampling and quantization.
2. Develop any image processing application.
3. Categorize various compression techniques.
4. Learn Various Morphological Algorithms.
5. Interpret image segmentation and representation techniques.

Unit-I

Digital Image Fundamentals: Introduction to Image Processing –Applications of Image Processing, Components in Image Processing,Image Sampling and Quantization, Basic Relationship Between Pixels.

Unit-II

Image Enhancement: Basic Gray level Transformations, Histogram processing, Arithmetic/Logical Operations- Image Subtraction and Image Averaging, Basics of Spatial Filtering-Smoothening Spatial Filters, Sharpening Spatial Filters.

Unit-III

Image Compression: Redundancy- Coding, Inter Pixel, Psycho-Visual, Fidelity Criteria, Image Compression Models-The Source Encoder and Decoder, Variable Length Coding, LZW Coding, Bit-Plane Coding, Image Compression Standard – JPEG.

Unit-IV

Image Morphology: Basic Concepts of Set Theory, Logical Operations Involving Binary Images, Dilation and erosion, opening and closing, The Hit or Miss Transformation, Basic Morphological algorithms-Boundary Extraction, Thinning, Thickening, Pruning.

Unit-V

Image Segmentation: Detection of discontinuities-point detection, line detection, edge detection, Thresholding-Basic Global Thresholding, Basic Adaptive Thresholding, Region-Based Segmentation-Basic Formulation, Region growing, Region Splitting and Merging.

Text books:

1. Digital Image Processing – R.C. Gonzalez & R.E. Woods, Addison Wesley / Pearson Education, 4th Edition, 2017.
2. Digital Image Processing – S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw Hill Education Pvt. Ltd., 5th Edition, 2015.

Reference books:

1. Digital Image Processing using MATLAB-Rafael C. Gonzalez, Richard E woods and Steven L. Eddins, Tata McGraw Hill, 2010.

Advanced Coding – II
(Interdisciplinary Elective – III)

Subject Code : 18IET33A **External Marks: 60**
Credits : 2.0 **Internal Marks : 40**

Course Objectives:

- Understanding importance of Mathematics and Problem solving approaches for programming
- Understanding importance of optimized solution for problem solving

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

1. Develop solution for problems Using Recursion
2. Select appropriate Sorting /Hashing technique to solve the Problem
3. Develop solutions using Non-Linear Data Structures
4. Develop Solution to problems using Greedy approach
5. Develop Solution to problems using Dynamic Programming

Unit – I

Recursion: Recursion and its applications, Exhaustive search using Backtracking.

Problems to Practice: Permutations, Palindrome Partitioning, Beautiful Arrangement, N-Queens , Path with Maximum Gold

Searching: Linear Search and Binary Search.

Practice Problems: Find Peak Element, Guess Number Higher or Lower, Peak Index in a Mountain Array,Koko Eating Bananas, Find Minimum in Rotated Sorted Array.

Unit – II

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quicksort and Count Sort.

Hashing: Introduction to Hashing, Open addressing and Separate chaining.

Problems to Practice: Sort Colors, Largest Number, H-Index, Car Fleet, Relative Sort Array, Maximum Gap, Merge Intervals, Pancake Sorting, Insertion Sort List, Valid Anagram.

Unit – III

Trees : Terminology of Tree concept, Types of Trees ,Tree traversal, Binary Search Tree and Heap sort.

Graphs: Terminology, Representation of Graph, Graph Traversal DFS and BFS, Disjoint Set Union (Union Find).

Problems to Practice: Word Ladder, Shortest Path in Binary Matrix, Rate In Maze, Same Tree, Path Sum, Loud and Rich, Matchsticks to Square.

Unit – IV

Greedy Approach: General approach, Fractional Knapsack problem, Scheduling problem, Dijkstra's Algorithm

Problems to Practice: Jump Game, Gas Station, Candy, Assign Cookies, Lemonade Change, Walking Robot Simulation, Two City Scheduling, Car Pooling

String Matching algorithms: Naïve approach, KMP algorithm, Rabin-Karp Algorithm.

Problems to Practice: Repeated String Match, Count Binary Substrings, Most Common Word, Goat Latin, Minimum Time Difference, Longest Common Prefix, Number of Segments in a String, Validate IP Address.

Unit – V

Dynamic Programming : Introduction, Bottom up DP, Top Down DP, Coin Change Problem, Road Cutting problem, Egg dropping problem, 0/1 Knapsack problem, Longest common Sub Sequence problem.

Text Book:

1. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.

Reference Books:

1. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
3. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.
4. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference links

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems