ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS
(Choice Based Credit System)

R19

Computer Science and Engineering

For
B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for batches admitted from 2019-2020)

SWARNANDHRA

COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

SEETHARAMAPURAM, NARSAPUR-534 280, W.G.DT., A.P.

SWARNANDHRA COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Vision of the Institution:
To provide the society with Centre of Learning in Technical Education and Research that motivates the students to evolve into dynamic professionals.

Mission of the Institution:
- Providing Quality education, student centered teaching learning process and sate of the art infrastructure for professional aspirants hailing from both rural and urban areas.
- Evolving this organization into a centre of Academic and Research Excellence.
- Imparting Technical Education that encourages independent thinking develops strong domain knowledge and positive attitudes towards holistic growth of young minds.

Vision of the Department
To empower Computer Science Engineers as highly proficient, innovative, self-driven, and socially responsible professionals by offering a multidimensional education.

Mission of the Department

M1: Empowerment of Computer Science Engineers :To empower Computer Science Engineers through comprehensive education, fostering high proficiency.

M2: Multidimensional Education: To provide a diverse education, equipping engineers with skills to navigate the global needs.

M3: Development of Proficiency and Innovation :To ensure graduates are well prepared to address technical issues with creativity and innovation.

.**M4: Social Responsibility and Professional Excellence: To** instill a strong sense of commitment, shaping graduates into socially responsible professionals and self-driven.

Program Educational Objectives Statements (PEOs)
PEO1:
Technical Excellence: Graduates will demonstrate a high level of proficiency and competence in computer science and engineering, equipped with the knowledge and practical skills necessary to excel in their chosen career paths.

PEO2:
Innovation and Problem-Solving : Graduates will be innovative thinkers and problem-solver, capable of applying their skills to tackle complex challenges in the ever-evolving technological landscape.

PEO3:
Self-Motivation and Lifelong Learning: Graduates will exhibit self-motivation and a commitment to lifelong learning, continually updating their skills and knowledge to stay current in their field.

PEO4:
Social Responsibility and Leadership: Graduates will demonstrate a strong sense of social responsibility, ethical conduct, and leadership abilities.

PROGRAM OUTCOMES

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.
a. **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.
b. **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.
c. **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.
d. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
e. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
f. **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.
g. **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.
h. **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 OUTCOME (PSOs)

PSO1:
Student will possess comprehensive knowledge and skills in computer networks, distributed computing and network security to design, implement, and manage robust secure and scalable computing systems that meet
the evolving needs of organizations and industries

PSO2:
Students will be equipped with the knowledge and skills to effectively apply data science and machine learning techniques o solve real-world problems , analyze complex datasets, and make data-driven decisions in diverse industries

ACADEMIC REGULATIONS

1. **INTRODUCTION**

   Swarnandhra College of Engineering & Technology (**Subsequently referred to as SCET**) will be followed the norms of Jawaharlal Nehru Technological University Kakinada and Govt. of Andhra Pradesh.

   All Academic Programme rules and regulations are approved by the Academic Council, which is the highest Academic body of the Institute. It is applicable for all Bachelor of Technology (B. Tech) degree programme from academic year 2019-20 admission onwards.

2. **ADMISSIONS**

   2.1 Regular Admission

   (Join in first year B. Tech Programme)

   Admissions in the Institution are classified into **CATEGORY – A,** through convener, EAMCET and **CATEGORY- B** filled by the college management.

   2.2 Lateral Entry Admission
   (Join in the Second year/third semester of B. Tech Programme)
   Eligibility: B.Sc. Graduate & Diploma holders.
   Based on the rank secured by the candidate at Engineering Common Entrance Test (ECET) conducted by the convener ,ECET, and Central counseling by Higher Education, Government of Andhra Pradesh.

   2.3 Advance standing Admission
   (Transfer from other Colleges/ Re-admission due to dis-continuation)
   These may arise in the following cases:

   a) When a student seeks transfer from other colleges to SCET and desirous to pursue the study at SCET in an eligible branch of study.
   b) When students of SCET get transferred from one regulation to another regulation or from previous syllabus to revised syllabus.

In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Programme of study at SCET will be governed by the transitory regulations.

3. **UNDER GRADUATE PROGRAMMES OFFERED**

   Presently, the College is offering Under Graduate Programmes in the following disciplines:
   - ➢ Computer Science and Engineering (CSE)
   - ➢ Electronics and communication Engineering (ECE)
   - ➢ Electrical and Electronics Engineering (EEE)
   - ➢ Information Technology (IT)
   - ➢ Mechanical Engineering (ME)
   - ➢ Civil Engineering (CE)

3.1 Structure of the Programme:

i) **Preamble:**

It is emphasized in UGC Guidelines on Choice Based Credit System (CBCS), that the important measures taken to enhance academic standards and quality in higher education include innovation and improvements in curriculum, teaching-learning process, examination and evaluation systems, besides governance and other matters. It is adopted grading system in place of conventional system of marks and percentages.

Our CBCS provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The students can register any courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach through open electives.

Key words CBCS, such as Course, credit, credit point, CGPA, SGPA, Grade Point, Letter Grades, Foundation Courses (FC), Programme Core Course (PCC) and Elective Courses (EC) as given in the UGC guidelines are used the same definitions.

Each Programme of a Discipline or branch will consist of:

    i).   Foundation courses in Basic Sciences, Engineering Sciences and Humanities.

    ii).   Programme core courses to impart broad based knowledge needed in the concerned branch.

    iii).   Elective courses from the discipline or interdisciplinary areas / industry related opted by the student based on their interest in specialization.

    iv).   Open Elective courses from the interdisciplinary areas opted by the students based on their interest in specialization.

Each Programme designed to have 35-40 theory courses and 20-25 laboratory courses. The categories of courses are indicated in the following table.

TABLE-1 CATEGORY OF COURSES

Course Category
Foundation Courses – Basic Sciences & Humanities
Foundation Courses – Engineering Sciences
Programme Core Courses in the branch of study
Elective Courses
Open Elective

Note: All components prescribed in the curriculum will be conducted and evaluated.

ii) **Contact hours:** Depending on the complexity and volume of the course the number of contact hours per week will be determined.

iii) **Credits:**

TABLE-2 CREDITS BASED ON CONTACT HOURS

Course type	No. of Contact Hours	No. of Credits
Theory	1	1
Laboratory	2	1

TABLE-3 CREDITS FOR DIFFERENT COURSES

Course type	Lecture method			Credits
	L	T	P	C
Theory /Elective	3	1	0	4
	2	1	0	3
	3	0	0	3
	2	0	2	3
	2	0	0	2
Laboratory	0	0	2	1
	0	0	3	1.5
	0	0	4	2

3.2 Curriculum for each Programme:

- The Four year curriculum of any B. Tech Programme of study in any branch of Engineering is formulated based on the guidelines mentioned in 3.1 and will be recommended by the concerned Board of Studies and is approved by the Academic Council.
- In case of students admitted under lateral entry, the respective regular curriculum contents from 3rd semester onwards are to be pursued by them.
- In case of students admitted under advanced standing, the equivalence will be prepared by the concerned Board of Studies and the Academic Council has to approve the same..

4. **DURATION OF THE PROGRAMME:**

The duration of the B. Tech. Programme is four academic years consisting of eight semesters. Students, who fail to fulfill all the academic requirements for the award of the degree within the prescribed duration as per article 4.1, will forfeit their admission in B. Tech course**.**

4.1 Maximum duration of study.

Maximum duration permitted for any student to successfully complete the four year B. Tech. Programme of study will be:

Regular Admission: Eight academic years in sequence from the year of admission for a student admitted into first year of any Programme.

Lateral Entry Admission: Six academic years in sequence from the year of admission for a student admitted into second year of any Programme.

Advanced standing Admission: The maximum time for completion of Programme of study, will be twice the period in terms of academic years in sequence, stipulated in the Programme curriculum defined at the time of admission.

4.2 Cancellation of Admission :

In case, any student fails to meet the above applicable/eligible conditions for the award of degree, his/her admission stands cancelled.

TABLE- 4 MAXIMUM DURATION OF STUDY

Admitted year of study	Maximum duration
First year	8 academic years in sequence
Second year (Lateral entry)	6 academic years in sequence
Advanced standing	Twice the period in terms of academic years in sequence

5. **MEDIUM OF INSTRUCTION** :
   The medium of instruction and examinations are in English.

6. **MINIMUM INSTRUCTION DAYS:** Each semester will consist of 22 weeks duration with minimum of 110 working days which includes instruction days, internal tests and End examinations.

7. **TRANSITORY REGULATIONS:**

   For those who admitted under advance standing, these transitory regulations will provide the modus of operandi. At the time of such admission, based on the Programme pursued (case by case)
   - Equivalent courses completed by the student are established by the BOS of concerned discipline.
   - Marks/Credits are transferred for all such equivalent courses and treated as successfully completed in the Programme of study prescribed by SCET.
   - A Programme chart of residual courses not completed will be derived and a Programme of study with duration specified will be prescribed for pursuit at SCET.
   - Marks obtained in the previous system, as the case maybe, shall be converted to equivalent grades and CGPA.

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

8. **DISTRIBUTION AND WEIGHTAGE OF MARKS:**

   Each semester consists of 4/5/6 theory courses and 2/3/4 Laboratories. However, in the 8th semester there will be only 2 theory courses in addition to the project work.

   (a). **Theory Courses:**
   - Each course consists of five units.
   - All courses will be evaluated with a maximum of 100 marks.
   - Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
   - The internal evaluation of 30 marks consists of two cycles. Each cycle consists of descriptive test (internal test) for 20 marks and two class tests for 10 marks.
   - Mid Examination: Each mid examination will be conducted for 20 marks with the duration of 75 Minutes. Internal test paper consists of three questions (8M+8M+4M) from two and half units and all are to be answered.
   - Class tests for 10 marks calculation: There will be two class tests conducted in each cycle unit wise. **Best of two** will be considered.
   - **Weighted average of two Cycles** performance will be considered, weightage of 80% for the best Cycle performance and 20% for second.
   - The **end semester** examination will be conducted for 70 marks which covers full syllabus. In end examination pattern, **Part – A** consists of five short questions from all units (Brainstorming/Thought provoking/Case study) for 10 marks. **Part – B** has **5 questions** with internal choice from each unit and valued for 60 marks.

(b). **Practical Courses:**
- All courses will be evaluated with a maximum of 100 marks.
- Marks distribution will be 30 marks for internal evaluation and 70 marks for the end semester examination.
- End practical examination will be conducted by the internal and external examiner appointed by COE.
- Internal evaluation will be a continuous assessment during the semester for 30 marks with 15 marks for day-to-day work, including record valuation and 15 marks for internal test.

(c). **Design or Engineering Drawing Marks Distribution:**

For the courses of design or drawing such as Engineering Graphics, etc., the distribution will be 30 marks for internal evaluation with 10 marks for day-to-day work, and 20 marks from two internal tests (80% of first best + 20% of second best). End examination will be conducted for 70 marks.

(d) **Internship:** It can be carried out with a minimum of two weeks and maximum of four weeks, any time after completion of 4th semester till end of 7th semester. It will be evaluated internally by an internal evaluation committee comprising of Head of the Department and two faculty of the department. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits

(e) **Mini Project:** The 6th/7th Semester Mini Project work will be evaluated for 100 marks.

The project work is evaluated for internal assessment for 30 and external examination for 70.

i) Internal Assessment: Internal Assessment will be monitored by Project Review Committee consisting of 1) Head of the Department 2) Supervisor and 3) Senior faculty member on the basis of two seminars and the internal marks will be awarded by Project Supervisor with recommendation of PRC.

ii) External Examination: External Examination will be conducted through presentation / viva - voice by the student by Project external examination committee consisting of 1) Head of the Department 2) Supervisor and 3) External examiner appointed by COE.

(g) Project Work: The 8th Semester main Project Work will be evaluated for 200 marks. The project work is evaluated for internal assessment of 60 and external examination for 140.

i) Internal Assessment: Internal Assessment will be monitored by Project Review Committee consisting of 1) Head of the Department 2) Supervisor and 3) Senior faculty member on the basis of two seminars and the internal marks will be awarded by Project Supervisor with recommendation of PRC.

ii) External Examination: External Examination will be conducted through presentation / viva - voice by the student by Project external examination committee consisting of 1) Head of the Department 2) Supervisor and 3) External examiner appointed by COE.

TABLE- 5 MARKS ALLOCATION

Course type	Marks Allocation			
	Internal		End Semester	Total
	Internal test	Class Test/ Day to day work		
Theory course	20	10	70	100
Laboratory course	15	15	70	100
Design or Drawing course	20	10	70	100

(h) Mandatory Courses: These courses are compulsory with zero credits. They shall be no external examination. However attendance in the mandatory course of minimum attendance (75%) in that particular course.

(i) Open Electives: Students are to choose Open Elective – I during 5th Semester, Open Elective–II during 6th Semester and Open Elective – III and IV during 7th Semester from the list of Open Electives given in the Course Structure. However, students cannot opt for an Open Elective Subject offered by their own (parent) Department, if it is already listed under any category of the courses offered by the parent Department in any Semester.

9. ATTENDANCE REGULATIONS

(i) A student will be eligible to appear for end semester examinations, if he/she acquired a minimum of 75% of attendance in aggregate of all the courses.

(ii) Condonation of shortage of attendance in aggregate up to 10% on medical grounds (Above 65% and below 75%) in any semester may be granted by the College Academic Committee.

(iii) Shortage of Attendance below 65% in aggregate shall not be condoned.

(iv) Students with less than 65% of attendance in any semester are not eligible to take up their end examination of that particular semester and their registration for examination shall be allowed.

(v) Attendance may also be condoned for those who participate in Intercollegiate/university sports, co- and extracurricular activities provided their attendance is in the minimum prescribed range for the purpose (>65%) and recommended by the concerned authority. He/ She shall pay the prescribed condonation fee.

(vi) Prescribed Condonation fee shall be payable by the student to appear for the end examination.

(vii) A Student will not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester as applicable. They may seek re-admission for that semester as and when offered consecutively by the Department.

(viii) A student will be condoned only four times for regular student and three times for lateral entry students during entire course of study.

TABLE-7 ATTENDANCE REQUIREMENT

Attendance Percentage	Condonation fee	Appear End Exams
Above 75 %	Nil	Eligible
65 % -75%	Yes (on medical grounds)	Eligible
Below 65 %	Nil	Not Eligible (Seek re-admission to that semester when offered)

10. MINIMUM ACADEMIC REQUIREMENTS:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in **S.No.9.**

(i)   A student will be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or drawing subject or project if he/she secures not less than a minimum of 35% of marks exclusively in the end semester examinations in each of the courses, for which the candidate had appeared. However, the candidate should have secured a minimum of 40% marks in both external and internal components put together to declare eligible for pass in the subject.

(ii)   A student will be promoted from first semester to second semester, second semester to third and third to fourth semester, if he/she satisfies the minimum attendance requirement.

(iii)   A student will be promoted from 4th Semester to 5th Semester, if he/she fulfills the academic requirements of 40% of the credits up to 4th Semester from all the examinations (Regular and supplementary) whether or not the candidate takes the examinations.

(iv)   A student will be promoted from 6th to 7th Semester, only if he/she fulfills the academic requirements of 40% of the credits up to 6th Semester from, all the examinations (regular and supply) whether or not the candidate takes the examinations.

(v)   There will be supplementary examinations along with the regular semester examinations enabling the students to give a fair chance to appear in the subject if any failed.

TABLE-8 PROMOTION IN TO NEXT HIGHER CLASS

Promotion From	Promotion to	Promotion Criteria
1ST Semester	2nd Semester	Minimum Attendance requirement
2nd Semester	3rd Semester	Minimum Attendance requirement
3rd Semester	4th Semester	Minimum Attendance requirement
4th Semester	5th Semester	Minimum Attendance requirement & 40% of credits up to 4th semester for all exams
5th Semester	6th Semester	Minimum Attendance requirement
6th Semester	7th Semester	Minimum Attendance requirement & 40% of credits up to 6th semester for all exams
7th Semester	8th Semester	Minimum Attendance requirement

11. GAP YEAR CONCEPT

Students who wish to pursue entrepreneurship full time can take break of one year study, after the 4th Semester with the due recommendations of the GAP committee and approved by the principal. This may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation
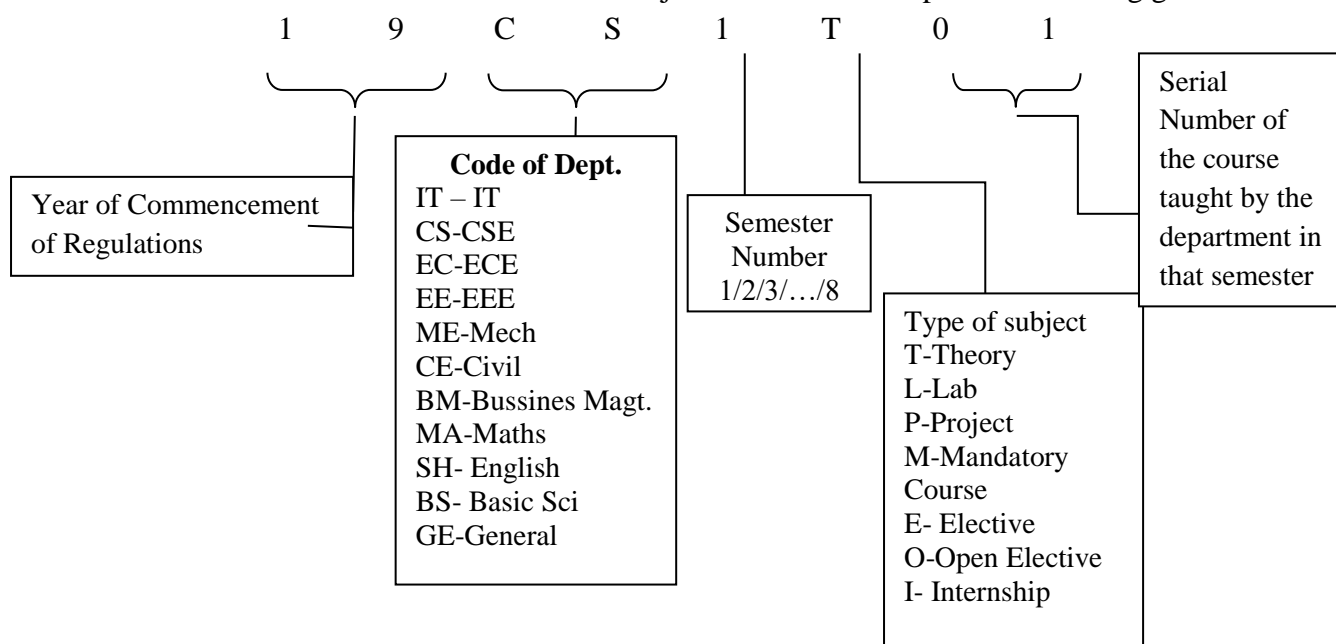
12. ELIGIBILITY FOR AWARD OF DEGREE:

A student shall be eligible for award of the B.Tech. Degree if he/she fulfills all the following conditions:

(i) Pursue the programme of study for a stipulated period of four years and not more than eight years.

(ii) Register for 160 credits and secure the same.

(iii) Registered and successfully completed all the components prescribed in the programme of study in which he/she is admitted.

(iv) All mandatory courses must be completed with satisfactory.

(v) Obtained CGPA greater than or equal to 4.75 (minimum requirements for pass).

13. COURSE CODE & COURSE NUMBERING SCHEME:

The subject codes will be given by the department teaching the subject. Each subject code contains 8 characters. The 8 characters for each subject will be filled as per the following guidelines.

1	9	C	S	1	T	0	1

Year of Commencement of Regulations

Code of Dept.
IT – IT
CS-CSE
EC-ECE
EE-EEE
ME-Mech
CE-Civil
BM-Bussines Magt.
MA-Maths
SH- English
BS- Basic Sci
GE-General

Semester Number 1/2/3/…/8

Type of subject
T-Theory
L-Lab
P-Project
M-Mandatory Course
E- Elective
O-Open Elective
I- Internship

Serial Number of the course taught by the department in that semester

14. GRADING SYSTEM:

14.1 Award of Grade:

(i) Grade Point Average (GPA):

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

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

Where C_i = number of credits for the subject i

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

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

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

Where C_i = number of credits for the subject i

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

c) Equivalent percentage = (CGPA-0.75) x 10

(ii) After a student satisfy the requirements prescribed for the award of UG/PG Programme he/she shall be placed in one of the following four grades. The award of the degree is based on CGPA on a grade point scale of 10 and given in Table 9.

Table -9

CGPA	Award of Division
≥7.75*	First Class with Distinction
≥6.75	First Division
≥5.75	Second Division
≥4.75	Pass Division
<4.75	Unsatisfactory

* In addition to the required CGPA of 7.75, the student must have necessarily passed all the courses of every semester in the minimum stipulated period for the programme.

14.2 Award of Grade in Each Semester:

(i) Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each subject. The letter grades and the corresponding grade points are as given in the Table 10.

Table -10

Percentage of Marks Scored	Letter Grade	Level	Grade points
>=90	O	Outstanding	10
80 - 89	S	Excellent	9
70-79	A	Very Good	8
60-69	B	Good	7
50-59	C	Fair	6
40-49	D	Satisfactory	5
<40	F	Fail	0
		Absent	0

(ii) A student earns a minimum of 5 grade points (D grade) in a subject is declared to have successfully completed the subject, and is deemed to have earned the credits assigned to that subject. However, it should be noted that a pass in any subject/term paper/seminar/project/mini project shall be governed by the rules mentioned in **S.No. 8**.

(iii) Grade Sheet: A grade sheet (memorandum) will be issued to each student indicating his/her performance in all courses taken in that semester and also indicating the grades.

(iv) Transcripts: After successful completion of the programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued up to any point of study to the student on request and by paying stipulated fee in force.

(v) Candidates shall be permitted to apply for revaluation within the stipulated period with payment of prescribed fee.

(vi) The Academic Council has to approve and recommend to the JNTUK, Kakinada for the award of a degree to any student.

14. SUPPLEMENTARY EXAMINATIONS:

In addition to the Regular Final Examinations held at the end of each semester, a Supplementary Examination will be conducted. A student can appear for any number courses of supplementary examinations till he/she clears the courses. However the maximum stipulated period of programme cannot be relaxed under any circumstance.

15. ADVANCED SUPPLEMENTARY EXAMINATIONS:

Candidate who fails the courses in 7th and 8th Semester can appear for Advanced Supplementary Examinations.

16. **ACADEMIC REGULATIONS FOR B.TECH (LATERAL ENTRY SCHEME):**
    i.   The students have to acquire 120 credits from 3rd Semester to 8th Semester of B. Tech Programmefor the award of the degree.
    ii. All mandatory courses must be completed with satisfactory for award of degree.
    iii. Obtained CGPA greater than or equal to 4.75 (minimum requirements for pass).
    iv. The same attendance regulations are to be adopted as per the rules mentioned in item No.10.
    v.   **Rules for Promotion from 6th Semester to 7th Semester**: A student shall be promoted from 6th Semester to 7th Semester only if he/she fulfills the academic requirements of 40% credits up to 6th Semester.
    vi. Students, who fail to fulfill the requirement for the award of the degree in six consecutive academic years from the year of admission, shall forfeit their seat.

17. **CONDUCT AND DISCIPLINE:**

    Students admitted in SCET are to be followed the conduct and discipline of the college and which will be updated from time to time.

18. **MALPRACTICES:**

    If any malpractices held in internal assessment tests or Semester-End Examinations, Principal constitute a Malpractice Enquiry Committee to enquire the case. The principal shall take necessary action based on the recommendations of the committee as per stipulated norms.

19. **WITHHOLDING OF RESULTS**

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

20. **ACADEMIC FLEXIBILITY:**

    Students can study two elective courses of 8th Semester in advance, one in 6th and the other in 7th semester, those who cleared all the courses with CGPA 8.50 up to 5th semester. If a student fails in any course of the 6th/ 7^{th}semester, the flexibility will be cancelled. 8th Semester elective courses can study in advance from the MOOC/NPTEL/SWAYAM/etc.,courses.

21. **GENERAL:**
    a) Wherever the words "he", "him", "his", occur in the regulations, they include "she", "her", "hers".
    b) The academic regulation should be read as a whole for the purpose of any interpretation.
    c) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final and which is to be ratified by the Chairman of the Governing Body.
    d) 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.

SEMESTER-I

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19MA1T01	Calculus and Linear Algebra	3	1	-	4.0	30	70	100
2	19BS1T02	Engineering Chemistry	3	-	-	3.0	30	70	100
3	19HS1T01	English	3	-	-	3.0	30	70	100
4	19CS1T01	Problem Solving and Programming Using C	3	-	-	3.0	30	70	100
5	19BS1L02	Engineering Chemistry Lab	-	-	3	1.5	30	70	100
6	19HS1L01	English Proficiency Lab	-	-	3	1.5	30	70	100
7	19CS1L01	C Programming Lab	-	-	3	1.5	30	70	100
8	19ME1L01	Engineering Workshop	-	-	3	1.5	30	70	100
		TOTAL	**12**	**1**	**12**	**19**	**240**	**560**	**800**

SEMESTER-II

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19MA2T04	Differential Equations and Numerical Methods	3	-	-	3.0	30	70	100
2	19BS2T01	Engineering Physics	3	-	-	3.0	30	70	100
3	19ME2T01	Engineering Graphics	3	-	-	3.0	30	70	100
4	19CS2T02	Object Oriented Programming Using C++	3	-	-	3.0	30	70	100
5	19EE2T01	Basic Electrical Engineering	3	-	-	3.0	30	70	100
6	19HS2L02	English Communication Skills Lab	-	-	3	1.5	30	70	100
7	19BS2L01	Engineering Physics Lab	-	-	3	1.5	30	70	100
8	19CS2L02	IT Workshop	-	-	3	1.5	30	70	100
9	19CS2L03	C++ Programming Lab	-	-	3	1.5	30	70	100
		TOTAL	**15**	**0**	**12**	**21**	**270**	**630**	**900**

L-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS.
IM-INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

SEMESTER-III

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19CS3T01	Discrete Mathematics	3	-	-	3.0	30	70	100
2	19CS3T02	Data Structures	3	1	-	4.0	30	70	100
3	19CS3T03	Java Programming Language	3	-	-	3.0	30	70	100
4	19EC3T05	Digital Logic Design	3	-	-	3.0	30	70	100
5	19CS3T04	Computer Organization and Architecture	3	-	-	3.0	30	70	100
6	19CS3L01	Data Structures Lab	-	-	3	1.5	30	70	100
7	19CS3L02	Java Programming Language Lab	-	-	3	1.5	30	70	100
8	19EC3L05	Digital Logic Design Lab	-	-	3	1.5	30	70	100
9	19CE0M01	Environmental Science	2	-	-	-	-	-	-
		TOTAL	**17**	**1**	**9**	**20.5**	**240**	**540**	**800**

SEMESTER-IV

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19MA4T05	Probability and Statistics	3	-	-	3.0	30	70	100
2	19CS4T01	Operating Systems	3	-	-	3.0	30	70	100
3	19CS4T02	Database Management Systems	3	-	-	3.0	30	70	100
4	19CS4T03	Design and Analysis of Algorithms	3	-	-	3.0	30	70	100
5	19IT4T04	Software Engineering	3	1	-	4.0	30	70	100
6	19CS4L01	Operating Systems Lab	-	-	3	1.5	30	70	100
7	19CS4L02	Database Management Systems Lab	-	-	3	1.5	30	70	100
8	19CS4L03	Python Programming and Applications Lab	-	-	4	2.0	30	70	100
9	19BM0M01	Professional Ethics and Intellectual Property Rights	2	-	-	-	-	-	-
		TOTAL	**17**	**1**	**10**	**21**	**240**	**560**	**800**

L-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS.
IM-INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

SEMESTER – V

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19CS5T01	Computer Networks	3	-	-	3.0	30	70	100
2	19CS5T02	Object Oriented Analysis and Design	3	-	-	3.0	30	70	100
3	19CS5T03	Data Science	3	-	-	3.0	30	70	100
4	19CS5T04	Automata Theory and Compiler Design	3	-	-	3.0	30	70	100
5		**Open Elective -I**	3	-	-	3.0	30	70	100
6		**Elective`-I**	3	-	-	3.0	30	70	100
7	19CS5L01	Computer Networks Lab	-	-	3	1.5	30	70	100
8	19CS5L02	Object Oriented Analysis and Design Lab	-	-	3	1.5	30	70	100
9	19CS5L03	Data Science Lab	-	-	3	1.5	30	70	100
10	19HS5L03	Advanced English Communications Skills Lab	-	-	2	1.0	30	70	100
		TOTAL	18	0	11	23.5	300	700	1000

SEMESTER – VI

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19CS6T01	AI Tools, Techniques and Applications	3	-	-	3.0	30	70	100
2	19CS6T02	Internet of Things and Cyber Security	3	-	-	3.0	30	70	100
3		**Open Elective - II**	3	-	-	3.0	30	70	100
4		**Elective - II**	3	-	-	3.0	30	70	100
5	19BM6T01	Managerial Economics and Financial Analysis	3	-	-	3.0	30	70	100
6	19CS6L01	Artificial Intelligence Lab	-	-	3	1.5	30	70	100
7	19CS6L02	Internet of Things and Cyber Security Lab	-	-	3	1.5	30	70	100
8	19CS6P01	Mini Project-1	-	-	6	3.0	30	70	100
9	19BM0M02	Introduction to Cyber Law	2	-	-	-	-	-	-
		TOTAL	17	0	12	21	240	560	800

L-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS.
IM-INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

SEMESTER – VII

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19CS7T01	Machine Learning and Deep Learning	3	-	-	3.0	30	70	100
2	19CS7T02	Full Stack Web Development	3	-	-	3.0	30	70	100
3		**Open Elective - III**	3	-	-	3.0	30	70	100
4		**Open Elective - IV**	3	-	-	3.0	30	70	100
5		**Elective - III**	3	-	-	3.0	30	70	100
6	19CS7L01	Machine Learning and Deep Learning Lab	-	-	3	1.5	30	70	100
7	19CS7L02	Full Stack Web Development Lab	-	-	3	1.5	30	70	100
8	19CS7P01	Mini Project-II	-	-	6	3.0	30	70	100
9	19CS7I01	Internship	-	-	2	1.0	50	-	50
10	19BM0M03	Indian Constitution	2	-	-	-	-	-	-
		TOTAL	17	0	14	22	290	560	850

SEMESTER – VIII

S.No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1		**Elective - IV**	3	-	-	3	30	70	100
2		**Elective - V**	3	-	-	3	30	70	100
3	19CS8P01	Project Work	-	-	12	6	60	140	200
		TOTAL	6	-	12	12	120	280	400

L-LECTURE HOURS, **T**- TUTORIAL HOURS, **P**-PRACTICAL HOURS, **C**-CREDITS.
IM-INTERNAL MARKS, **EM**- EXTERNAL MARKS, **TM**- TOTAL MARKS

S.NO	COURSE CODE	COURSE NAME	L	T	P	C	IM	EM	TM
		PROFESSIONAL ELCTIVE-I (SEM-5)							
1	19EC5E27	Microprocessor and Interfacing	3	-	-	3.0	30	70	100
2	19CS5E01	Computer Graphics	3	-	-	3.0	30	70	100
3	19CS5E02	Principles of Programming Languages	3	-	-	3.0	30	70	100
4	19CS5E03	Software Project Management	3	-	-	3.0	30	70	100
		PROFESSIONAL ELCTIVE-II (SEM-6)							
5	19CS6E04	Software Testing Methodologies	3	-	-	3.0	30	70	100
6	19CS6E05	Mobile Computing	3	-	-	3.0	30	70	100
7	19CS6E06	Big Data and Hadoop	3	-	-	3.0	30	70	100
8	19CS6E07	.NET Technologies	3	-	-	3.0	30	70	100
		PROFESSIONAL ELCTIVE-III (SEM-7)							
9	19CS7E08	Quantum Computing	3	-	-	3.0	30	70	100
10	19EC7E20	Image Processing	3	-	-	3.0	30	70	100
11	19CS7E09	Social Networks	3	-	-	3.0	30	70	100
12	19CS7E10	Data Engineering	3	-	-	3.0	30	70	100
		PROFESSIONAL ELCTIVE-IV (SEM-8)							
13	19CS8E11	Cloud Computing	3	-	-	3.0	30	70	100
14	19CS8E12	Augmented Reality and Virtual Reality	3	-	-	3.0	30	70	100
15	19CS8E13	Block chain Technology	3	-	-	3.0	30	70	100
16	19CS8E14	Advanced Data Structures	3	-	-	3.0	30	70	100
		PROFESSIONAL ELCTIVE-V (SEM-8)							
17	19CS8E15	Distributed and High Performance Computing	3	-	-	3.0	30	70	100
18	19ME8E25	Robotics	3	-	-	3.0	30	70	100
18	19CS8E16	Cryptography and Network Security	3	-	-	3.0	30	70	100
20	19CS8E17	Multicore Architectures	3	-	-	3.0	30	70	100

LIST OF OPEN ELECTIVES

S. No.	Course Code	Course Title	L	T	P	C	IM	EM	TM
1	19EEXO01	Electrical Safety Management	3	-	-	3.0	30	70	100
2	19EEXO02	Non-conventional Energy sources	3	-	-	3.0	30	70	100
3	19EEXO03	Electrical Vehicle	3	-	-	3.0	30	70	100
4	19EEXO04	Electrical Energy Conservation and Auditing	3	-	-	3.0	30	70	100
5	19CEXO01	Disaster Management	3	-	-	3.0	30	70	100
6	19CEXO02	Water Pollution and Control	3	-	-	3.0	30	70	100
7	19CEXO03	Solid Waste Management	3	-	-	3.0	30	70	100
8	19CEXO04	Building Planning and Drawing	3	-	-	3.0	30	70	100
9	19MEXO01	3D Printing	3	-	-	3.0	30	70	100
10	19MEXO02	Form Machinery	3	-	-	3.0	30	70	100
11	19MEXO03	Bio-Mechanical Engineering	3	-	-	3.0	30	70	100
12	19MEXO04	Waste to Energy Conversion	3	-	-	3.0	30	70	100
13	19CSXO01	Internet of Things and Applications	3	-	-	3.0	30	70	100
14	19CSXO02	Foundation to Data Analytics	3	-	-	3.0	30	70	100
15	19CSXO03	Data Engineering	3	-	-	3.0	30	70	100
16	19CSXO04	Machine Learning	3	-	-	3.0	30	70	100
17	19ECXO01	Nanotechnology and Applications	3	-	-	3.0	30	70	100
18	19ECXO02	Global Positioning and Navigation Satellite Systems	3	-	-	3.0	30	70	100
19	19ECXO03	Remote Sensing	3	-	-	3.0	30	70	100
20	19ECXO04	Mobile Communication and Applications	3	-	-	3.0	30	70	100
21	19ITXO01	Software Engineering Principles	3	-	-	3.0	30	70	100
22	19ITXO02	Cloud Computing Principles	3	-	-	3.0	30	70	100
23	19ITXO03	E-Commerce	3	-	-	3.0	30	70	100
24	19ITXO04	Web Technology Principles	3	-	-	3.0	30	70	100
25	19BMXO01	Innovations and Entrepreneurship	3	-	-	3.0	30	70	100
26	19BMXO02	Industrial Sociology and Psychology	3	-	-	3.0	30	70	100
27	19BMXO03	Digital Marketing	3	-	-	3.0	30	70	100
28	19BMXO04	Business Environment	3	-	-	3.0	30	70	100
29	19MAXO01	Operation Research	3	-	-	3.0	30	70	100
30	19MAXO02	Optimization Models	3	-	-	3.0	30	70	100
31	19BSXO01	Quantum Computing	3	-	-	3.0	30	70	100
32	19BSXO04	Optoelectronics	3	-	-	3.0	30	70	100

LIST OF OPEN ELECTIVES

S. No.	COURSE CODE	COURSE TITLE	L	T	P	C	IM	EM	TM
1	19EEXO01	Electrical Safety Management	3	-	-	3	30	70	100
2	19EEXO02	Non-conventional Energy sources	3	-	-	3	30	70	100
3	19EEXO03	Electrical Vehicle	3	-	-	3	30	70	100
4	19EEXO04	Electrical Energy Conservation and Auditing	3	-	-	3	30	70	100
5	19CEXO01	Disaster Management	3	-	-	3	30	70	100
6	19CEXO02	Environmental Pollution and Control	3	-	-	3	30	70	100
7	19CEXO03	Solid Waste Management	3	-	-	3	30	70	100
8	19CEXO04	Building Planning and Drawing	3	-	-	3	30	70	100
9	19MEXO01	3D Printing	3	-	-	3	30	70	100
10	19MEXO02	Farm Machinery	3	-	-	3	30	70	100
11	19MEXO03	Bio-Mechanical Engineering	3	-	-	3	30	70	100
12	19MEXO04	Waste to Energy Conversion	3	-	-	3	30	70	100
13	19CSXO01	Internet of Things and Applications	3	-	-	3	30	70	100
14	19CSXO02	Foundation to Data Analytics	3	-	-	3	30	70	100
15	19CSXO03	Data Engineering	3	-	-	3	30	70	100
16	19CSXO04	Machine Learning	3	-	-	3	30	70	100
17	19ECXO01	Nanotechnology and Applications	3	-	-	3	30	70	100
18	19ECXO02	Global Positioning and Navigation Satellite Systems	3	-	-	3	30	70	100
19	19ECXO03	Remote Sensing	3	-	-	3	30	70	100
20	19ECXO04	Mobile Communication and Applications	3	-	-	3	30	70	100
21	19ITXO01	Software Engineering Principles	3	-	-	3	30	70	100
22	19ITXO02	Cloud Computing Principles	3	-	-	3	30	70	100
23	19ITXO03	E-Commerce	3	-	-	3	30	70	100
24	19ITXO04	Web Technology Principles	3	-	-	3	30	70	100
25	19BMXO01	Innovations and Entrepreneurship	3	-	-	3	30	70	100
26	19BMXO02	Industrial Sociology and Psychology	3	-	-	3	30	70	100
27	19BMXO03	Digital Marketing	3	-	-	3	30	70	100
28	19BMXO04	Business Environment	3	-	-	3	30	70	100
29	19MAXO01	Operations Research	3	-	-	3	30	70	100
30	19MAXO02	Optimization Models	3	-	-	3	30	70	100
31	19BSXO01	Quantum Computing	3	-	-	3	30	70	100
32	19BSXO02	Optoelectronics	3	-	-	3	30	70	100

I SEMESTER	L	T	P	C
	3	1	-	4
19MA1T01 - CALCULUS AND LINEAR ALGEBRA				

Course Objectives:

1. This course will illuminate the students in the concepts of calculus and linear algebra.
2. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various realworld problems and their applications.

Bridge Course: Limits, continuity, Types of matrices

Unit I: Matrix Operations and Solving Systems of Linear Equations

Rank of a matrix by echelon form, Normal form - solving system of homogeneous and non-homogeneous linear equations- Gauss Elimination, Jacobi and Gauss Seidel methods - Eigen values and Eigen vectors and their properties (without proof).

Learning Outcomes:

At the end of this unit, the student will be able to
solve systems of linear equations, determine the rank, Eigen values and eigenvectors(K2).

Unit II: Cayley-Hamilton theorem and Quadratic forms

Cayley-Hamilton theorem (without proof), Finding inverse and power of a matrix by Cayley-Hamilton theorem - Reduction to diagonal form - Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

Learning Outcomes:

At the end of this unit, the student will be able to

3. reduce to diagonal form and identify special properties of a matrix, such as positive definite, etc.,and use this information to facilitate the calculation of matrix characteristics; (K3)

Unit III: Multivariable calculus

Expansions of functions: Taylor's and Maclaurin's series - Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

Learning Outcomes:

At the end of this unit, the student will be able to

4. Expand the given function as series of Taylor's and Maclaurin's (K3)
5. Find partial derivatives numerically and symbolically and use them to analyze and interpret theway a function varies. (K3)
6. Acquire the Knowledge in maxima and minima of functions of several variables (K1)
7. Utilize Jacobian of a coordinate transformation to deal with the problems in change of variables(K3)

Unit IV: Multiple Integrals

Double Integrals: change of order of integration, double integrals in polar coordinates, areas enclosedby plane curves.
Triple Integral: Evaluation of triple integrals, change of variables

Learning Outcomes:

At the end of this unit, the student will be able to

8. evaluate double integrals of functions of several variables in two dimensions using Cartesian andpolar coordinates (K3)
9. apply double integration techniques in evaluating areas bounded by a region (K4)

Unit V: Special Functions

Beta and Gamma functions and their properties, relation between beta and gamma functions.

Learning Outcomes:

At the end of this unit, the student will be able to

10. Conclude the use of special functions in multiple integrals (K3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 42/e, 2012.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9/e, 2013.
2. B.V. RAMANA, Higher Engineering Mathematics, Tata McGraw Hill, 2007.

Course Outcomes:

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

1. Develop the use of matrix algebra techniques that is needed by engineers for practical applications
2. Apply the functions of several variables which is useful in optimization
3. Acquire important tools of calculus in higher dimensions and will become familiar with double integral
4. Solve the multiple integrals and are apply for special functions.

	L	T	P	C
B. TECH 1 SEMESTER	**3**	**-**	**-**	**3**
19BS1T02- ENGINEERING CHEMISTRY				

COURSE OUTCOMES

At the end of semester, the students will be able to

1. Summarize the impurities present in raw water, problems associated and how to avoid them
2. List out the advantages of Polymers in daily life
3. Illustrate the theory of construction of battery and fuel cells and theories of corrosion and prevention methods.
4. Compare conventional and non-conventional energy sources and their advantages and disadvantages.
5. Interpret the usage of advanced materials in day to day life

UNIT I: WATER TECHNOLOGY

Hardness of water-types of hardness-disadvantages of hard water-determination of hardness by EDTA complexometric method. Portable water and its specifications-steps involved in purification of water-chlorination, break point of chlorination. Boiler troubles: Scale and sludge-priming and foaming-boiler corrosion-caustic embrittlement.

Industrial Water Treatment: Softening methods: zeolite process-ion exchange process.

Brackish water treatment (desalination methods): Reverse osmosis - electro dialysis.

Learning Outcomes: At the end of this unit, the students will be able to Explain

The impurities present in raw water, problems associated with them and how to avoid them

UNIT-II: POLYMERS AND COMPOSITE MATERIALS

Polymers-Introduction-Types of polymers-degree of polymerization-functionality-preparation properties and applications of individual polymers-Bakelite-PVC-Poly styrene.

Plastics: Types (thermosetting and thermoplastic)-compounding of plastics-moulding Process (Any Four) - recycling of e-waste.

Rubbers and elastomers: Introduction-natural rubber-vulcanization of rubber-synthetic rubbers-Buna-N, Buna-S.

Composite materials: Fiber reinforced plastics-biodegradable polymers-biomedical polymers-conducting polymers

Learning Outcomes: At the end of this unit, the students will be able to

1. Outline the properties of polymers and various additives added and different methods of forming plastic materials.

2. Explain the preparation, properties and applications of some plastic materials.

3. Discuss natural and synthetic rubbers and their applications.

UNIT III: ELECTRO CHEMICAL CELLS AND CORROSION

Electrochemical Cells

Introduction-single electrode potential-electrochemical cell-electrochemical series and applications. Reference electrodes-standard hydrogen electrode and calomel electrode-construction of glass electrode.

Batteries: Construction, working and cell reaction of primary (dry cell) and Secondary (Pb acid, Ni-Cd, Zinc-Air and Li-ion) battery. Fuel cells (H_2-O_2, Methanol-Air cells).

Corrosion

Defination-theories of corrosion (Chemical and Electrochemical corrosion)-types of corrosion (Galvanic, Differential aeration (waterline and pitting corrosion), stress Corrosion). Factors influencing rate of corrosion-nature of metal-nature of corrosive atmosphere.

Corrosion Prevention methods: Cathodic protection-Sacrificial anodic method-Impressed voltage method. Metallic coatings: Galvanization-Tinning-Electro plating-Electro less plating.

Learning Outcomes: At the end of this unit, the students will be able to
1. **Explain** the theory of construction of battery and fuel cells.
2. **Categorize** the reasons for corrosion and study some methods of corrosion control.

UNIT IV: CONVENTIONAL AND NONCONVENTIONAL ENERGY RESOURCES

Conventional energy sources

Introduction to fuels-classification and characteristics of fuels-solid, Liquid and gaseous fuels-advantages and disadvantages-calorific value-higher and lower calorific values-construction and working of bomb calorimeter-analysis of coal-proximate and ultimate analysis-numerical problems related to bomb calorimeter, Dulong's formula and coal analysis-petroleum refining-cracking-petrol and diesel knocking-octane number and cetane number-gaseous fuels-Natural gas-CNG-LPG

Non-conventional energy sources

Solar energy: Advantages-disadvantages of solar cells-construction and working of photo voltaic cell-Introduction to hydro power-geo thermal power-tidal and wave power.

Learning Outcomes: At the end of this unit, the students will be able to
1. **Differentiate** conventional and non conventional energy sources and their advantages and disadvantages.
2. **Explains** energy production by different natural sources

UNIT V: CHEMISTRY OF MATERIALS

Nano materials: Introduction-sol-gel method-characterization by BET, SEM and TEM methods-carbon nanotubes and fullerenes: Types, preparation and applications

Semiconductors:Preparation (Distillation, Zone refining, Czochralski crystal pulling epitaxy, diffusion, ion implantation)-semiconductor devices (P-N junction diode as rectifier, junction transistor)

Cement: Constituents of cement-setting and Hardening of cement, Decay of Cement.

Refractories: Definition of refractory-classification and properties of refractoriness-applications of refractories.

Learning Outcomes: At the end of this unit, the students will be able to

1. Outline the awareness of materials like nanomaterials and fullerenes and their uses.

2. Explain the techniques that detect and measure the surface properties of materials.

3. Illustrate the commonly used industrial materials.

Text Books:

T1.A Text Book of Engineering Chemistry - N. Y. S. Murthy, V. Anuradha & K. Ramana Rao, Maruthi Publications. (2018)

T2.A Text Book of Engineering Chemistry - K. Sesha Maheswaramma, Mridula Chugh, Pearson Publications (2018).

Reference Books:

R1. Engineering Chemistry – Jain & Jain, Dhanpat Rai Publishing Company (2017)

R2. Text Book of Engineering Chemistry - Shashi Chawla, Dhanpat Rai & Co. (P) Limited (2017)

R3. Chemistry –Prasanta Rath, Subhendu Chakroborthy, Cengage publications (2018)

B. TECH 1 SEMESTER	L	T	P	C
	3	-	-	3
19HS1T01 - ENGLISH				

COURSE OBJECTIVES

1. To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
2. To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
3. To assist students to carry on the tasks and activities through guided instructions and materials.
4. To effectively integrate English language learning with employability skills and training.
5. To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
6. To provide hands-on experience through case –studies, mini –projects, group and individual presentations.

COURSE OUTCOMES

1. Observe parts of speech, root words and apply relative writing formats to prepare notes.
2. Express and state ideas coherently in day to day life.
3. Identify the importance of correct usage of grammar.
4. Illustrate ideas effectively on various topics.
5. Prepare the reports and essays by using appropriate sentences.

Syllabus :

S No	Content
UNIT –I	**Vocabulary Building** **1.1** Video Lesson 1.2.1 Word formation 1.2.2. Root words 1.2.3. Prefixes and Suffixes 1.2.4. Synonyms and Antonyms **1.3 Parts of Speech** **1.4 Note- making, Note-taking**

UNIT -II	**Basic Writing Skills** **2.1** Video Lesson 2.2.1 Basic sentence structure 2.2.2. Clauses and Phrases 2.2.3 Punctuations 2.2.4 Creating coherence 2.2.5 Organizing principles of paragraph documents 2.2.6 Techniques for writing precisely **2.3 Tenses** **2.4 Letter Writing**
UNIT-III	**Identifying Common Errors in Writing** **3.1** Video Lesson 3.2.1 Sub + verb agreement 3.2.2 Noun pronoun agreement 3.2.3 Articles 3.2.4 Preposition 3.2.5 Redundancies 3.2.6 Clichés **3.3.1 Active - Passive Voice** **3.3.2 Reported Speech** **3.4 Resume Writing**
UNIT-IV	**Nature and Style of sensible Writing** **4.1** Video Lesson 4.2.1 Describing 4.2.2 Classifying 4.2.3 Writing Introduction and conclusion **4.3.1 Conditional Sentences** **4.3.2 Degrees of Comparison** **4.4 Email writing**
UNIT-V	**Writing Practice** **5.1** Video Lesson 5.2.1 Comprehension 5.2.2 Precise writing 5.2.3 Essay Writing **5.3 Simple Compound and Complex Sentences** **5.4 Report Writing**

TEXT BOOK: Building Effective Communication Skills
        By Maruti Publications (2019)

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B. TECH 1 SEMESTER	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**

19CS1T01 - PROBLEM SOLVING AND PROGRAMMING USING C

Course Objectives:
1. To impart adequate knowledge on the need of programming languages and problem solving techniques and develop programming skills.
2. To enable effective usage of Control Structures and Implement different operations on arrays.
3. To demonstrate the use of Strings and Functions.
4. To impart the knowledge of pointers and understand the principles of dynamic memory allocation.
5. To understand structures and unions and illustrate the file concepts and its operations.
6. To impart the Knowledge Searching and Sorting Techniques.

UNIT-I
Introduction to Computer Problem Solving: Programs and Algorithms, Computer Problem Solving Requirements, Phases of Problem-Solving, Problem-Solving Strategies, Top-Down Approach, Algorithm Designing, Program Verification, Improving Efficiency, Algorithm Analysis and Notations.

UNIT-II
Introduction to C Programming: Introduction, Structure of a C Program, Comments, Keywords, Identifiers, Data Types, Variables, Constants, Input/output Statements, Operators, Type Conversion.
Control Flow, Relational Expressions: Conditional Branching Statements: if, if-else, if-else–if, switch. Basic Loop Structures: while, do-while loops, for loop, nested loops, The Break and Continue Statements, goto statement.

UNIT-III
Arrays: Introduction, Operations on Arrays, Arrays as Function Arguments, Two dimensional Arrays, Multi-dimensional arrays.
Pointers: Concept of a Pointer, Declaring and Initializing Pointer Variables, Pointer Expressions and Address Arithmetic, Null Pointers, Generic Pointers, Pointers as Function Arguments, Pointers and Arrays, Pointer to Pointer, Dynamic Memory Allocation, Dangling Pointer, Command Line Arguments.

UNIT-IV
Functions: Introduction, Function Declaration, Function Definition, Function Call, Categories of Functions, Passing Parameters to Functions, Scope of Variables, Variable Storage Classes, Recursion.
Strings: String Fundamentals, String Processing with and without Library Functions, Pointers and Strings.

UNIT-V
Structures, Unions, Bit Fields: Introduction, Nested Structures, Arrays of Structures, Structures and Functions, Self-Referential Structures, Unions, Enumerated Data Type –enum variables, Using Typedef keyword, Bit Fields.
Files: Introduction to Files, Using Files in C, Reading from Text Files, Writing to Text Files, Random File Access.

Course Outcomes:
At the end of the Course, Student will be able to:
1. Develop an algorithm/flowchart to find a solutionfor computational problem
2. Develop C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or bitwise operators
3. Develop a C program using arrays to divide a given computational problem into a number of modules
4. Apply pointersfor array processing and parameter passing
5. Develop C programs with structure or union and files for storing the data to be processed.

Text Books:

1. How to solve it by Computer, R. G. Dromey, and Pearson Education.
2. Computer Programming, Reema Thareja, Oxford University Press.

Reference Books:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
2. Programming In C A-Practial Approach, Ajay Mittal, Pearson.
3. C Programming – A Problem Solving Approach, Forouzan, Gilberg, Cengage.
4. The C Programming Language, Dennis Richie And Brian Kernighan, Pearson Education.
5. Programming In C, Ashok Kamthane, Second Edition, Pearson Publication.
6. Let us C , Yaswanth Kanetkar, 16th Edition, BPB Publication.

Web Links:
 1. http://www.c4learn.com/
 2. http://www.geeksforgeeks.org/c/
 3. http://nptel.ac.in/courses/122104019/
 4. http://www.learn-c.org/
 5. https://www.tutorialspoint.com/cprogramming/

B. TECH 1 SEMESTER	**L**	**T**	**P**	**C**
	-	-	3	1.5
19BS1L02 - ENGINEERING CHEMISTRY LAB				

Outcomes: The experiments introduce volumetric analysis: Acid-Base, complexometric, Redox, Conductometric and potentiometric titrations. Then they are exposed to a few instrumental methods of chemical analysis.

Thus at the end of the lab course, the student is exposed and able to :-

1. Observe the concentration of given solution by different methods of chemical analysis.

2. Analyze the water purity by checking hardness, DO and Acidity.

3. Estimate the Cu+, Fe+, Ca+, Mg+ ions and Ascorbic acid present in given solution.

4. Identify the pour and cloud point of lubricants.

5. Examine the principles of conduct metric and potentiometric titrations.

 Syllabus:

1. Estimation of HCl using standard Na_2CO_3 through acid-base titration.

2. Estimate the total hardness of water using standardized EDTA solution through complexometric titration.

3. Estimation of $KMnO_4$ using standard $H_2C_2O_4$ through redox titration method.

4. Estimation of Dissolved Oxygen in given water sample by Wrinkler's Method

5. Determination of ferric (Fe^{+3}) ions using standard KCr_2O_7 solution

6. Determination of copper (II) using standard hypo solution.

7. Estimation of strong acid by using strong base through conductometric titration method.

8. Estimation of strong acid by using strong base through potentiometric titration method.

9. Preparation of polymer (Demo).

10. Determination of Vitamin 'C'.

11. Determination of Pour and Cloud Point of lubricating oils

Reference Books
1. A Textbook of Quantitative Analysis, Arthur J. Vogel.

B. TECH 1 SEMESTER	**L**	**T**	**P**	**C**
	-	-	3	1.5
19HS1L01 - ENGLISH PROFICIENCY LAB				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) **Reading Skills.**
- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) **Writing Skills:**
- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) **Interactive skills:**
- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) **Life Skills and Core Skills:**
- Examining self-attributes and identifying areas that require improvement self-diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Enrich your interactive Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PRE REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus

Unit	TOPIC
1	Vowels, Consonants, Pronunciation, Phonetic transcripts
2	Word stress and syllables
3	Rhythm and Intonation
4	Contrastive Stress –Homographs
5	Word Stress : Weak and Strong forms , Stress in compound words

Text Book:
"Infotech" by Maruthi Publications (2019)

Reference Books:
1. Better English Pronunciation by O' Connor
2. Phonetics and Phonology – Peter Roach
3. A Grammar of Spoken English – Harold Palmer
4. English Phonetics – Bansal and Harrison

	L	T	P	C
B. TECH 1 SEMESTER	-	-	3	1.5
19CS1L01 - C PROGRAMMING LAB				

Course Objectives:
- To impart knowledge on various Editors, Raptor.
- To make the students understand the concepts of C programming.
- To nurture the students on Control Structures and develop different operations on arrays.
- To make use of String fundamentals and modular programming constructs.
- To implement programs using dynamic memory allocation.
- To explain the concepts of Structure, Unions and files for solving various problems.

List of Experiments:
1. Introduction to Algorithms and Flowcharts
   1.1) Implement Algorithm Development for Exchange the values of Two numbers.
   1.2) Given a set of n student's examination marks (in the range 0-100) make a count of the number of students that passed the examination. A Pass is awarded for all of 50 and above.
   1.3) Given a set of n numbers design an algorithm that adds these numbers and returns the resultant sum. Assume N is greater than or equal to zero.

2. Introduction to C Programming
   2.1) Exposure to Turbo C, Code Blocks IDE, Dev C++, Falcon C++.
   2.2) Writing simple programs using printf(), scanf() .

3. Raptor
   3.1) Introduction to Raptor.
   3.2) Draw a flow chart to find the Sum of 2 numbers.
   3.3) Draw a flow chart to find Simple interest.

4. Basic Math
   4.1) Write a C Program to convert Celsius to Fahrenheit and vice versa.
   4.2) Write a C Program to find largest of three numbers using ternary operator.
   4.3) Write a C Program to Calculate area of a Triangle using Heron's formula.

5. Control Flow- I
   5.1) Write a C Program to Find Whether the Given Year is a Leap Year or not.
   5.2) Write a C program to find the roots of a Quadratic Equation.
   5.3) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch…case.

6. Control Flow- II
   6.1) Write a C Program to Find Whether the Given Number is Prime number or not.
   6.2) Write a C Program to Find Whether the Given Number is Armstrong Number or not.
   6.3) Write a C program to print Floyd Triangle.

7. Control Flow- III
   7.1) Write a C program to find the sum of individual digits of a positive integer.
   7.2) Write a C program to check whether given number is palindrome or not.
   7.3) Write a C program to read two numbers, x and n, and then compute the sum of the geometric progression $1+x+x^2+x^3+\ldots\ldots\ldots+x^n$.

Practice Programs:
 Write a C program to print all natural numbers from 1 to n. - using while loop
 Write a C program to print all natural numbers in reverse (from n to 1). - using while loop
 Write a C program to print all alphabets from a to z. - using while loop
 Write a C program to print all even numbers between 1 to 100. - using while loop
 Write a C program to print sum of all even numbers between 1 to n.
 Write a C program to print sum of all odd numbers between 1 to n.
 Write a C program to print table of any number.
 Write a C program to find first and last digit of any number.
 Write a C program to count number of digits in any number.
 Write a C program to calculate sum of digits of any number.
 Write a C program to calculate product of digits of any number.
 Write a C program to swap first and last digits of any number.
 Write a C program to enter any number and print its reverse.
 Write a C program to enter any number and check whether the number is palindrome or not.
 Write a C program to find frequency of each digit in a given integer.
 Write a C program to enter any number and print it in words.
 Write a C program to print all ASCII character with their values.
 Write a C program to enter any number and print all factors of the number.
 Write a C program to enter any number and calculate its factorial.
 Write a C program to find HCF (GCD) of two numbers.
 Write a C program to find LCM of two numbers.
 Write a C program to check whether a number is Prime number or not.
 Write a C program to check whether a number is Armstrong number or not.
 Write a C program to check whether a number is Perfect number or not.
 Write a C program to check whether a number is Strong number or not.
 Write a C program to print Fibonacci series up to n terms.

8. Arrays
 8.1) Write a C program to search an element in the given array (Linear Search).
 8.2) Write a C program to perform matrix addition.
 8.3) Write a C program to perform matrix multiplication.
Practice Programs:
 Write a C program to read and print elements of array.
 Write a C program to find sum of all array elements. - using recursion.
 Write a C program to find maximum and minimum element in an array. - using recursion.
 Write a C program to find second largest element in an array.
 Write a C program to copy all elements from an array to another array.
 Write a C program to insert an element in an array.
 Write a C program to delete an element from an array at specified position.
 Write a C program to print all unique elements in the array.
 Write a C program to print all negative elements in an array.
 Write a C program to count total number of even and odd elements in an array.
 Write a C program to count total number of negative elements in an array.
 Write a C program to count total number of duplicate elements in an array.
 Write a C program to delete all duplicate elements from an array.
 Write a C program to count frequency of each element in an array.
 Write a C program to merge two array to third array.

Write a C program to find reverse of an array.

Write a C program to convert lowercase string to uppercase.

Write a C program to convert uppercase string to lowercase.

Write a C program to toggle case of each character of a string.

Write a C program to find total number of alphabets, digits or special character in a string.

9. Pointers
9.1) Write a C Program to Perform Addition, Subtraction, Multiplication and Division of two numbers using Command line arguments.
9.2) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.
9.3) Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc () function.

10. Functions, Array & Pointers
10.1) Write a C Program to demonstrate parameter passing in Functions.
10.2) Write a C Program to find Fibonacci, Factorial of a number with Recursion and without recursion.
10.3) Write a C Program to find the sum of given numbers with arrays and pointers.

Practice Programs:
Program to change the value of constant integer using pointers.

Program to print a string using pointer.

Program to count vowels and consonants in a string using pointer.

Program to read array elements and print with addresses.

11. Strings
11.1) Implementation of string manipulation operations with library function:
   a) copy
   b) concatenate
   c) length
   d) compare
11.2) Implementation of string manipulation operations without library function:
   a) copy
   b) concatenate
   c) length
   d) compare
11.3) Verify whether the given string is a palindrome or not.

12. Structures
12.1) Write a C Program to Store Information of a book Using Structure.
12.2) Write a C Program to Add Two Complex Numbers by Passing Structure to a Function.

13. Files
13.1) Write a C program to open a file and to print the contents of the file on screen.
13.2) Write a C program to copy content of one file to another file.
13.3) Write a C program to merge two files and store content in another file.

14. Application
Creating structures to capture the student's details save them in file in proper record format, search and prints the student details requested by the user.

Note: Draw the flowcharts using Raptor from Experiment 3 to Experiment 6.

Course Outcomes:
1. Develop basic programs in C and design flowcharts in Raptor.
2. Apply Conditional and Iterative statements to solve the real time scenarios in C.
3. Implement the concept of Arrays and Modularity and Strings.
4. Apply the Dynamic Memory Allocation functions using pointers.
5. Develop programs using structures and Files.

Reference Books:
1. Let Us C Yashwanth Kanetkar, 16th edition, BPB Publications.
2. Programming in C A-Practial Approach Ajay Mittal. Pearson Education.
3. The C programming Language, Dennis Richie and Brian Kernighan, Pearson Education.
4. Problem solving using C , K Venugopal,3rd Edition,TMG Publication.

Web Links:
1. https://www.hackerrank.com/
2. https://www.codechef.com/
3. https://www.topcoder.com/
4. https://code-cracker.github.io/
5. https://raptor.martincarlisle.com/
6. https://nptel.ac.in/courses/106105085/2

I SEMESTER	L	T	P	C
	0	0	3	1.5
19ME1L01 - ENGINEERING WORKSHOP				

COURSE OUTCOMES: Students will be able to

1. Identify the components of a personal computer and Install Operating System.

2. Prepare and Send email messages (with or without attachments).

3. Show own Presentation / Documentation using Office Tools.

4. Choose and create Interactive Visual Programs Using Scratch.

5. Identify the components of a personal computer and Install Operating System.

NOTE: At least Two Exercises to be done from each trade.

TRADE:

I. CARPENTRY:

1. CROSS LAP JOINT   2. DOVETAIL JOINT   3. MORTISE and TENNON JOINT

II. FITTING:

1. SQUARE FIT   2. V-FIT   3. HALF ROUND FIT

III. FORGING:

1. ROUND ROD TO SQUARE

2. S-HOOK

3. ROUND ROD TO SQUARE HEADED BOLT

IV. HOUSE WIRING:

1. PARALLEL/SERIES CONNECTION OF THREE BULBS

2. STAIRCASE WIRING

3. FLOURESCENT LAMP FITTING

V. SHEET METAL:

1. SQUARE TRAY 2. HOLLOW CYLINDER 3. OPEN SCOOP

MANUAL:

1. Engineering Workshop Practice Lab Manual Prepared by Mechanical Faculty.

II SEMESTER	**L**	**T**	**P**	**C**
	3	-	-	3
19MA2T04 - DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS				

Course Objectives:

1. To enlighten the learners in the concept of differential equations and vector calculus.
2. To furnish the learners with basic concepts and techniques at plus two level to lead them intoadvanced level by handling various real world applications.

Unit I: Ordinary Differential equations of first order and first degree:

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exactform.
Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories

Learning Outcomes:

At the end of this unit, the student will be able to
- solve first order differential equations by appropriate method (K3)
- apply to geometrical and real world problems (K3)

Unit II: Linear differential equations of higher order:

Solutions of Non-homogeneous equations of higher order with constant coefficients – with non- homogeneous term of the type e^{ax}, sin ax, cos ax, polynomials in x^n, e^{ax} V(x) and x^nV(x) – Method ofVariation of parameters. Applications: LCR circuit

Learning Outcomes:

At the end of this unit, the student will be able to
- identify the essential characteristics of linear differential equations with constant coefficients(K3)
- solve the linear differential equations with constant coefficients by appropriate method (K3)

Unit –III: Partial Differential Equations of First Order:

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.

Learning Outcomes:

At the end of this unit, the student will be able to
- apply a range of techniques to find solutions of standard PDEs (K3)
- outline the basic properties of standard PDEs (K2)

Unit IV: Vector differentiation

Scalar and vector point functions, vector operator del, del applied to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, physical interpretation of Gradient Div F and Curl F, Del applied twice to point functions Del applied to products of point functions.

Learning Outcomes:

At the end of this unit, the student will be able to
- apply del to Scalar and vector point functions (K3)
- illustrate the physical interpretation of Gradient, Divergence and Curl (K3)

Unit V: Vector integration

Integration of Vectors Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

Learning Outcomes:

At the end of this unit, the student will be able to
- find the work done in moving a particle along the path over a force field (k3)
- evaluate the rate of fluid flow along and across curves (K3)
- apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (K3)

Textbooks:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna publishers, 42/e, 2012.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 9/e, 2013.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications,2008.

Course Outcomes:

At the end of the course, the student will be able to
1. Solve the differential equations related to various engineering fields.
2. Identify solution methods of partial differential equations that model physical process.
3. Evaluate the approximate roots of polynomial and transcendental equations by different Algorithms.
4. Interpret integrate and ordinary differential equations by various numerical techniques.

B. TECH 1 SEMESTER	L	T	P	C
	3	-	-	3
19BS1T01 - ENGINEERING PHYSICS				

COURSE OUTCOMES

After completion of course student able to:

1. Acquire the knowledge of basic crystal systems and determination of crystal structures.

2. Summarize the Magnetic and Dielectric Materials properties.

3. Illustrate the concept of Magnetic Induction and Super Conducting properties.

4. Interpret Pure &Doped Semiconductor materials for better utility.

5. Acquire the knowledge on Optical fibers and Optical properties of materials and their applications

SYLLABUS

UNIT –I: CRYSTAL STRUCTURE AND X-RAY DIFFRACTION

CRYSTAL STRUCTURE:
Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC, BCC and FCC.

X-RAY DIFFRACTION:
Directions in crystals- planes in crystals- Miller indices and procedure to find Miller indices- Various planes in crystals- Separation between successive (h k l) planes-Bragg's law-Bragg's Spectrometer.

Learning Outcomes: At the end of this unit, the students will be able to
- **Explain** the seven crystal systems
- **Interpret** the crystal structure based on Bragg's law

UNIT – II: MAGNETIC AND DIELECTRIC PROPERTIES

MAGNETIC PROPERTIES: Introduction-Magnetic permeability – Magnetization – Relation between three magnetic vectors - Origin of magnetic moment – Classification of Magnetic materials- Dia, Para, Ferro, Anti-Ferro and Ferri-magnetism – Hysteresis- soft and Hard Magnetic materials.

DIELECTRIC PROPERTIES: Introduction-Dielectric constant- Relation between three electric vectors-Electronic and ionic polarizations (Quantitative) - orientation polarizations (Qualitative) - Internal fields in solids- Clausius - Mossotti equation.

Learning Outcomes: At the end of this unit, the students will be able to

- **Classify** the magnetic materials into dia, para, ferro, anti ferro and ferri
- **Explain** the importance of hysteresis
- **Explain** the concept of polarization in dielectric materials.
- **Summarize** various types of polarization of dielectrics .
- **Interpret** Lorentz field and Claussius- Mosotti relation in dielectrics.

UNIT-III: ELECTROMAGNETIC WAVES AND SUPERCONDUCTIVITY

ELECTROMAGNETIC WAVES: Introduction-Electric flux –magnetic flux- Gauss law in electrostatics- Gauss law in magnetostatics- Ampere's law - Biot-Savart's law-Magnetic Induction due to current carrying circular loop- Faraday's law - Maxwell's equations.

SUPERCONDUCTIVITY: General and Thermal properties –Meissner effect – Type-I and Type-II superconductors – Flux quantization – BCS Theory of Superconductivity - Josephson effects – Applications of Superconductors.

Learning Outcomes: At the end of this unit, the students will be able to
- **Illustrate** the concept of electro magnetism based on fundamental laws of electro magnetism
- **Explain** Maxwell's equations
- **Summarize** various properties and applications of superconductors

UNIT-IV: PHYSICS OF SEMICONDUCTORS:

Classification of solids based on band theory - Intrinsic semiconductors- density of charge carriers- Equation for conductivity – Extrinsic semiconductors- P-type and N-type- density of charge carriers- Drift and diffusion – Einstein's equation – Hall Effect- Hall coefficient – Applications of Hall effect– direct & indirect band gap semiconductors.

Learning Outcomes: At the end of this unit, the students will be able to
- **Summarize** various types of solids based on band theory.
- **Outline** the properties of n-type and p-type semiconductors.
- **Identify** the type of semiconductor using Hall effect

UNIT-V: LASERS AND OPTICAL FIBERS

LASERS: Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

FIBER OPTICS: Introduction to Optical fibers- Critical angle of propagation- Total internal reflection- Acceptance angle and acceptance cone- Numerical aperture- Classification of optical fibers based on refractive index profile-Classification of optical fibers based on modes- Applications of optical fibers.

Learning Outcomes: At the end of this unit, the students will be able to
- **Design** various types of lasers
- **Explain** the principle and propagation of light through Optical fibers
- **Discuss** the application of lasers and Optical fibers

TEXT BOOK:
  A text book of "Engineering Physics" by M. N. Avadhanulu, P.G. Kshirasagar & TVS Arun Murthy, S Chand publications, 11th Addition 2019.

REFERENCE BOOKS:
1. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Education, 2018.

2. Engineering Physics by Palanisamy (Scitech Publishers)

3. Engineering Physics by D. Thirupathi Naidu and M. Veeranjaneyulu

II SEMESTER	**L**	**T**	**P**	**C**
	2	**-**	**2**	**3**
19ME2T01 - **ENGINEERING GRAPHICS**				

COURSE OBJECTIVE

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

COURSE OUTCOMES: Students are able to

1. Construct polygons, conics, cycloids, involutes.
2. Develop the orthographic projections of points, lines in different positions.
3. Develop the orthographic projections of plane surfaces in different positions.
4. Develop the orthographic projections of solids like prisms, cylinder, pyramids and cone.
5. Translate Isometric views to orthographic views and vice-versa and also visualize 2D & 3D objects using Auto CAD.

UNIT I

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

Curves: Parabola, Ellipse and Hyperbola by Eccentricity method, Cycloid, Epi-cycloid and Hypo-cycloid and Involutes.

UNIT II

Orthographic Projections: Reference plane, importance of reference lines, projections of points in various quadrants, projections of lines, line parallel to both the planes, line parallel to one plane and inclined to other plane. Projections of straight lines inclined to both the planes, determination of true lengths, and angle of inclination.

UNIT III

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

UNIT IV

Projections of Solids: Prisms, Pyramids, Cone and Cylinder, Simple positions of solids and Axis of the Solid parallel to one plane and inclined to other plane.

UNIT V

Isometric Views: Conversion of isometric views to orthographic views; Conversion of orthographic views to isometric views.

CAD: Fundamentals of AutoCAD - For Polygons, Creating 2d And 3d Drawings.
Using Auto CAD: Computer Aided Design, Drawing practice using Auto CAD simple figures like polygons, creating 2D&3D drawings of objects using Auto CAD.

Note: In the End Examination there will be no question from CAD.

TEXT BOOKS:
 1. Engineering Drawing by N.D. Butt, Chariot Publications 2016

 2. Engineering Drawing + AutoCAD by K. Venugopal, V. Prabhu Raja, New Age 2010

REFERENCE BOOKS:
1. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers 2016

2. Engineering Graphics for Degree by K.C. John, PHI Publishers 2009

3. Engineering Graphics by PI Varghese, McGrawHill Publishers 2013

.

	L	**T**	**P**	**C**
SEMESTER-II	**3**	**0**	**0**	**3**

OBJECT ORIENTED PROGRAMMING THROUGH C++

COURSE OUTCOMES:

At the end of the Course, Student will be able to:

1. Outline the Principles of object oriented technology.
2. Summarize the Evolution and Purpose of Object Oriented Programming.
3. Acquire the Object Oriented programming concepts and logic implementations.
4. Analyze the file I/O operations and exceptions.
5. Identify and implement appropriate Solution for a given Problem.

UNIT I

INTRODUCTION: The Object-Oriented Technology, Disadvantages of Conventional Programming, Advantages of OOP, Structure of a C++ Program, Differences between C and C++

INPUT AND OUTPUT IN C++: Streams, Stream Classes Hierarchy, Bit Fields, Manipulators. Tokens in C++, Data Types, Constants, L Value and R Values, Operators in C and C++, Scope Access Operator, Comma Operator, This Operator, Reference Variable, Decision and Loop Statements.

UNIT II

FUNCTIONS IN C++: Passing Arguments to a Function, Default Arguments, Const Arguments, Inputting Default Arguments, Inline Functions, Function Overloading.

CLASSES AND OBJECTS: Class Definition, Declaring Objects, Access specifiers and their scope, Member functions, Outside member functions as inline, Data Hiding or Encapsulation, Memory for Class and Objects, Static Member variables, Static Member Functions, Static Object, Array of Objects, Objects as Function Arguments, Friend Functions, Friend class, Local class, Empty Class, Qualifiers and Nested Classes, Member Function and Non-Member Function.

UNIT III

CONSTRUCTORS AND DESTRUCTORS: Introduction of Constructor, Destructor & Characteristics, Parameterized Constructor, Overloading Constructors, Constructor with Default Arguments, Copy Constructor

OPERATOR OVERLOADING: Introduction of Overloading, Overloading Unary Operators, Constraint on Increment and Decrement Operators, Overloading Binary Operators, Overloading with Friend Functions, Overloading Assignment Operator, Rules for Overloading Operators.

UNIT IV

INHERITANCE: Introduction of Inheritance, Access specifiers, Protected Data with Private Inheritance, Types of Inheritances, Virtual Base Class, Constructors and Destructors in Inheritance, Constructor and Destructor in Derived Class, Advantages and Disadvantages of Inheritance.

POLYMORPHISM: Polymorphism, Types, Pointer and Inheritance, Virtual and Pure Virtual Functions, Abstract Classes.

UNIT V

APPLICATIONS WITH FILES: File Stream Classes, File Opening Modes, File Pointers and Manipulators, Sequential Access Files, Binary and ASCII Files, Random Access Files.

TEMPLATES & EXCEPTION HANDLING

Principles of Exception Handling, Keywords, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions.

Generic Programming with Templates, Need for Templates- Definition of class Templates.

Introduction to STL- Containers, Algorithms, Iterators.

TEXT BOOKS

1. Programming in C++,Ashok N Kamthane, Pearson, 4th edition

2. The C++ Programming Language, B. Stroutstrup, Pearson Education. , 4th edition

3. The Complete Reference C++, Herbert Schildt, Tata McGraw Hill, 4th edition

REFERENCES

1. Object Oriented Programming C++, Joyce Farrell, Cengage, 4th edition

2. Mastering C++ , Venugopal, Raj Kumar, Ravi Kumar TMH, 2nd edition

3. Object Oriented Programming with C++, SouravSahay and OXFORD, 2nd edition

LINKS

https://www.geeksforgeeks.org/object-oriented-programming-in-cpp/

https://www.tutorialspoint.com/cplusplus/cpp_object_oriented.htm

B. TECH I1 SEMESTER	L	T	P	C
	3	-	-	3
19EE2T01 - BASIC ELECTRICAL ENGINEERING				

COURSE OUTCOMES: After successful completion of this course, students should be able to:

1 : Analyze different electrical networks using KVL, KCL and Theorems.

2 : Observe the basic concepts of single-phase system for simple AC circuit.

3 : Illustrate the construction, working and operating characteristics of AC & DC machines.

4 : Summarize the construction details, operation and characteristics of various semiconductor devices, digital and logic operations.

SYLLABUS

UNIT-I   :   DC CIRCUIT ANALYSIS

Electrical Circuit Elements (R, L and C), Voltage and Current Sources, Ohms Laws, Kirchoff's Laws and Star/Delta Conversion, Network Reduction Techniques-Series-Parallel- Series and Parallel (Only Resistor), Superposition, Thevenin's and Norton's Theorems, Problems in Simple Circuits with DC Excitation.

UNIT-II   :   AC CIRCUIT ANALYSIS

Representation of Sinusoidal Waveforms, Peak and RMS Values, Phasor Representation, Real Power, Reactive Power, Apparent Power, Power Factor, Analysis of Single Phase AC Circuits Consisting of R, L, C, RL, RC and RLC Combinations (Series and Parallel), Resonance, Three Phase Circuits- Voltage and Current Relations in Star/Delta Connections-Simple Problems.

UNIT-III   :   DC MACHINES & TRANFORMERS

DC MACHINES: Introduction-Construction Details - Principle of Operation - EMF Equation – Classification Based on Excitation - Torque Equation- Characteristics: OCC of DC Shunt Generator-Load Characteristics of DC Shunt Motor, 3-Point Starter – Speed Control by Armature Voltage, Field Control of DC Motors -Simple Problems.

TRANFORMERS: Introduction-Constructional Details - Principle of Operation - EMF Equation – OC and SC Test – Equivalent Circuit, Voltage Regulation, Losses and Efficiency.

UNIT-IV :AC MACHINES

3-Ø INDUCTION MOTOR: Introduction-Construction Details - Principle of Operation-Generation of Rotating Magnetic Fields, Torque-Slip Characteristic. Losses and Efficiency.

ALTERNATOR: Introduction-Construction Details - Principle of Operation – Definition for Pitch Factor and Distribution Factor-E.M. F Equation - Determination of Voltage Regulation by E.M.F Method.

UNIT-V   :   ELECTRICAL INSTALLATIONS

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics of Batteries. Elementary Calculations for Energy Consumption, Battery Backup.

TEXT BOOKS:
1. Basic Electrical Engineering, D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. Basic Electrical Engineering, P. V. Prasad, S. Sivanagaraju, K. R. Varmah, and Chikku Abraham, Cengage, 2019.

REFERENCE BOOKS:
1. Basic Electrical Engineering - D.C. Kulshreshtha, 2009, Tata McGraw Hill.
2. Fundamentals of Electrical Engineering, L.S. Bobrow, Oxford University Press, 2011
3. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010.
4. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989.
5. Principles of Electrical Engineering and Electronics", V K Mehta & Rohit Mehta,S Chand Publishers,2019 edition.

	L	T	P	C
B. TECH II SEMESTER	-	-	3	1.5
19HS2L01 - ENGLISH COMMUNICATION SKILLS LAB				

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES:

1. Employ the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
2. Practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
3. Observe the students to carry on the tasks and activities through guided instructions and materials.
4. Illustrate English language learning with employability skills and training.
5. Show main course material and exercise authentic materials drawn from everyday use.

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice the language he is learning in order to acquire communication skills. 'Enrich your interactive Skills: Part - B' is designed to provide opportunities for engineering students to revise and consolidate communication skills in different contexts formal and informal. It prepares the student for facing Interviews, participating in group discussions and making presentations.

PRE-REQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus

UNIT	TOPIC
1	Oral Activity : JAM, Hypothetical situations, self / peer profile, Common errors in pronunciation, Neutralizing Accent
2	Oral Activity : Telephonic Etiquette, Role plays, Poster presentations and e-mail Writing
3	Oral Activity : Oral Presentation Skills, Public Speaking Data Interpretation
4	Oral Activity : Group Discussion: Do's and Don'ts –Types, Modalities
5	Oral Activity : Interview Skills: Preparatory Techniques, FAQ, Mock Interviews Pronunciation : Connected speech (pausing, tempo, tone, fluency etc.,)

Text Book:
    "Infotech" by Maruthi Publications (2019)
Reference Books:
1. How to Face Interviews – by Clive Fletchers

2. The 7 Habits of Highly Effective People – by Stephen Covey.

B. TECH I1 SEMESTER	**L**	**T**	**P**	**C**
	-	-	3	1.5
19BS2L01 - ENGINEERING PHYSICS LAB				

Course outcomes:-
1. Observe the basic knowledge to know the frequency of a vibrator, hall coefficient,
2. Predict to verify some of the properties of physical optics.
3. Develop skills to plot various characteristic curves and to calculate the physical properties of given materials.
4. Calculate some the properties of semiconducting materials.

STUDENT HAS TO DO ANY TEN OF THE FOLLOWING

1. Determination of wavelength of Laser using diffraction grating.
2. Determination of Numerical Aperture and Acceptance angle of an Optical Fiber.
3. Determination of the charge carrier density by using Hall Effect.
4. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
5. Study of Characteristic curves (l/V) of a Zener diode to determine its Breakdown voltage.
6. Determination of Temperature coefficient of resistance of a Thermistor by using its Characteristic curve.
7. Study the variation of intensity of magnetic field along the axis of a circular current carrying coil by using Stewart and Gee's experiment.
8. Study of Characteristic curves (l/V) of a P-N diode.
9. Determine Frequency of given electrically driven tuning fork in Transverse and Longitudinal modes by using Melde's apparatus
10. Determine frequency of A.C. supply by using Sonometer.
11. Determination of the Time Constant for a C-R Circuit
12. Determination of the Planck's constant by using Photo-Cell
13. Determination of dielectric constant of a given material

	L	T	P	C
SEMESTER-II	**0**	**0**	**3**	**1.5**
IT WORKSHOP				

COURSE OUTCOMES:

At the end of the Course, Student will be able to:

1. Identify the components of a personal computer and Install Operating System.

2. Prepare and Send email messages (with or without attachments).

3. Show own Presentation / Documentation using Office Tools.

4. Choose and create Interactive Visual Programs Using Scratch.

5. Develop Static web site Applications.

WEEK	TOPIC
1	**KNOWING OF COMPUTER** **Identification of peripherals of a PC, Laptop, and Smart Phones:** Prepare a report containing the block diagram along with the configuration of each component and its functionality, Input/ Output devices, I/O ports and interfaces, main memory, cache memory and secondary storage technologies, digital storage basics, networking components and speeds.
2	**OPERATING SYSTEMS** Functions of OS, Types, **OS simple setting** : Changing system date and time, display properties, to add or remove a window component and changing mouse properties **File and Directory Management** : Creating and renaming of files and directories, **MS-DOS Commands**
3	**INTERNET SERVICES** Web Browser usage and **Advanced settings** like LAN, Proxy, Content, Privacy, Security, Cookies, Extensions/ Plug-in**, Antivirus installation,** Configuring a firewall, blocking pop-ups ,**Email** creation and usage.
4	Practice on **Microsoft-Word**
5	Practice on **Microsoft-PowerPoint**
6	Practice on **Microsoft-Excel**
7	Creating pdf documents.
8	**CLOUD BASED COLLABORATION TOOLS** Store, sync, and share files with ease in the cloud using Google Drive Manage event registrations, create quizzes, and analyze responses using Google Forms
9&10	**STATIC WEB PAGE DESIGNING** Basic HTML Tags,Table Tags,List Tags,Image Tags, Forms

	L	T	P	C
SEMESTER-II	**0**	**0**	**3**	**1.5**
OBJECT ORIENTED PROGRAMMING THROUGH C++ LAB				

COURSE OUTCOMES:

At the end of the Course, Student will be able to:

1. Distinguish structure-oriented programming and object-oriented programming.
2. Apply various object-oriented features.
3. Acquire the concepts in operator overloading, function overloading & polymorphism.
4. Develop, compile and debug programs in C++ language.
5. **Develop programs involving constructors, destructors.**

EXERCISE-1(BASICS)

A. Write a CPP Program to demonstrate the structure of a C++ program.
B. Write a CPP Program to display the names of header files, definitions and list of functions supported.
C. Write a program to show the base of a numeric value of a variable using **Hex, Oct** and **Dec** manipulator functions.
D. Write a CPP Program to use of the standard manipulators normally used in the stream classes.
E. Write a CPP Program to demonstrate the usage of bit fields.
F. Write a CPP Program to define constant pointer and pointer to constant and perform possible operations.
G. Write a CPP Program access a variable in different scopes by using scope resolution operator and the use of comma operator.

EXERCISE-2(CLASSES & OBJECTS)

A. Write a CPP Program to swap two numbers using call by value, call by address, call by reference and return by reference.
B. Write a CPP Program to calculate square and cube of a number using inline functions and macros. (Demonstrate the use of inline functions compared to macros).
C. Write a CPP Program to find the area of a rectangle, a triangle and surface area of a sphere using function overloading.

D. Write a CPP Program to declare all members of a class as public, Access the members using objects. (Use public, protected, private).
E. Write a CPP Program to access the member functions inside and outside a class.
F. Write a CPP Program to access private data using non-member functions. (Use friend function).

G. Write a CPP Program to pass objects to functions by pass by value method.

H. Write a CPP Program to declare main () function as member function and overload it.

EXERCISE-3(CONSTRUCTORS AND OPERATOR OVER LOADING)

A. Write a CPP Program to show that "for each object constructors is called separately" and read the values through keyboard (Use Constructor).

B. Write a CPP Program to create constructor with arguments and pass the arguments to constructor.

C. Write a CPP Program to create object and release them using destructor.

D. Write a CPP Program to perform addition, subtraction, multiplication of two objects using operator keyword.

E. Write a CPP Program to overload unary and binary operator overloading with friend function.

EXERCISE-4(INHERITANCE AND POLYMORPHISM)

A. Write a CPP Program to derive a class publicly from base class. Declare base class members under public, private and protected.

B. Write a CPP Program to derive single and multiple inheritances.

C. Write a CPP Program to declare virtual base class. Derive a class using two virtual classes.

D. Write a CPP Program to implementation of Virtual Function.

E. Write a CPP Program to Implementation of Pure Virtual Function.

EXERCISE- 5(FILES, TEMPLATES AND EXCEPTION HANDLING)

A. Write a CPP Program to write and read text in a file. Use ofstream and ifstream classes.

B. Write a CPP Program to open a file for writing and reading purpose. Use open () function.

C. Write a CPP Program write text in a file. Read the text from the file from EOF. Display the contents in reverse order.

D. Write a CPP Program to demonstrate that the data is read from file using ASCII format.

E. Write a CPP Program to find the factorial of a number. Throw multiple exceptions and define multiple catch statements to handle exceptions.

F. Write a C++ Program to illustrate template class

Practice Programms

1. Write C++ Program to Create Floyd's Triangle

2. Write a C++ program Add Two Matrices using Multi-dimensional Arrays

3. Write a C++ program Multiply Matrix by passing it to a Function

To perform this task three functions are made:

To take matrix elements from user

To multiply two matrix

To display the resultant matrix after multiplication

 4. Write a C++ program to create a class for student to get and print details of N students.

   (C++ program to demonstrate example of array of objects.)

5. Write a C++ program to convert time from HH:MM:SS format to seconds using class

6. Write a C++ program to convert time from seconds to HH:MM:SS format using class

7. Write a C++ program to define a class employee having members Emp-id, Emp-name,

  basic salary and functions accept() and display(). Calculate DA=25% of basic salary,

  HRA=800, I-tax=15% of basic salary. Display the pay slip using appropriate output

     format.

     1) To accept the data

     2) To display the data

 8. Write a C++ Program to check prime Number or not using class

 9. To create a class staff having fields: Staff-id , name, salary and functions accept() and

     display(). Calculate DA=25% of basic salary, HRA=800, I-tax=15% of basic salary.

     Display the pay slip using appropriate output format.

     1) To accept the data

     2) To display the data

     3) To sort the data by name

10. To define a class to represent a bank account. Include the following members:

Data members:

      1) Name of the depositor

     2) Account number

     3) Type of account

     4) Balance amount in the account.

     Member functions:

     1) To assign initial values

     2) To deposit an amount

3) To withdraw an amount after checking the balance

4) To display name and balance.

11. To create a class for an electricity board that charges the following rates to users

   a) For first 100 units : 40p per unit

   b) For next 200 units : 50p per unit

   c) Beyond 300 units   : 60p per unit

All users are charged a minimum of Rs.500. If the total cost is more than Rs.250.00 then an additional charges of 15% are added.

Write a C++ program using class to read the names of users & number of units consumed & print out the charges with names.

12. Write C++ program to demonstrate Overloading new and delete operator

13. Write C++ program to compare two Strings using Operator Overloading

14. Write C++ Program to concatenate two strings using Operator Overloading

15. Write a C++ Program to Find the Number of Vowels, Consonants,Digits and White Spaces in a String

16. Write a C++ Program to remove all Characters in a String except Alphabets.

17. Write a C++ Program to Find the Frequency of Characters in a String

18) Write C++ Program for remove all duplicates from the input string. Print all the duplicates in the input string.

19. Write C++ Program for remove characters from the first string which is present in the second string

20. Write C++ Program to check if strings are rotations of each other or not

21. Write C++ Program to read a string .Add the same string in the reverse order to the end of the same string.

22. Write a C++ program to read a string. Change the first letter of every capital word.

23. Write C++ program to declare string objects .Perform assignment and concatenation with the string objects.

24. Write C++ program to perform string operations using string library functions.

25. Write C++ Program for return maximum occurring character in the input string

26. Write C++ program using string manipulating functions.

27. Write a C++ Program to Implement Stack in STL using the following

   1. Insert Element into the Stack

   2. Delete Element from the Stack

   3. Size of the Stack

   4. Top Element of the Stack

   5. Exit

28. Write a C++ Program to Implement String in STL using following

   1. Insert Substring in a String

2. Erase Substring from a String

3. Append Substring to a String

4. Replace the String with a Substring

5. Size of the String

6. Find substring in a String

7. Display the String

8. Exit

29. Write a C++ Program to Implement Array in STL using following

1. Insert Element into the Array

2. Size of the array

3. Front Element of Array

4. Element of Array

5. Display elements of the Array

6. Exit

30. Write C++ program to implement Bubble Sort using templates in C++

B. TECH 3ⁿᵈ SEMESTER	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
19CS3T01-DISCRETE MATHEMATICS				

COURSE OUTCOMES:
At the end of the lab students are able to
1. Identify programming errors efficiently through enhanced logical capabilities. (K2)
2. Calculate a general solution of recurrence equation. (K4)
3. Discover set theory, graph of the relations which are used in data structures. (K2)
4. Summarize the concepts in graph theory. (K2)
5. Develop graph theory concepts in core subjects such as data structures and network theory effectively. (K3)

Unit 1: Mathematical logic
Connectives, negation, conjunction, disjunction, statement formula and Truth Tables, conditional and bi-conditional, well-formed formulae, tautologies, equivalence of formulae, duality, tautological implications, functionally complete set of connectives, other connectives, principal disjunctive and conjunctive normal forms, inference calculus, rules of inference, consistency of premises, indirect method of proof, Theory of inference for the statement calculus, validity using Truth tables.

Unit 2: Recurrence relations
Generating Function of Sequences, Calculating Coefficient of generating functions, Recurrence relations, solving recurrence relation by substitution and Generating functions, the method of Characteristic roots, Solution of Inhomogeneous Recurrence Relation.

Unit 3: Set theory and Relations
Relations and ordering, Relations, Properties of binary Relations in a set, Relation Matrix and the Graph of a Relation, partition and covering of a set, Equivalence, Compatibility Relations, Composition of Binary Relations, Partial ordering, Hasse diagram, Principle of Inclusion-Exclusion, Pigeonhole Principle and its applications.

Unit 4: Graph theory
Basic Concepts, Representation of Graph, Sub graphs, Multigraphs, Planar graphs, Euler Paths, Euler circuits, Hamiltonian Graphs and Graph Isomorphism and its related Problems, Chromatic Number.

Unit 5: Trees
Spanning Trees, minimal Spanning Trees, BFS, DFS, Kruskal's Algorithm, Prim's Algorithm, Binary trees, Planar Graphs.

Text Books:
1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997.
2. Joe L. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2/e, Prentice Hall of India Ltd, 2012.

References:

1. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill, 2009.
2. Richard Johnsonburg, Discrete Mathematics, 7/e, Pearson Education, 2008
3. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science,   Prentice Hall of India, 2006.

SEMESTER-III	**L**	**T**	**P**	**C**
	3	**1**	**-**	**4**
DATA STRUCTURES				

COURSE OUTCOMES:

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

1. Show applications using stacks and implement various types of queues. (K2)

2. Analyze the operations on linked lists and demonstrate their applications. (K4)

3. Observe the various operations on trees. (K2)

4. Practice various types of Graphs and Graph Traversals. (K3)

5. Categorize various searching and sorting techniques. (K4)

UNIT-I:

Introduction: Definition of data structure, types and overview of data structures.

Algorithm: Preliminaries of algorithm, Algorithm analysis and complexity

Stacks and Queues: Stack Representation using Arrays, operations on stack, Applications of stacks - Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions. Queue Representation using Arrays, operations on queues, Applications of queues, Circular queues, Priority queues, Implementation of queue using stack

UNIT-II:

Linked Lists: Introduction, Single linked list, representation of a linked list in memory**,** Operations on a single linked list. Double linked list, Operations on a double linked list. Circular linked list, Operations on a circular linked list. Applications of single linked list

UNIT-III:

Trees: Basic tree concepts. **Binary Trees:** Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, Creation of binary tree from pre-order, in-order and post order traversals, threaded binary tree. **Binary search trees:** Basic concepts, BST operations: Search, insertion, deletion and traversals, Creation of binary search tree from in-order and pre (post)order traversals.

AVL Trees: Self Balanced Trees, Height of an AVL Trees and AVL Tree Rotations

UNIT-IV:

Graphs: Basic concepts, Representations of Graphs: using Linked list and adjacency matrix, Graph Traversals - BFS & DFS, Applications: Dijkstra's shortest path algorithm, Minimum Spanning Tree using Prim's algorithm and Kruskal's algorithm, Transitive closure, Warshall's algorithm.

UNIT-V:

Searching: Linear Search, Binary Search and Fibonacci search.

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Radix sort.

Hashing: Introduction, Hash Function, Collision Resolution Techniques: Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Separate Chaining, Extendible Hashing

TEXT BOOKS:

1. Data Structures: A Pseudo code approach with C by Richard F. Gilberg and Behrouz.A. Forouzan, 2nd edition, Cengage, 2012.

2. Classic Data Structures, Debasissamanta, PHI, 2nd edition, 2016.

3. Data Structures through C, 2nd edition by Yashavant Kanetker, BPB publications, 2017.

4..Data Structures & Algorithms, Alfred V Aho, John E Hopcraft, Jeffery D Ullman, Pearson
   Education. Ltd., Second Edition 2016.

REFERENCE BOOKS

1. Data Structure with C, Seymour Lipschutz , TMH, 2017

2. Data Structures and Algorithms, G. A. V. Pai , TMH, 2017.

3. Fundamentals of Data Structure in C, Horowitz, Sahani, Anderson Freed, University Press, 2nd edition, 2018.

	L	**T**	**P**	**C**
SEMESTER-III	**3**	**0**	**0**	**3**
JAVA PROGRAMMING LANGUAGE				

COURSE OUTCOMES:

1. Solve real world problems using OOP techniques. (K3)
2. Identify the use of abstract classes. (K2)
3. Observe problems using java collection framework and I/O classes. (K2)
4. Show the multithreaded applications with synchronization. (K2)
5. Apply applets for web applications and plan to apply the GUI based applications. (K3)

UNIT - I

Object-oriented thinking- A way of viewing world – Agents and Communities, messages and methods, Responsibilities, Classes and Instances, Class Hierarchies- Inheritance, Method binding, Overriding and Exceptions, Summary of Object-Oriented concepts. Java buzzwords, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Introducing classes, Methods and Classes, String handling.

Inheritance– Inheritance concept, Inheritance basics, Member access, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism-ad hoc polymorphism, pure polymorphism, method overriding, abstract classes, Object class, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance.

UNIT - II

Packages- Defining a Package, CLASSPATH, Access protection, importing packages.

Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

Stream basedI/O(java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations, The Console class, Serialization, Enumerations, auto boxing, generics.

UNIT - III

Exception handling - Fundamentals of exception handling, Exception types, Termination or presumptive models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes.

Multithreading- Differences between thread-based multitasking and process-based multitasking, Java thread model, creating threads, thread priorities, synchronizing threads, inter thread communication.

UNIT - IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable,Properties, Stack, Vector

More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner

UNIT - V

GUI Programming with Swing – Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout.

Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes. A Simple Swing Application,

Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs.

TEXT BOOKS

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

REFERENCE BOOKS

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.
4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object-oriented Application Development, R. A. Johnson, Cengage Learning.

	L	T	P	C
SEMESTER-III	3	0	0	3
	DIGITAL LOGIC DESIGN			

COURSE OUTCOMES:-

1. Observe the functions of digital systems. (K2)
2. Analyze Boolean functions with basic theorems and properties. (K4)
3. Examine the behavior of various combinational circuits. (K3)
4. Construct digital systems using sequential circuits(K3)

UNIT- I

Digital Systems and Binary Numbers: Digital Systems, Binary Numbers, Octal and Hexadecimal Numbers, Complements of Numbers, Signed Binary Numbers, Arithmetic addition and subtraction, 4-bit codes: BCD, EXCESS 3, alphanumeric codes, 9's complement, 2421, etc.

UNIT -II

Concept of Boolean algebra: Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.

Gate level Minimization: Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive-OR Function.

UNIT- III

Combinational Logic: Introduction, Analysis Procedure, Binary Adder–Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator, Realization of Switching Functions Using PROM, PAL and PLA.

UNIT- IV

Synchronous Sequential Logic: Introduction to Sequential Circuits, Storage Elements: Latches, Flip-Flops, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK, T and D Flip Flops, Truth and Excitation Tables, Conversion of Flip Flops.

UNIT –V

Registers and Counters: Registers, Shift Registers, Ripple Counters, Synchronous Counters, Ring Counter, Johnson Counter.

TEXT BOOKS:

1. Digital Design, 5/e, M.Morris Mano, Michael D Ciletti, PEA.
2. Fundamentals of Logic Design, 5/e, Roth, Cengage.

REFERENCE BOOKS:

1. Digital Logic and Computer Design, M.Morris Mano, PEA.
2. Digital Logic Design, Leach, Malvino, Saha, TMH.
3. Modern Digital Electronics, R.P. Jain, TMH.

SEMESTER-III	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
COMPUTER ORGANIZATION AND ARCHITECTURE				

COURSE OUTCOMES:

At the end of the course the student able to

1. Sketch the basic structure of computer organization and its instruction sets. (K3)

2. Observe the CPU operations and language concepts. (K3)

3. Apply the arithmetic algorithms and decimal arithmetic operations. (K3)

4. Develop input/output and memory organization in the computer systems. (K3)

5. Express the concept of pipelining and various processor families. (K2)

UNIT I

Basic Structure of Computers and Machine Instructions

Basic Organization of Computers, Von Newmann Computers, Functional Units, Basic Operational Concepts, Generation of computers.

Numbers, Arithmetic Operations and Instructions, Memory Locations and Addresses, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Basic Input / Output Operations, Stacks and Queues, Case study – Arithmetic & Logic Instructions, Branch Instructions, I/O Operations of ARM Processor

UNIT II

Central Processing Unit and Programming the basic Computer

CPU - General Register and Stack Organizations, Instructions Formats, Addressing Modes, Data Transfer and Manipulation, RISC, Programming the Basic Computer – Machine Language, Assembly Language, Programming Arithmetic and Logic Operations, Micro Program Examples, Case Study – Design of Control Unit.

UNIT III

Computer Arithmetic

Addition, Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

UNIT IV

Input-Output and Memory Organization

Accessing I/O Devices, Interrupts, Direct Memory Access, Buses, Interface Circuits, Standard I/O interfaces, Case Study – Processor Examples Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.

UNIT V

Pipelining and Processor Families

Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction sets, Data Path and control consideration, Superscalar Operation, Performance Considerations. ARM family, Motorola 680X0 and Coldfire families, Intel IA 64 Family, SPARC Family.

Text Books:

1. Computer Organization, Carl Hamacher, Zvonks Varanesic, SafeaZaky, Fifth Edition 2015, McGraw Hill.
2. Computer System Organization, M. Moris Mano, Revised Third Edition 2019, Pearson PTE academic.

Reference Books:

1. Computer Organization and Architecture, William Stallings, Sixth Edition, Pearson/PHI.
2. Computer Organization, a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition, Elsevier.
3. Structured Computer Organization, Andrew S.Tanenbaum, 4th Edition.
4. Fundamentals of Computer Organization and Design, Sivaraama, Dandamudi, Springer Int. Edition.

	L	**T**	**P**	**C**
SEMESTER-III	**0**	**0**	**3**	**1.5**
DATA STRUCTURES LAB				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Illustrate various linked lists and its operations (K4)

2. Complete operations on stack application using arrays and linked lists. (K3)

3. Show Queue operations and applications using arrays and linked lists. (K2)

4. Identify and develop various operations on binary trees. (K2)

5. Articulate various searching and sorting techniques for user data. (K3)

Note: Students has to complete at least 20 Programs

Write C Program for the following

Exercise – I : Linked Lists

1. Program to create and display a singly linked list.
2. Program to create a singly linked list of n nodes and count the number of nodes
3. Program to create a singly linked list of n nodes and display it in reverse order
4. Program to delete a new node from the beginning of the singly linked list
5. Program to delete a new node from the middle of the singly linked list
6. Program to delete a node from the end of the singly linked list
7. Program to find the maximum and minimum value node from a singly linked list
8. Program to insert a new node at the middle of the singly linked list
9. Program to insert a new node at the beginning of the singly linked list
10. Program to insert a new node at the end of the singly linked list
11. Program to remove duplicate elements from a singly linked list
12. Program to search an element in a singly linked list
13. Program to sort the elements of the singly linked list
14. Program to Search an element in a Linked List (Iterative and Recursive)
15. Program to Nth node from the end of a Linked List

Exercise – II Stacks and Queues

Stacks

16. Program to implement STACK operations using Arrays.

17. Program to implement STACK operations using Linked List.

18. Program to implement STACK operations using QUEUE operations.

19. Program to Reverse the list using STACK operations.

20. Program to convert Infix expression into Postfix expression.

21. Program to evaluate Postfix expression.

22. Program to calculate factorial of a given number using STACK operations.

Queues

23. Program to implement QUEUE operations using Arrays.

24. Program to implement QUEUE operations using Linked List

25. Program to implement QUEUE operations using STACK operations.

26. Program to implement Circular Queues using Arrays.

27. Program to implement Priority Queue using Arrays.

Exercise – III Tress

28. To create a Binary Search Tree of integers, insert, delete and search integers into (from) Binary search tree.

29. Use recursive functions to traverse a binary search tree in preorder, in-order and post-order.

30. Program to Construct a Binary Search Tree and Perform Deletion and In-order Traversal

31. Program to Find the Largest Element in a Binary Tree

32. Program to Find the Smallest Element in a Binary Tree

33. Program to Find the Sum of all the Nodes of a Binary Tree

34. Program to Implement Binary Tree using the Linked List

35. Program to Search a Node in a Binary Tree.

Exercise – IV Searching Techniques

36. Program to search an element in the array using iterative Linear Search.

37. Program to search an element in the array using recursive Linear Search.

38. Program to search an element in the array using iterative Binary Search.

39. Program to search an element in the array using recursive Binary Search.

40. Program to search an element in the array using iterative Fibonacci Search.

41. Program to search an element in the array using recursive Fibonacci Search

Exercise – V Sorting Techniques

42. Program to implement Bubble Sort, to sort a given list of integers in ascending order.

43. Program to implement Selection Sort, to sort a given list of integers in ascending order.

44. Program to implement Insertion Sort, to sort a given list of integers in ascending order.

45. Program to implement Quick Sort, to sort a given list of integers in ascending order.

46. Program to implement Quick Sort, to sort a given list of integers in ascending order using recursion   method.

47. Program to implement Merge Sort, to sort a given list of integers in ascending order.

48. Program to implement Merge Sort, to sort a given list of integers in ascending order using recursion method.

49. Program to implement Radix Sort, to sort a given list of integers in ascending order.

50. Program to implement Merge Sort., to sort a given list of integers in ascending order.

51. Program to implement Heap Sort, to sort a given list of integers in ascending order.

Exercise – VI Graphs

52. Program to Implementation of Breadth-First Search Techniques.

53. Program to Implementation of Depth- First Search Techniques.

54. Program to Implementation of Prim's Algorithm.

55. Program to Implementation of Dijkstra's Algorithm.

56. Program to Implementation of Kruskal's Algorithm.

Text Books:

1. Data Structures Through C 2nd Edition, Yashavant Kanetker, BPB Publications, 2018

2. Data structures and Algorithm Analysis in C, Mark Allen Weiss, Pearson Education. Ltd., Second Edition 2013.

3. Data Structures & Algorithms, Alfred V Aho, John E Hopcraft, Jeffery D Ullman, Pearson Education. Ltd., Second Edition 2016.

Reference Books:

1. Fundamentals of Data Structures in C, S.Sahni, Second Edition, Universities Press, Pvt. Ltd.

2. Data Structures and Algorithms using C by R. S. Salari, Fifth Edition, KHANNA Publishing.

3. Data structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.

4. Data Structures and Algorithms Made Easy: Second Edition: Data Structure and   Algorithmic Puzzles, Narasimha Karumanchi, Fifth Edition, Career Monk.

5. Data Structures Using C, Reema Thareja, Second Edition, Oxford.

6. Problem-solving with C++, The OOP, Fourth edition, W.Savitch, Pearson education.

	L	T	P	C
SEMESTER-III	**0**	**0**	**3**	**1.5**
JAVA PROGRAMMING LANGUAGE LAB				

COURSE OUTCOMES:

1. Identify java compiler installation and JVM execution process in various environments. (K2)

2. Practice hands on experience with oops in java using console and eclipse environment. (K3)

3. Simulate Basics of java programming, multi-threaded programs and Exception handling. (K3)

4. Apply OOP in Java programming in problem solving. (K3)

5. Develop applet programming for web applications on GUI based events. (K3)

Exercise - 1 (Basics)

a) Write a JAVA program to display default value of all primitive data type of JAVA

b) Write a java program that display the roots of a quadratic equation $ax2+bx=0$. Calculate

the discriminate D and basing on value of D, describe the nature of root.

c) Five Bikers Compete in a race such that they drive at a constant speed which may or may

not be the same as the other. To qualify the race, the speed of a racer must be more than the

average speed of all 5 racers. Take as input the speed of each racer and print back the speed

of qualifying racers.

d) Write a case study on public static void main(250 words)

Exercise - 2 (Operations, Expressions, Control-flow, Strings)

a) Write a JAVA program to search for an element in a given list of elements using binary

search mechanism.

b) Write a JAVA program to sort for an element in a given list of elements using bubble sort

c) Write a JAVA program to sort for an element in a given list of elements using merge sort.

d) Write a JAVA program using StringBufferto delete, remove character.

Exercise - 3 (Class, Objects)

a) Write a JAVA program to implement class mechanism. – Create a class, methods and

invoke them inside main method.

b) Write a JAVA program to implement constructor.

Exercise - 4 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading.

Exercise - 5 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

c) Write a java program for abstract class to find areas of different shapes

Exercise - 6 (Inheritance - Continued)

a) Write a JAVA program give example for "super" keyword.

b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise - 7 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 8 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

b) Write a Case study on run time polymorphism, inheritance that implements in above

problem

Exercise – 9 (User defined Exception)

a) Write a JAVA program for creation of Illustrating throw

b) Write a JAVA program for creation of Illustrating finally

c) Write a JAVA program for creation of Java Built-in Exceptions

d) Write a JAVA program for creation of User Defined Exception

Exercise – 10 (Threads)

a) Write a JAVA program that creates threads by extending Thread class .First thread display

"Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and the

third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)

b) Write a program illustrating **isAlive** and **join ()**

c) Write a Program illustrating Daemon Threads.

Exercise - 11 (Threads continuity)

a) Write a JAVA program Producer Consumer Problem

b) Write a case study on thread Synchronization after solving the above producer consumer

problem

Exercise – 12 (Packages)

a) Write a JAVA program illustrate class path

b) Write a case study on including in class path in your os environment of your package.

c) Write a JAVA program that import and use the defined your package in the previous

Problem

Exercise - 13 (Applet)

a) Write a JAVA program to paint like paint brush in applet.

b) Write a JAVA program to display analog clock using Applet.

c) Write a JAVA program to create different shapes and fill colors using Applet.

Exercise - 14 (Event Handling)

a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.

b) Write a JAVA program that identifies key-up key-down event user entering text in a Applet.

Exercise - 15 (Swings)

a) Write a JAVA programto build a Calculator in Swings

b) Write a JAVA program to display the digital watch in swing tutorial.

Exercise – 16 (Swings - Continued)

a) Write a JAVA program that to create a single ball bouncing inside a JPanel.

b) Write a JAVA program JTree as displaying a real tree upside down.

SEMESTER-III	L	T	P	C
	0	0	3	1.5
DIGITAL LOGIC DESIGN LAB				

COURSE OUTCOMES:

At the end of the course student able to

1.Show the truth tables of different Combinational & Sequential circuits(K2)

2. Construct Boolean functions using logic gates. (K3)

3. Analyse different Combinational & Sequential circuits. (K4)

4. Employ different Combinational & Sequential circuits. (K3)

List of Experiments

1. Verification of Basic Logic Gates.

2. Implementing all individual gates with Universal Gates NAND & NOR.

3. Design a circuit for the given Canonical form, draw the circuit diagram and verify the De-Morganlaws.

4. Design a Combinational Logic circuit for 4x1 MUX and verify the truth table.

5. Design a Combinational Logic circuit for 1x4 De- MUX and verify the truth table.

6. Construct Half Adder and Full Adder using Half Adder and verify the truth table.

7. Verification of truth tables of the basic Flip- Flops with *Synchronous* and *Asynchronous* modes.

8. I implementation of Master Slave Flip-Flop with J-K Flip- Flop and verify the truth table for *racearound* condition*.

9. Design a Decade Counter and verify the truth table.

10. Ripple counter using-JK Flip -Flop.

11. Construct 4-bit ring counter with T-Flip –Flop and verify the truth table.

12. Design a 8 – bit right Shift Register using D-Flip -Flop and verify the truth table.

SEMESTER-IV	L	T	P	C
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OPERATING SYSTEMS				

COURSE OUTCOMES:

At the end of the course student are able to

1. Show the basic concepts about Operating System and its functions. (K2)

2. Generalize the Process management, CPU scheduling and Deadlocks. (K2)

3. Analyze the concepts of Memory management. (K4)

4. Observe the File systems & Disk Structures. (K2)

5. Illustrate Case Study on LINUX, WINDOWS and Android OS. (K4)

UNIT – I

OPERATING SYSTEMS OVERVIEW

Introduction-OS Concepts – Evolution of OS, OS Structures- Kernel, Shell. Operating-System Services, System Calls, Types of System Calls, System Structure. UNIX- Introduction-Architecture, Logging In, Files and Directories, Input and Output, Programs and Processes, Error Handling, User Identification, Time Values, System Calls and Library Functions, Command-Line Arguments, UNIX File API'S.

UNIT – II

PROCESS MANAGEMENT

Process: Concept, Operations on Processes, Interprocess Communication. Threads-Multithreading Models, Threading Issues, Pthreads .

Synchronization: The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Critical Regions, Monitors, Classic Problems of Synchronization,

Process Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms- CPU (Uniprocessor) scheduling algorithms, Multiprocessor and Real-time scheduling algorithms.

Deadlocks: Characterization – Prevention – Avoidance - Detection and Recovery

UNIT – III

MEMORY MANAGEMENT

Basic Memory Management, Swapping, Contiguous Memory Allocation, Virtual Memory Concept, Demand Paging - Page Interrupt Fault, Page Replacement Algorithms, Segmentation – Simple, Multi-level, Segmentation with Paging, Memory Management.

UNIT – IV

INFORMATION MANAGEMENT

File system Interface: The concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation: File system structure, allocation methods, free-space management

Mass-storage structure: Overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling, Disk Management, Swap-Space Management, RAID Structure.

UNIT – V

CASE STUDY

The Linux System, Microsoft Windows 7, Android Software Platform**:** Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure.

TEXT BOOK:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 10th

   Edition, John Wiley and Sons Inc., 2018.

2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice

    Hall, 2016.

3. Operating Systems-S Halder, Alex A Aravind,Second Edition,Pearson Education,2016 .

REFERENCE BOOKS:

1."Understanding Operating Systems"Ann McIver McHoes Ida M. Flynn, Sixth Edition,Course

Technology-Cengage Learning ,2011.

2. Modern Operating Systems, Andrew S. Tanenbaum, Second Edition, Addison Wesley, 2001.

3. Operating Systems Design and Implementation, Andrew S. Tanenbaum , Albert S. Woodhull - Amherst,

Third Edition Prentice Hall, 2006.

4. Advanced Programming in UNIX Environment, by W. Richard Stevens: 2nd Ed, Pearson Education,

2005.

5. UNIX System Programming Using C++,by Terrence Chan: Prentice Hall India, 1999.

6. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIScBANG/Operating%20Systems/New_index1.html

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SEMESTER-IV	**3**	**0**	**0**	**3**
DATABASE MANAGEMENT SYSTEMS				

COURSE OUTCOMES

At the end of the course student are able to

1. Apply basic concepts of database management system and design an Entity- Relationship (E-R) model and convert E-model to relational model. (K3)

2. Construct database using Relational algebra and SQL. (K3)

3. Classify Normalization techniques to normalize the database. (K4)

4. Show transaction management using different concurrency control protocols and recovery algorithms. (K3)

5. Illustrate Different file organization and indexing methods. (K4)

UNIT-1

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages , Database Architecture, Database Users and Administrators.

Introduction to Database Design: Database Design and ER Diagrams, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model.

Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations.

Enforcing Integrity constraints, querying relational data, Logical data base Design, Views.

UNIT-II
Relational Algebra: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division.
SQL: Form of Basic SQL Query - Examples of Basic SQL Queries, UNION, INTERSECT, and EXCEPT, Introduction to Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Outer Joins, Disallowing NULL values, Triggers.

UNIT-III
SCHEMA REFINEMENT AND NORMAL FORMS: Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form.

UNIT-IV

Transaction Management - The ACID Properties - Transactions and Schedules- Concurrent Execution of Transactions- Lock-Based Concurrency Control- 2PL, Serializability, and Recoverability- Dealing With Deadlocks - Concurrency Control without Locking.

CRASH RECOVERY: Introduction to ARIES- The Log - The Write-Ahead Log Protocol – Checkpoints - Recovering from a System Crash(ARIES) - Media Recovery.

UNIT-V

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing- Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

TEXT BOOKS:

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2014.

2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill,
6th edition, 2016.

Reference Books:

1. Fundamentals of Database Systems, RamezElmasri, Shamkant B Navathe-7th Edition, 2016.

2. Introduction to Database Systems, 8/e, C.J. Date, Pearson, 2012.

3. Database System Design, Implementation and Management, 5/e, Rob, Coronel, Thomson, 2012.

	L	T	P	C
SEMESTER-IV	**3**	**0**	**0**	**3**
DESIGN & ANALYSIS OF ALGORITHMS				

COURSE OUTCOMES:

At the end of the lab students are able to

1. Observe the correctness of algorithms using inductive proofs and invariants. (K2)
2. Analyze asymptotic runtime complexity of algorithms for real world problems. (K4)
3. Identify the optimal solutions by using advanced design and analysis of algorithm techniques. (K2)
4. Illustrate and derive dynamic-programming paradigm and apply when an algorithmic design Situation calls for it. (K3)
5. Categorize the search space and optimization problem techniques. (K4)

UNIT- I

Introduction- Algorithm definition, Algorithm Specification, Performance Analysis-Space complexity, Time complexity, Randomized Algorithms. **Divide and conquer**- General method, applications - Binary search, Merge sort, Quick sort, Strassen's Matrix Multiplication.

UNIT II

Greedy method- General method, applications- Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest path problem.

UNIT- III

Dynamic Programming- General Method, applications- Chained matrix multiplication, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack problem, Reliability design, Traveling sales person problem.

UNIT- IV

Backtracking-General method, applications The 8-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.

UNIT- V

Branch and Bound- General Method, applications-0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution, Traveling sales person problem. **NP-completeness**-NP-Hard and NP-Complete problems- Basic concepts, Non-deterministic algorithms, NP - Hard and NP- Complete classes, Cook's theorem.

TEXT BOOKS:

1. Fundamentals of Computer Algorithms, 2nd Edition, Ellis Horowitz, Sartaj Sahni and S. Rajasekharan, Universities Press.

2. Design and Analysis of Algorithms, P. H. Dave, H.B.Dave,2nd edition, Pearson Education.

REFERENCE BOOKS:

1. Algorithm Design: Foundations, Analysis and Internet examples, M. T. Goodrich and R. Tomassia, John Wiley and sons.

SEMESTER-IV	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
SOFTWARE ENGINEERING				

COURSE OUTCOMES:

At the end of the course, the student should be able to

1. Identify & Formulate the various software engineering concepts(K2)

2. Observe and develop different software development process models. (K2)

3. Analyze and Specify software requirements with various stakeholders of software development project. (K4)

4. Apply systematic procedures for software design and deployment. (K3)

5. Compare and contrast various testing methods and art of debugging(K2)

UNIT I

INTRODUCTION AND SOFTWARE PROCESS: Evolving Role of Software, Software Characteristics, Changing Nature of Software, Software Myths, Software Engineering- A layered Technology, a Process Framework, Capability Maturity Model Integration(CMMI), Process Assessment, Process Models – Waterfall Model, Incremental Process Models, Evolutionary Process Models, The Unifies Process.

UNIT II

REQUIREMENTS ANALYSIS AND SPECIFICATION: Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNIT III

SOFTWARE DESIGN: Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design – Architectural styles, Architectural Design, Architectural Mapping using Data Flow-User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV

TESTING AND IMPLEMENTATION: Software testing fundamentals-Internal and external views of Testing-white box testing- basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging – Software Implementation Techniques: Coding practices-Refactoring.

UNIT V

PROJECT MANAGEMENT: Estimation – FP Based, LOC Based, Make/Buy Decision, COCOMO II – Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection, RMMM – Scheduling and Tracking –Relationship between people and effort, Task Set & Network, Scheduling, EVA – Process and Project Metrics.

TEXT BOOK:

1. Software Engineering, A practitioner's Approach- Roger S. pressman, 8th edition, McGraw-Hill lnternational Edition, 2014.

2. Software Engineering, Ian Sommerville, 10th Edition, Pearson Education Asia, 2016.

REFERENCE BOOKS:

1. Software Engineering, Pankaj Jalote, A Precise Approach", Wiley India, 2010.

2. Systems Analysis and Design- Shely Cash man Rosenblatt, 9th Edition,Thomson publications, 2016.

3. Software Project Management, Bob Hughes, Mike Cotterell and Rajib Mall, Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

4. https://nptel.ac.in/courses/106101061/

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SEMESTER-IV	**0**	**0**	**3**	**1.5**
OPERATING SYSTEMS LAB				

COURSE OUTCOMES:

At the end of the course students are able to

1. Observe fundamentals of shell scripting with UNIX/LINUX environment(K2)
2. Develop CPU scheduling and cite programs on it. (K3)
3. Practice Bankers Algorithm for Dead Lock Avoidance. (K3)
4. Show Disk allocation methods and cite programs on it. (K2)
5. Predict Page Replacements algorithms and develop programs. (K3)

LIST OF PROGRAMS

1.a) Study of Vi editor, Bash Shell, Bourne Shell   and C Shell in UNIX/LINUX Operating

System.

b) Study of UNIX/LINUX general purpose utility command list man,who,cat, cd, cp, ps, ls, mv,

rm,mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout,

shutdown.

c) Study of Unix/Linux file system (tree structure).

e) Study of .bashrc, /etc/bashrc and Environment variables.

2. UNIX/LINUX based exercises to practice/simulate File system related system calls and some

of the process management concepts in LINUX Environment.

a) Write a C program that makes a copy of a file using standard I/O, and system calls

b) Write a C program to emulate the UNIX ls –l command.

c) Write a C program that illustrates how to execute two commands concurrently with a

 command pipe Ex: - ls –l | sort.

d) Write a C program that illustrates two processes communicating using shared memory.

e) Write a C program to simulate producer and consumer problem using semaphores.

f) Write C program to create a thread using pthreads library and let it run its function.

g) Write a C program to illustrate concurrent execution of threads using pthreads library.

3. Simulate FCFS and SJF CPU scheduling algorithm.

4. Simulate Priority CPU scheduling algorithm.

5. Simulate Round Robin CPU scheduling algorithm.

6. Simulate Bankers Algorithm for Dead Lock Avoidance.

7. Simulate Sequential file allocation strategy.

8. Simulate Linked file allocation strategy.

9. Simulate Indexed file allocation strategy.

10. Simulate First In First Out page replacement algorithm.

11. Simulate Least Recently used page replacement algorithm.

12. Simulate optimal page replacement algorithm.

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SEMESTER-IV	**0**	**0**	**3**	**1.5**
DATABASE MANAGEMENT SYSTEMS LAB				

COURSE OUTCOMES:

At the end of the course student able to

1. Observe different issues involved in design and implementation of a database system (K2)

2. Employ entity relationship, convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data. (K3)

3. Develop to Create, manipulate tables and query database commands using SQL. (K3)

4. Summarize the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization. (K2)

5. Practice to acquire knowledge of database systems and use design databases for different applications. (K3)

1. Create a table STUDENT with appropriate data types and perform the following queries.

Regdno, student name, date of birth, branch and year of study.

a) Insert 5 to 10 rows in a table

b) List all the students of all branches

c) List student names whose name starts with 's'

d) List student names whose name contains 's' as third literal

e) List student names whose contains two 's' anywhere in the name

f) List students whose branch is NULL

g) List students of CSE & ECE who born after 1980

h) List all students in reverse order of their names

i) Delete students of any branch whose name starts with 's'

 j) Display student name padded with '*' after the name of all the students

2. Create the following tables with appropriate data typesand constraints.

EMPLOYEE (Fname,Mname, Lname, SSN, Bdate, Address, Gender, Salary, SuperSSN,Dno)

DEPARTMENT(Dnumber, Dname, MgrSSN, Mgrstartdate)

DEPENDENT (ESSN, Dependent_Name, Gender, Bdate, Relationship)

a) Insert 5 to 10 rows into all the tables.

b) Display all employee's names along with their department names.

c) Display all employee's names along with their dependent details.

d) Display name and address of all employees who work for 'ECE' department.

e) List the names of all employees with two or more dependents.

f) List the names of employee who have no dependents.

f) List the names of employees who have at least one dependent.

g) List the names of the employees along with names of their supervisors using aliases.

h) Display name of the department and name of manager for all the departments.

i) Display the name of each employee who has a dependent with the same first name and gender as the employee.

j) List the names of managers who have at least one dependent.

xii) Display the sum of all employees' salaries as well as maximum, minimum and average salary in the entire departments department wise if the department has more than two employees.

k) List the departments of each female employee along with her name.

l)List all employee names and also the name of the department they manage if they happen to manage a dept

3. Consider the following schema for a Library Database:

BOOK (Book_id, Title, Publisher_Name, Pub_Year)

BOOK_AUTHORS (Book_id, Author_Name)

PUBLISHER(Name, Address, Phone)

BOOK_COPIES (Book_id, Branch_id, No-of_Copies)

BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out,Due_Date)

LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

4. Write SQL queries to

a) Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch

b) Get the particulars of borrowers who have borrowed more than 3books in particular period.

c) Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation

d) Partition the BOOK table based on year of publication Demonstrate its working with a simple query

e) Create a view of all books and its number of copies that arecurrently available in the Library.

f) Apply Drop, Alter, Order by, Group By clauses on the above tables

.4. Create the following tables for university database

Department (deptname, building, budget, primary key (dept name))

Course (courseid, title, dept name, credits, primary key (course id))

Instructor (ID, name, deptname, salary, primary key (ID), foreign key (dept name) references department);

 Section(course id ,sec id ,semester ,year, building ,room number, time slot id, primary key (course id, sec id, semester, year),foreign key (course id) references course);

Teaches (ID, course id, sec id, semester, year numeric, primary key (ID, course id, sec id, semester, year), foreign key (course id, sec id, semester, year) references section, foreign key (ID) references instructor);

a) List the names of instructors along with the titles of courses that they teach

b) Find the names of all instructors whose salary is greater than at least one instructor in the CSE department

c) To find the set of all courses taught in the   Even as well as in Odd semester

d) Find the average salary of instructors in the Computer Science department

e) Find the average salary in each department

f) To find all the courses taught in the even semester in current year but not in previous year in the same semester

g) Delete all instructors with a salary between 15,000 and 35,000.

5. Create the following tables based on the above Schema Diagram with appropriate data types and constraints and perform the following queries.

 SAILORS (Saild, Salname, Rating, Age)

 RESERVES (Sailid, boatid, Day)

 BOATS (Boatid, Boat-name, Color)

a) Insert 5 to 10 rows in all tables?

b) Find the name of sailors who reserved boat number 3.

c) Find the name of sailors who reserved green boat.

d) Find the colors of boats reserved by   Particular Sailor

e) Find the names of sailors who have reserved atleast one boat.

f) Find the all sailid of sailors who have a rating of 10 or have reserved boated 104.

g) Find the Sailid's of sailors with age over 20 who have not registered a red boat.

h) Find the names of sailors who have reserved a red or green boat.

i) Find sailors whose rating is better than some sailor called _Salvador'.

j) Find the names of sailors who are older than the oldest sailor with a rating of 10.

6. Queries on Working with Index, Sequence, Synonym, ControllingAccess and Locking Rows for Update, Creating Password and Securityfeatures

a) Write a PL/SQL Block to find whether the number is Armstrong or not.

b) Write a PL/SQL program for generating Fibonacci series

c) Write a PL/SQl program to print given number in reverse

d) print different patterns using PL/SQL program

e) Print Floyd's triangle in PL/SQL

f) Count odd and even digits in a number in PL/SQL

7. Write a program that updates salaries of all employees with 10 % hike (use cursors).

8. Write a program to fetch salary and employee name from employee table for a given user input. When no data found raise an exception that prints the message "no data found".

9. Write a program to find the number of records of any given table using %

ROWCOUNT.

10. Write a database trigger on employee table so that the trigger fires when all the DML statements are executed (print appropriate message).

11. Write a trigger in such a way that it should not allow insert or update or delete on saturday and Sunday and display the proper message.

12. Write a database trigger on employee table so that the trigger fires when all the DML statements are executed (print appropriate message)

13. Write a cursor to display the list of employees and total salary department wise.

14. Write a procedure to display the name and salary of employee when user inputs SSN using IN/OUT parameters.

15. Write a function to check the validity of the given employee number from the employee table (print the appropriate message using PL/SQL block)

16. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc.

	L	T	P	C
SEMESTER-IV	**0**	**0**	**6**	**3**
PYTHON PROGRAMMING LAB				

COURSE OUTCOMES:

At the end of the course student able to

1. Show the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python. (K2)
2. Express different Decision-Making statements and Functions (K2)
3. Interpret Object oriented programming in Python. (K3)
4. Summarize different File handling operations. (K2)
5. Develop Client Server network applications using Python. (K3)

Exercise 1 - Basics

a) Running instructions in Interactive interpreter and a Python Script

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

Exercise 2 - Operations

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

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

Exercise - 3 Control Flow

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

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

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

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

Exercise 4 - Control Flow - Continued

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

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

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

Exercise - 5 - DS

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

b) Write a program to use split and join methods in the string and trace a birthday with adictionary data structure.

Exercise - 6 DS - Continued

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

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

Exercise - 7 Files

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

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

Exercise - 8 Functions

a) Write a function ball collide that takes two balls as parameters and computes if they arecolliding. Your function should return a Boolean representing whether or not the balls arecolliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r), r being the radius

If (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Find mean, median, mode for the given set of numbers in a list.

Exercise - 9 Functions - Continued

a) Write a function nearly equal to test whether two strings are nearly equal. Two strings a and bare nearly equal when a can be generated by a single mutation on b.

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

c) Write a function unique to find all the unique elements of a list.

Exercise - 10 - Functions - Problem Solving

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

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

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

Exercise 11 - Multi-D Lists

a) Write a program that defines a matrix and prints

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

c) Write a program to perform multiplication of two square matrices

Exercise - 12 - Modules

a) Install packages requests, flask and explore them. using (pip)

b) Write a script that imports requests and fetch content from the page. Eg. (Wiki)

c) Write a simple script that serves a simple HTTPResponse and a simple HTML Page

Exercise - 13 OOP

a) Class variables and instance variable and illustration of the self-variable

i) Robot

ii) ATM Machine

Exercise - 14 GUI, Graphics

1. Write a GUI for an Expression Calculator using tk

2. Write a program to implement the following figures using turtle
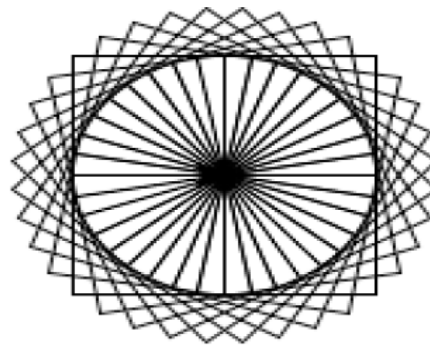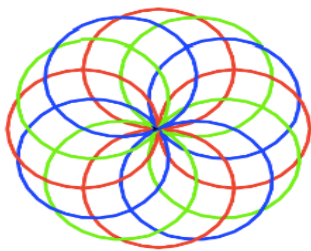
Exercise - 15 - Testing

a) Write a test-case to check the function even numbers which return True on passing a list of all even numbers

b) Write a test-case to check the function reverse string which returns the reversed string

Exercise - 16 - Advanced

a) Build any one classical data structure.

b) Write a program to solve knapsack problem.

Exercise - 17–Data Analysis

Data analysis or manipulation using the following packages

 a) Numpy   b) Pandas

Exercise - 17 - Advanced

Data analysis or manipulation using the following packages

  a) Scipy   b) matplotlib

Exercise - 18–Case Studies

  a) Weather Forecasting Data Preparation and Analysis

  b) Stock Exchange Data set and perform Linear regression analysis

  c) Twitter Dataset Preparation and find the sentimental Analysis

  d) Clustering algorithms for customer segmentation

  e) Evolution of a salesman: A complete genetic algorithm tutorial for Python

  f) Using Machine Learning to Simulate World Cup Matches

  g) A Machine Learning Approach — Building a Hotel Recommendation Engine

  h) Spotify's "This Is" playlists: the ultimate song analysis for 50 mainstream artists

  i) An Examination of International Cuisines through Unsupervised Learning

  j) To Create Data Products That Are Magical Using Sequence-to-Sequence Models

  k) An End-to-End Project on Time Series Analysis and Forecasting with Python

SEMESTER-V	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
COMPUTER NETWORKS				

COURSE OUTCOMES:

At the end of the course students are able to

1. Differentiate network reference models such as OSI, TCP/IP. (K4)

2. Classify various Data Link Layer protocols. (K4)

3. Generalize various protocols used in MAC and Network layer. (K2)

4. Distinguish various Transport layer protocols and its applications. (K2)

5. Illustrate various application layer protocols. (K4)

UNIT I:

Data communication Components: Representation of data and its flow of networks, Categories of Networks, Various Connection Topologies, Protocols and Standards, OSI network model, TCP/IP Protocol suit, Transmission Media.

UNIT II:

Data Link Layer: Error Detection and Error Correction -Fundamentals, Block coding, Hamming Distance, CRC, Flow Control and Error control protocols - Sliding Window Protocols: Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Piggybacking,

UNIT III:

Medium Access Sub Layer: Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.
Network Layer: Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP– Delivery,

UNIT IV:

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), Congestion control, Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

UNIT V:

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP.

Text Books:

1. Behrouz A. Forouzan, "Data Communication and Networking", McGrawHill, 5th Edition, 2017
2. Andrew S. Tanenbaum, "Computer Networks", 6th Edition, Pearson New International Edition, 2021.
3. William Stallings, "Data and Computer Communication", 8th Edition, Pearson Prentice Hall India, 2007

Reference Books:

1. Douglas Comer, "Internetworking with TCP/IP", Volume 1, 6th Edition, Prentice Hall of India, 2015.
2. W. Richard Stevens, "TCP/IP Illustrated", 2nd Edition, Addison-Wesley Professional, 2011

SEMESTER-V	**L**	**T**	**P**	**C**
	3	**0**	**0**	**3**
OBJECT ORIENTED ANALYSIS & DESIGN				

COURSE OUTCOMES:

At the end of the course students are able to:

1. State the importance of modeling and object-oriented systems analysis and design (K2)

2. Show the basic structural modeling techniques using building blocks of UML (K2)

3. Generalize common modeling techniques for class and object diagrams (K2)

4. Observe the basic behavioral and advanced behavioral modeling diagrams (K3)

5. Illustrate the components and deployment diagrams with case study(K4)

UNIT I:

Introduction to UML: Importance of modeling, Principles of modeling, Object oriented modeling, An Overview of the UML, A conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT II:

Basic Structural Modeling: Classes, Relationships, Common Mechanisms, Diagrams.

Advanced Structural Modeling: Advanced classes, Advanced relationships, Interfaces.

UNIT III:

Class & Object Diagrams: Terms and concepts, Common modeling techniques for Class & Object Diagrams.

UNIT IV:

Basic Behavioral Modeling: Interactions, Interaction diagrams, Use cases, Use case Diagrams, Activity Diagrams.

Advanced Behavioral Modeling: Events and signals, State machines, processes and Threads, State chart diagrams.

UNIT V:

Architectural Modeling: Components, Deployment, Component diagrams and Deployment diagrams.

Case Study: The Unified Library Management Application.

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", Pearson Education, 2009

2. Hans - Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, "UML 2 Toolkit", Wiley- Dreamtech India Pvt, 2004

Reference Books:

1. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", Pearson Education, 2000.

2. Pascal Roques, "Modeling Software Systems Using UML2", Wiley-Dreamtech India Pvt. Ltd., 2007.

3. Atul Kahate,"Object Oriented Analysis & Design", 1st Edition, McGraw-Hill Companies, 2007.

e-Resources:

1. Ref1: http://en.wikipedia.org/wiki/Software_development_process

2. Ref2: http://en.wikipedia.org/wiki/Rational_Unified_Process

3. Ref3: http://www.uml-diagrams.org/profile-diagrams.html

SEMESTER-V	L	T	P	C
	3	0	0	3
DATA SCIENCE				

COURSE OUTCOMES:

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

1. Show skills of data inspecting and cleansing. (K2)
2. Determine the relationship between data dependencies using statistics. (K3)
3. Interpret data handling using Numpy and Pandas in Python. (K3)
4. Represent the useful information using mathematical skills. (K2)
5. Apply with matplotlib and analyze data using seaborn. (K3)

UNIT I:

INTRODUCTION: Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

UNIT II :

DESCRIBING DATA I: Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data

UNIT III:

PYTHON FOR DATA HANDLING: Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT IV:

DESCRIBING DATA II: Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r2 – multiple regression equations – regression toward the mean

UNIT V:

PYTHON FOR DATA VISUALIZATION: Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using statmodels and seaborn – graph plotting using Plotly – interactive data visualization using Bokeh

Text Books:

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", 1st Edition, Manning Publications, 2016. (first two chapters for Unit I)

2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Chapters 1–7 for Units II and III)

3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Parts of chapters 2–4 for Units IV and V)

Reference Books:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", 2nd Edition, O'Reilly Media, 2014.

SEMESTER-V	L	T	P	C
	3	0	0	3
AUTOMATA THORY AND COMPILER DESIGN				

COURSE OUTCOMES:

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

1. Show the basics of finite automata and applications toward lexical analysis. (K2)
2. Apply the techniques and design different components (phases) of a compiler. (K3)
3. Relate practical aspects of automata theory. (K2)
4. Use the tools Lex, Yacc in compiler construction. (K3)
5. Interpret code generation and usage of DAG. (K3)

UNIT - I:

Introduction to Formal Language and Regular Expressions: Languages, Definition Languages regular expressions, Finite Automata – DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools. Introduction to Compiler, Interpreter, Phases of compiler.

UNIT - II:

Context Free grammars and parsing: Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1).

UNIT - III:

Context Sensitive features – Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and operations.

UNIT - IV:

Run time storage: Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation.

Code optimization: Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs.

UNIT - V:

Code generation: Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.

TEXT BOOKS:

1. Micheal Sipser, "Introduction to Theory of computation", 3rd Edition, Cengage, 2014.

2. Aho Ullman, Ravisethi, "Compilers Principles, Techniques and Tools", 3rd Edition, Pearson Education, 2013.

REFERENCES:

1. Andrew W.Appel, "Modern Compiler Construction in C", Cambridge University Press, 1998.

2. Kenneth C. Louden, "Compiler Construction", Course Technology Inc, 1997.

3. A. Meduna, "Compiler Construction, Elements of Compiler Design", Auerbach Publications, 2007.

4. V. Raghavan, "Principles of Compiler Design", McGraw Hill Education, 2017.

SEMESTER-V (ELECTIVE-I)	L	T	P	C
	3	-	-	3
19EC5E18-MICROPROCESSOR AND INTERFACING				

COURSE OUTCOMES:

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

CO1. Analyze the development and design of 8086 Microprocessor.

CO2. Illustrate different programming solutions for various industrial requirements.

CO3. Develop different interfacing applications using Peripherals with 8086 microprocessor.

CO4. Designing of minimum controllable applications using Microcontrollers.

UNIT-I
8086 MICROPROCESSOR
Introduction to Microprocessors: Family of Intel processors.
8086 Microprocessor: Internal block diagram, Pin description, Register organization, Physical memory organization, General bus operation, I/O addressing capability, Special purpose activities.

UNIT-II
8086 PROGRAMMING:
Minimum mode and maximum mode configurations, **Minimum mode RD/WR Timing diagrams and , Maximum mode RD/WR Timing diagrams,** program development steps, Addressing modes of 8086, Instruction set of 8086, Assembler directives, writing simple programs with an assembler, Procedures and Macros.

UNIT-III
BASIC PERIPHERALS AND INTERFACING WITH 8086:
Introduction to Programmable PeripheralInterface-8255, Internal architecture, modes of operation of 8255, **Interfacing EPROM/RAM**, Interfacing to D/A and A/D converters, Stepper motor interfacing, Control of high power devices using 8255.

UNIT-IV
SPECIAL PURPOSE PROGRAMMABLE INTERFACING DEVICES:
Interrupts and interrupt service routines, Interrupt cycle of 8086, maskable interrupt and non-maskable interrupts, interrupt programming, Programmable interrupt controller-8259, programmable communication interface USART-8251, DMA Controller-8257.

UNIT-V
8051 MICROCONTROLLER:
Introduction to microcontrollers, **Difference between microprocessor and microcontroller, Internal architecture of 8051 microcontroller**, 8051 pin description, **Special function registers,** I/O ports, Memory organization, **Addressing modes, Instruction set,** Interrupts, Timers, **Timers programming in different modes,** Serial port, Programming with Embedded C.

TEXT BOOKS:

1. A .K .Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd Edition, Tata McGraw Hill Publishers, 2012. **(UNITS – I to IV)**
2. Kenneth Ayala, "8051 Microcontroller", 3rd Edition, Cengage Learning Publishers, 2007.
(UNIT - V)

REFERENCE BOOKS:

1. Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286,80386, 80486, and Pentium processors. Architecture, programming and interfacing", 8th Edition, Pearson Publication, 2012.
2. DoughlasV.Hall,"Microprocessors and Interfacing, Programming and Hardware", 2nd Edition, TMH,2012.

E-REFERENCES:

1. Microprocessors and Microcontrollers

   https://www.tutorialspoint.com/microprocessor/index.htm
2. Microprocessors and Microcontrollers, NPTEL
   https://nptel.ac.in/courses/108/105/108105102/

	L	T	P	C
SEMESTER-V (ELECTIVE-I)	**3**	**0**	**0**	**3**
19CS5E01-COMPUTER GRAPHICS				

COURSE OUTCOMES:

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

1. Observe operations of display devices and develop algorithms for graphics primitives. (K2)
2. Sketch lines, circles, ellipse and design 2D-object Transformations and Viewing. (K3)
3. Illustrate 3D-object representations, Transformations and Viewing (K4)
4. Analyze different Visibility Detection methods. (K4)
5. Develop simple Graphics Animation Applications. (K3)

UNIT- I:

Introduction: Application areas of Computer Graphics, Overview of Graphics Systems: video-display devices, raster-scan systems, random scan systems, storage tube graphics display, Raster scan display and input devices.

Output primitives : Points and lines, line drawing algorithms: DDA, Bresenhams, Mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

UNIT- II:

2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations homogeneous coordinates, composite transforms, transformations between coordinate systems.

2-D viewing : The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, Cohen-Sutherland and Liang-Barsky line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm

UNIT- III:

3-D Object Representation : Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and Surfaces. 3-D Geometric transformations: Translation, Rotation, Rotation about an arbitrary axis in space,scaling, reflection and shear transformations, composite transformations

UNIT- IV:

3-D Viewing : Viewing pipeline, Viewing Coordinates, View Volume, Projections: Parallel Projection, Perspective Projections Clipping.

Visible Surface Detection Methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, Area Sub-division and Octree methods

UNIT –V:

Computer Animation: Design of Animation Sequence, General Computer Animation Functions, Raster Animation, Computer Animation Languages, Key Frame, Motion Specifications. Introduction to Multimedia.

TEXT BOOKS:

1. Donald Hearn, M.Pauline Baker, "Computer Graphics C version", Pearson, 2002.
2. Z. Xiang, R. Plastock " Schaum's outline of Computer Graphics", 2nd Ed, McGraw-Hill Education, 2000.

REFERENCE BOOKS:

1. Foley, VanDam, Feiner, Hughes, "Computer Graphics Principles & Practice", 3rd Edition, Pearson, 2013.
2. David F Rogers, "Procedural elements for Computer Graphics", 2/e, TMH, 1997.
3. Neuman ,Sproul, "Principles of Interactive Computer Graphics", 2/e, TMH, 2001.
4. ShaliniGovil, Pai, "Principles of Computer Graphics", Springer, 2005

SEMESTER-V (ELECTIVE-I)	L	T	P	C
	3	0	0	3
19CS5E02-PRINCIPLES OF PROGRAMMING LANGUAGES				

COURSE OUTCOMES:

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

1. Describe syntax and semantics of programming languages

2. Explain data, data types, and basic statements of programming languages

3. Design and implement subprogram constructs, Apply object - oriented, concurrency, and event handling programming constructs

4. Develop programs in Scheme, ML, and Prolog

5. Understand and adopt new programming languages

UNIT- I:

Reasons for studying, concepts of programming languages, Syntax and semantics: Evolution of programming languages, describing syntax, context, free grammars, attribute grammars, describing semantics, lexical analysis, parsing, recursive - decent bottom - up parsing

UNIT- II:

Data, data types, and basic statements: Names, variables, binding, type checking, scope, scope rules, lifetime and garbage collection, primitive data types, strings, array types, associative arrays, record types, union types, pointers and references, Arithmetic expressions, overloaded operators, type conversions, relational and boolean expressions , assignment statements , mixed mode assignments, control structures – selection, iterations, branching, guarded Statements

UNIT- III:

Subprograms and implementations: Subprograms, design issues, local referencing, parameter passing, overloaded methods, generic methods, design issues for functions, semantics of call and return, implementing simple subprograms, stack and dynamic local variables, nested subprograms, blocks, dynamic scoping

UNIT- IV:

Object- orientation, concurrency, and event handling: Object – orientation, design issues for OOP languages, implementation of object, oriented constructs, concurrency, semaphores, Monitors, message passing, threads, statement level concurrency, exception handling, event handling

UNIT -V:

Functional programming languages: Introduction to lambda calculus, fundamentals of functional programming languages, Programming with Scheme, – Programming with ML, Logic programming languages: Introduction to logic and logic programming, – Programming with Prolog, multi - paradigm languages

TEXT BOOKS:

1. Robert W. Sebesta, "Concepts of Programming Languages", Tenth Edition, Addison Wesley, 2012.
2. Allen B Tucker, Robert E Noonan, "Programming Languages, Principles & Paradigms", 2nd, TMH

REFERENCE BOOKS:

1. R. Kent Dybvig, "The Scheme programming language", Fourth Edition, MIT Press, 2009.
2. Jeffrey D. Ullman, "Elements of ML programming", Second Edition, Prentice Hall, 1998.
3. Richard A. O'Keefe, "The craft of Prolog", MIT Press, 2009.
4. W. F. Clocksin and C. S. Mellish, "Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003

SEMESTER-V (ELECTIVE-I)	L	T	P	C
	3	**0**	**0**	**3**
19CS5E03-SOFTWARE PROJECT MANAGEMENT				

COURSE OUTCOMES:

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

1. Illustrate the process to be followed in the software development life-cycle models. (K4)

2. Articulate the concepts of project management & planning. (K3)

3. Analyze the Software architecture and workflows. (K4)

4. Identify activities necessary for successfully competition of Software projects. (K2)

5. Show communication, modeling, and construction & deployment practices in software Development. (K2)

UNIT – I:

Conventional Software Management: The waterfall model, conventional software Management performance.

Evolution of Software Economics: Software Economics, pragmatic software cost estimation.

Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT – II:

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of The Process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.

UNIT – III:

Model Based Software Architectures: A Management perspective and technical perspective.

Work Flows of the Process: Software process workflows, Iteration workflows.

Checkpoints of the Process: Major mile stones, Minor Milestones, Periodic status assessments.

UNIT – IV:

Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

UNIT – V:

Process Automation: Automation Building blocks, The Project Environment.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.

Project Estimation and Management: COCOMO model, Critical Path Analysis, PERT technique, Monte Carlo approach (Text book 2)

Text Books:

1. Walker Royce, "Software Project Management", Pearson Education, 2005.
2. Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", 6th edition, McGraw Hill Education, 2017.

Reference Books:

1. Joel Henry, "Software Project Management", Pearson Education, 2004.
2. Pankaj Jalote, "Software Project Management in practice", Pearson Education, 2005.
3. Robert K.Wysocki, "Effective Software Project Management", Wiley, 2006.

	L	**T**	**P**	**C**
SEMESTER-V	**0**	**0**	**3**	**1.5**
COMPUTER NETWORKS LAB				

COURSE OUTCOMES:

At the end of this course, students are able to

1. Show and practice various networking commands and Linux network configuration(K2)

2. Discover and implement different network cables. (K2)

3. Illustrate various networking commands in packet traces software. (K4)

4. Develop and configure a network using packet tracer software. (K3)

5. Observe and configure various routing algorithms using packet tracer. (K2)

List of Programs:

1. Study of Networking Commands (Ping, Tracert, TELNET, nslookup, netstat, ARP) and Network Configuration Files.

2. Linux Network Configuration:

    a. Configuring NIC's IP Address.

    b. Determining IP Address and MAC Address using if-config command.

    c. Changing IP Address using if-config.

    d. Static IP Address and Configuration by Editing.

    e. Determining IP Address using DHCP.

    f. Configuring Hostname in /etc/hosts file.

3. Study of different types of network cables and practically implement the cross wired cable and straight through cable   using crimping tool

4. Implementing Data link layer farming methods such as bit stuffing and character stuffing.

5. Study of network IP and implementing IP address scheme

6. Connect the computers in LAN network

7. Study and practice basic network command and network configuration commands using packet tracer

8. Performing initial Switch and Router configuration using packet tracer

9. Configure a network topology using packet tracer software using two different networks

10. Configure a network topology using RIP protocol

11. Configure a network topology using link state vector routing protocol

SEMESTER-V	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**
OBJECT ORIENTED ANALYSIS & DESIGN LAB				

COURSE OUTCOMES:

At the end of the course students are able to

1. Observe and model various UML diagrams(K2)
2. Show a System Analyst role and identify the functionality of each UML model in developing object-oriented software (K2)
3. Illustrate importance of system analysis and design in solving computer based problems. (K2)
4. Predict and apply software architecture for a mini project. (K3)
5. Classify dynamic and static aspects of various case studies. (K4)

List of UML CASE STUDY(S): USING RATIONAL ROSE OR ARGO UML

NOTE: Must draw the Use case, Class, Sequence, Activity Diagrams

1. Model the UML diagrams of ATM APPLICATION.
2. Model the UML diagrams of LIBRARY MANAGEMENT SYSTEM.
3. Model the UML diagrams of ONLINE SHOPHING.
4. Model the UML diagrams of RAILWAY RESERVATION SYSTEM.
5. Model the UML diagrams of BANKING SYSTEM.
6. Model the UML diagrams of CREDIT CARD PROCESSING.
7. Model the UML diagrams of GOOGLE-PAY APPLICATION.
8. Model the UML diagrams of MATRIMONIAL APPLICATION.
9. Model the UML diagrams of RECRUITMENT APPLICATION.
10. Model the UML diagrams of STUDENT ADMISSION APPLICATION.
11. Model the UML diagrams of PATIENT MANAGEMENT IN HOSPITAL APPLICATION.
12. Model the UML diagrams of LIFT MANAGEMENT IN APARTMENTS APPLICATION.

SEMESTER-V	L	T	P	C
	0	0	3	1.5
DATA SCIENCE LAB				

COURSE OUTCOMES:

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

1. Develop relevant programming abilities (K3)

2. Observe knowledge of statistical data analysis techniques (K2)

3. Estimate proficiency to build and assess data-based models. (K2)

4. Illustrate data management & processing tasks using Python (K4)

5. Articulate data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively. (K3)

List of Programs:

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

1. Working with Numpy arrays

2. Working with Pandas data frames

3. Basic plots using Matplotlib

4. Frequency distributions

5. Averages

6. Variability

7. Normal curves

8. Correlation and scatter plots

9. Correlation coefficient

10. Regression

REFERENCES:

1. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.

2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

		L	T	P	C
SEMESTER-VI		**3**	**0**	**0**	**3**

ARTIFICIAL INTELLIGENCE

COURSE OUTCOMES:

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

1. Apply clever search and gaming agents. (K3)

2. Interpret AI problems through Python/Prolog/ etc. (K3)

3. Complete learning optimization and inference algorithms for model learning. (K3)

4. Design and develop programs for an agent to learn and act in a structured environment. (K3)

5. Illustrate the MDP concepts. (K3)

UNIT I:

Introduction: Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT II:

Search Algorithms: Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.

UNIT III:

Probabilistic Reasoning: Probability, conditional probability, Bayes Rule, Bayesian Networks-representation, construction and inference, temporal model, hidden Markov model.

UNIT IV:

Markov Decision process: MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT V:

Reinforcement Learning: Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Prentice Hall. 2010.

2. Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill. 2017.

Reference Books:

1. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", 2nd edition, Khanna Book Publishing, 2018

2. Saroj Kaushik, "Artificial Intelligence", 1st edition, Cengage Learning India, 2011

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SEMESTER-VI	**3**	**0**	**0**	**3**
INTERNET OF THINGS AND CYBER SECURITY				

COURSE OUTCOMES:

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

1. Show IoT value chain structure (device, data cloud), application areas and technologies Involved. (K2)
2. Identify IoT sensors and technological challenges faced by IoT devices and show wireless, energy, power, and sensing modules. (K2)
3. Associate Internet of Things with help of preparing projects designed for Raspberry Pi. (K2)
4. Generalize the send, receive and manage data through cloud tools. (K2)
5. Predict the security threats, attacks and malicious code. (K3)

UNIT-I:

Introduction to Internet of Things- Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT-II:

IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-III:

Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, unipolar and bipolar Stepper motors Sensors- Light sensor, temperature sensor with thermistor, voltage sensor, ADC and DAC, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Wireless Bluetooth Sensors, Level Sensors, USB Sensors, Embedded Sensors, Distance Measurement with ultrasound sensor.

UNIT-IV:

Cloud Platforms for IOT: Virtualization concepts and Cloud Architecture, Cloud computing, benefits Cloud services -- SaaS, PaaS, IaaS, Cloud providers & offerings, Study of IOT Cloud platforms.

UNIT-V:

ThingSpeak API and MQTT, Interfacing ESP8266 with Web services. Attacker Techniques and Motivations: How attacker cover their attacks, Fraud Techniques, Threat infrastructure. Exploitation: Techniques to gain foothold. Malicious code

Text Books:

1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things - A Hands-on Approach", Universities Press, 2015, ISBN: 9788173719547

2. Matt Richardson & Shawn Wallace, "Getting Started with Raspberry Pi", O'Reilly (SPD), 2014, ISBN: 9789350239759

3. Simon Monk, "Raspberry Pi Cookbook, Software and Hardware Problems and solutions", O'Reilly (SPD), 2016, ISBN 7989352133895

4. James Graham, Richard Howard, Ryan Olson, "Cyber Security Essentials", CRC Press.-eBook

Reference Books:

1. Peter Waher, "Learning Internet of Things", 3rd Edition, Packt Publishing, 2015

2. Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment", River Publishers, 2014

3. N. Ida, "Sensors, Actuators and Their Interfaces", SciTech Publishers, 2014.

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SEMESTER-VI (ELECTIVE-II)	**3**	**0**	**0**	**3**

19CS6E04 - SOFTWARE TESTING METHODOLOGIES

COURSE OUTCOMES:

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

1. Identify various software testing problems, knowledge, engineering methods and solve these problems by software test models, criteria, strategies, and methods (K2)
2. Show and conduct a software test process for a software project. (K2)
3. Analyze the needs of software test automation. (K4)
4. Use communication methods to conduct practice-oriented software testing projects. (K3)
5. Observe basic knowledge of contemporary issues in software testing. (K2)

UNIT – I:

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, definition, Model for testing, Effective Vs Exhaustive Software Testing.

Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle, Software Testing Methodology.

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, verifying code, Validation.

UNIT – II:

Dynamic Testing-Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing.

White-Box Testing: need, Logic Coverage criteria, Basis Path testing, Graph matrices, Loop testing, data flow testing, mutation testing.

UNIT – III:

Static Testing: Inspections, Structured Walkthroughs, Technical Reviews.

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing.

Regression Testing: Progressives Vs regressive testing, Regression test ability, Objectives of regression testing, Regression testing types, Regression testing techniques.

UNIT – IV:

Efficient Test Suite Management: growing nature of test suite, Minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite

Software Quality Management: Software Quality metrics, SQA models. Debugging: process, techniques, correcting bugs.

UNIT – V:

Automation and Testing Tools: need for automation, categorization of testing tools, selection of testing tools, Cost incurred, Guidelines for automated testing, overview of some commercial testing tools such as Win Runner, Load Runner, Jmeter and JUnit . Test Automation using Selenium tool.

Testing Object Oriented Software: basics, Object oriented testing Testing Web based Systems: Challenges in testing for web based software, quality aspects, web engineering, testing of web based systems, Testing mobile systems.

Text Books:
1. Naresh Chauhan, "Software Testing, Principles and Practices", 2nd Edition, Oxford, 2016
2. Yogesh Singh, "Software Testing", CAMBRIDGE, 2012.

Reference Books:
1. Aditya P Mathur, "Foundations of Software Testing", 2ed, Pearson, 2013.
2. Baris Beizer, Dreamtech, "Software Testing Techniques", Second Edition, Itp- Media, 1990.
3. M G Limaye, "Software Testing, Principles, Techniques and Tools", TMH, 2009.
4. Willian E Perry, "Effective Methods for Software Testing", 3ed, Wiley, 2006.

e-Resources:
1. https://www.tutorialspoint.com/software_testing_dictionary/test_tools.htm

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SEMESTER-VI (ELECTIVE-II)	**3**	**0**	**0**	**3**

19CS6E04-MOBILE COMPUTING

COURSE OUTCOMES:

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

1. Interpret Wireless local area networks (WLAN): MAC design principles, 802.11 WIFI. (K3)
2. Observe challenges in mobile communications and potential Techniques in GSM. (K2)
3. Outline the Mobile IP in Network layer. (K4)
4. Illustrate different data delivery methods and synchronization protocols. (K4)
5. Develop applications that are mobile-device specific and demonstrate current Practice in mobile computing contexts. (K3)

UNIT – I:

Mobile Communications: An Overview - Mobile Communication: Guided Transmission; Unguided Transmission; Modulation Methods and Standards for Voice - Oriented Data Communication Standards; Modulation Methods and Standards for Data and Voice Communication;

Mobile Computing - Novel Applications and Limitations; Mobile Computing Architecture; Mobile System Networks; Mobile Devices and Systems - Cellular Networks and Frequency Reuse; Mobile Smartphones, Smart Mobiles and Systems; Handheld Pocket Computers - Handheld devices; Smart Systems; Limitations of Mobile Devices.

UNIT – II:

GSM and other 2G Architectures: GSM - Services and System Architecture; Radio Interfaces of GSM; Protocols of GSM; Localization; Call Handling; Handover; GPRS System Architecture;

Wireless Medium Access Control, CDMA, 3G, 4G and 5G Communication: Controlling the Medium Access; Spread Spectrum; Coding Methods; IMT-2000 3G Wireless Communication Standards; WCDMA 3G communication standards; CDMA 2000 3G Communication Standards; Broadband Wireless Access; 4G Networks; MIMO; LTE; 5G Networks.

UNIT – III:

Mobile IP Network Layer: IP and Mobile IP Network Layers - OSI Layer Functions, TCP/IP and Internet Protocol, Mobile Internet Protocol; Packet Delivery and Handover Management; Location Management; Registration; Tunnelling and Encapsulation; Route Optimization;

Introduction to Mobile Ad-hoc Network: fixed infrastructure architecture, MANET Infrastructure Architecture; MANET: Properties, Spectrum, Applications; Security in Ad-hoc network; Wireless Sensor Networks; Sensor Network Applications.

UNIT - IV:

Synchronization: Synchronization in Mobile Computing Systems, Usage Models for Synchronization in Mobile Application, Domain - dependent specific rules for Data Synchronization; Personal Information Manager;

Mobile Agent: Mobile Agent Design, Aglets; Application Server; Gateways; OMADM.

UNIT - V:

Mobile Wireless Short Range Networks and Mobile Internet: Wireless Networking and Wireless LAN, Wireless LAN (WLAN) Architecture, IEEE 802.11Protocol Layers; Wireless Application Protocol (WAP) - WAP1.1 Architecture, Wireless Datagram protocol (WDP), Wireless Transport Layer Security (WTLS), LWA, LLA.

Text Books:

1. Raj kamal, "Mobile Computing", 2nd edition, Oxford,2011

2. Asoke K Talukder, Hasanahmed, Roopa R Yavagal, "Mobile Computing, Technology Applications and Service Creation", 2nd Edition, McGraw Hill,2017

Reference Books:

1. UWE Hansmann, Lother Merk, Martin S. Nocklous, Thomas Stober, "Principles of Mobile Computing", 2nd Edition, Springer, 2003

e-Resources:

1. https://nptel.ac.in/noc/courses/noc16/SEM2/noc16-cs13/

SEMESTER-VI (ELECTIVE-II)	L	T	P	C
	3	**0**	**0**	**3**
19CS6E06 - BIG DATA AND HADOOP				

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

1. Describe big data and use cases from selected business domains.
2. Explain NoSQL big data management.
3. Install, configure, and run Hadoop and HDFS.
4. Perform map-reduce analytics using Hadoop.
6. Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

UNIT – I:

UNDERSTANDING BIG DATA: What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics

UNIT – II:

NoSQL DATA MANAGEMENT: Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – sharding – master-slave replication – peer-peer replication – sharding and replication – consistency – relaxing consistency – version stamps – map-reduce – partitioning and combining – composing map-reduce calculations

UNIT – III:

BASICS OF HADOOP: Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures

UNIT – IV:

MAPREDUCE APPLICATIONS: MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats

UNIT – V:

HADOOP RELATED TOOLS: Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

Text books:

1. Tom White "Hadoop: The Definitive Guide", 3rd Edition, O'Reilly, 2012.
2. Chuck Lam, "Hadoop in Action", Dreamtech Press, 2011.
3. Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk, BruceBrown, Rafael Coss, "Hadoop for Dummies", Wiley, 2014.

Reference Books:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
4. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
5. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
6. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
7. Alan Gates, "Programming Pig", O'Reilley, 2011.

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SEMESTER-VI (ELECTIVE-II)	**3**	**0**	**0**	**3**
19CS6E06 - .NET TECHNOLOGIES				

COURSE OUTCOMES:

By the end of the course the student

1. List the major elements of the .NET frame work.

2. Explain how C# fits into the .NET platform.

3. Analyze the basic structure of a C# application.

4. Debug, compile, and run a simple application.

5. Develop programs using C# on .NET.

6. Design and develop Web based applications on .NET.

7. Discuss CLR.

UNIT I:

INTRODUCTION TO C#

Introducing C#, Understanding .NET, overview of C#, Literals, Variables, Data Types, Operators, checked and unchecked operators, Expressions, Branching, Looping, Methods, implicit and explicit casting, Constant, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.

UNIT II:

OBJECT ORIENTED ASPECTS OF C#

Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism, sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.

UNIT III:

APPLICATION DEVELOPMENT ON .NET

Building windows application, Creating our own window forms with events and controls, menu creation, inheriting window forms, SDI and MDI application, Dialog Box(Modal and Modeless), accessing data with ADO.NET, DataSet, typed dataset, Data Adapter, updating database using stored procedures, SQL Server with ADO.NET, handling exceptions, validating controls, windows application configuration.

UNIT IV:

WEB BASED APPLICATION DEVELOPMENT ON .NET

Programming web application with web forms, ASP.NET introduction, working with XML and .NET, Creating Virtual Directory and Web Application, session management techniques, web.config, web services, passing datasets, returning datasets from web services, handling transaction, handling exceptions, returning exceptions from SQL Server.

UNIT V:

CLR AND .NET FRAMEWORK

Assemblies, Versoning, Attributes, reflection, viewing meta data, type discovery, reflection on type, marshalling, remoting, security in .NET

Text Books:

1. Herbert Schildt, "The Complete Reference: C# 4.0", Tata McGraw Hill, 2012.
2. Christian Nagel et al. "Professional C# 2012 with .NET 4.5", Wiley India, 2012.

References:

1. Andrew Troelsen, "Pro C# 2010 and the .NET 4 Platform, Fifth edition, A Press, 2010.
2. Ian Griffiths, Matthew Adams, Jesse Liberty, "Programming C# 4.0", Sixth Edition, O"Reilly, 2010.

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SEMESTER-VI	**0**	**0**	**3**	**1.5**
INTERNET OF THINGS AND CYBER SECURITY LAB				

COURSE OUTCOMES:

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

1. Observe and measure temperature and humidity using various sensors. (K2)

2. Use IR sensor/push button to on/off LED. (K3)

3. Interpret Bluetooth module with Arduino and Use the same. (K3)

4. Illustrate Actuating elements with Arduino and control the same (K4)

5. Develop secure data application (Mobile or Web). (K3)

List of Experiments:

All experiments can be done using: Node-MCU/Arduino/Raspberry Pi boards

Expt 1: Familiarization with Arduino and perform necessary software installation.

Expt 2: To interface Push button/Digital sensor (IR/LDR) with Arduino and write a program to turn ON LED when push button is pressed or at sensor detection.

Expt 3: To interface DHT11 sensor with Arduino and write a program to print temperature and humidity readings.

Expt 4: To interface OLED with Arduino and write a program to print temperature and humidity readings on it.

Expt 5: To interface Bluetooth with Arduino and write a program to send sensor data to smart phone using Bluetooth.

Expt 6: To interface Bluetooth with Arduino/Node-MCU/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smart phone using Bluetooth.

Expt 7: To interface Servo motor with Arduino and write a program to control the same

Expt 8: To interface Stepper motor with Arduino and write a program to control the same using potentiometer

Expt 9: To interface thermistor with Arduino for temperature measurement

Expt 10: To measure temperature using thermocouple by interfacing it with Arduino

Expt 11: Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.

Expt 12: Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Expt 13: Case Studies: Weather forecast station, Traffic control, Hospital management, Security management for house or building, Student/Employee attendance management.

SEMESTER-VI	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**
ARTIFICIAL INTELLIGENCE LAB				

COURSE OUTCOMES:

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

1. State the Basic AI example problems such as water jug, tic-tac-toe etc.(K2)

2. Illustrate Simulation for Annealing Algorithm(K4)

3. Prepare program towers of Honoi and A* Algorithm(K3)

4. Develop and design Expert systems(K3)

5. Plan MDP Concepts and Reinforcement Learning examples(K4)

Artificial Intelligence Lab – Using Python/Java/C++/Prolog/Lisp

1. Implementation of DFS for water jug problem

2. Implementation of BFS for tic-tac-toe problem

3. Implementation of TSP using heuristic approach

4. Implementation of Simulated Annealing Algorithm

5. Implementation of Hill-climbing to solve 8- Puzzle Problem

6. Implementation of Towers of Honoi Problem

7. Implementation of A* Algorithm

8. Implementation of Hill Climbing Algorithm

9. Implementation Expert System with forward chaining

10. Implementation Expert System with backward chaining

11. Implement Reinforcement Learning examples

12. Implement MDP concepts

SEMESTER-VII	**L**	**T**	**P**	**C**
	3	**-**	**-**	**3**
MACHINE LEARNING AND DEEP LEARNING				

COURSE OUTCOMES:

At the end of the course students are able to

1. Define basic concepts of machine learning.

2. Evaluate and compare the performance of regression and logistic regression

3. Understand the hidden patterns inside the data using clustering techniques.

4. Analyze optimization and generalization in deep learning

5. Explore the deep learning applications

UNIT - I:

INTRODUCTION: Introduction to Machine learning, Examples, Well defined machine learning problem, Decision tree learning and Random Forests. Probabilistic Classification:

UNIT - II:

REGRESSION: Linear Regression: Basic model, solving linear regression, Error in linear regression, advanced regression models.

Logistic Regression: Logistic regression vs. linear regression, sigmoid function, MLE via gradient ascent, Regularization, Logistic regression for multiple classes

UNIT - III:

CLUSTERING: k-means, Lloyd's method, Hierarchical clustering, Agglomerative Clustering, Mixture of Gaussian clustering, Dimensionality Reduction.

UNIT-IV:

INTRODUCTION TO DEEP LEARNING: Historical Trends in Deep learning, Deep Feed - forward networks, Gradient-Based learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

UNIT-V:

OPTIMIZATION AND GENERALIZATION: Optimization in deep learning– Non-convex optimization for deep networks- Stochastic Optimization Generalization in neural networks- Spatial Transformer Networks

DEEP LEARNING APPLICATIONS: Image Processing, Natural Language Processing, Speech Recognition, Video Analytics

Text Books:

1. Tom M. Mitchell, "Machine Learning", Indian Edition, MGH, 2017.
2. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2010.
3. Ian Goodfellow, Yoshua Bengio and Aaron Courville, "Deep Learning", MIT Press, 2016.

Reference Books:

1. Rogers S and Girolami M, "A first course in Machine Learning", CRC Press, 2011.

e-Resources:

1. https://www.coursera.org/course/ml
2. https://nptel.ac.in/courses/106/106/106106184/

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SEMESTER-VII	**3**	**0**	**0**	**3**
FULL STACK WEB DEVELOPMENT				

COURSE OUTCOMES:

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

- Design simple web pages using markup languages like HTML and CSS.
- Create dynamic web pages using DHTML and java script that is easy to navigate and use.
- Create web pages using AngularJS.
- Build web applications using Servlet and JSP.
- Understand various operations on Mongo Database.

UNIT-I:

HTML: An Introduction to HTML, Basic XHTML Syntax and Semantics, Basic HTML Elements: Images, Links, Lists, Tables, Forms, Frames, Division and Spanning, HTML 5.0.

CSS: Levels of Style sheets, Style specification formats, Selector forms, CSS Colors and Backgrounds, CSS Text and Font Properties, The Box Model, CSS Margins, Padding, and Borders Conflict Resolution.

UNIT-II:

Java Script: The Basics of Java Script, Objects, Primitive operations and Expressions, Screen output and Keyboard input, Control statements, Object Creation and modification, Arrays, functions, Constructors, Pattern matching using Regular Expressions, DHTML: Positioning moving and Changing Elements.

DOM: Introduction to the Document Object Model DOM, HTML DOM Event Handling, Modifying Element Style, Document Tree, DOM Event Handling

UNIT-III:

Introduction to AngularJS: Expressions, Modules, Data Binding, Scopes, Directives & Events, Controllers, Filters, Services, HTTP, Tables, Select, Fetching Data from MySQL.

UNIT-IV:

Servlet: Servlet Basics, Need of Server Side Programming, Servlet Life Cycle, Servlet Hello World Application, Web.xml Structure, Servlet Directives- include(), forward(), sendRedirect(), HttpServletRequest and HttpServletResponse in Servlet, Servlet and JDBC Integration.
JSP: JSP Basics, JSP Scripting Elements (Declaration,Expression,Scriptlet), Directive Elements(page,include,taglib), Action Elements(jsp:forward,jsp:include,jsp:useBean), JSP Implicit Objects.

UNIT-V

Introduction to Mongo DB: Mongo DB Environment, Create Database, Drop Database, Create Collection, Drop Collection, Read Operations, Write Operations.

Text Books:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, Uttam K Roy, Oxford
3. Head First Servlet and JSP
4. Node.js, MongoDB, and AngularJS Web Development by Brad Dayley

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book, Dream Tech.
2. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage
3. Pro Angular JS by Adam Freeman
4. MEAN Web Development by Amos Q. Haviv

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SEMESTER-VII (ELECTIVE-III)	**3**	**0**	**0**	**3**
19CS7E08 - QUANTUM COMPUTING				

COURSE OBJECTIVES:

The objectives of the course is

1. To understand the basics of Quantum Computing

2. To familiarize the concepts of Quantum gates

3. To understand the importance of Shor's algorithm & Grover's algorithm

4. To explore the applications of Quantum Computing

5. To conceptualize the physical realization of Quantum computing models.

COURSE OUTCOMES

Upon successful completion of this course, students should be able to:

1. Analyze the basic concepts in Quantum computing

2. Design simple circuits using Quantum gates

3. Apply Shor's and Grover's algorithm in Quantum computing

4. Design vital applications using Quantum computing

5. *Handle Quantum computing models*

UNIT I:

Fundamentals of Quantum Computing: Introduction: Quantum Mechanics, Qubits, Quantum Measurements, Fragility of quantum information: Decoherence, Quantum Superposition and Entanglement.

UNIT II:

Quantum Gates and Circuits: Quantum Gates, Single & Multiple Qubit Gates, Matrix Representation of Quantum Gates and Circuits, Bell States, Quantum Measurement, Quantum Half-Adder and Subtractor.

UNIT III:

Quantum Algorithms: Deutsch and Deutsch–Jozsa algorithms, Grover's Search Algorithm, Quantum Fourier Transform, Shore's Factorization Algorithm.

UNIT IV:

Applications of Quantum Computing: Performance, Security and Scalability, Quantum Teleportation, Quantum Parallelism, Superdense Coding, Quantum Error Correction: Fault tolerance; Quantum Cryptography.

UNIT V:

Quantum Computing Models: NMR Quantum Computing, Spintronics and QED MODEL, Linear Optical MODEL, Nonlinear Optical Approaches; Future of Quantum computing.

Text Books:

1. V.K Sahni, "Quantum Computing", TATA McGrawHill, 2007

2. Eric R. Johnston, Nic Harrigan, Mercedes and Gimeno-Segovia, "Programming Quantum Computers: Essential Algorithms and Code Samples", O'Reilly, 2019

3. Dr. Christine Corbett Moran, "Mastering Quantum Computing with IBM QX: Explore the world of quantum computing using the Quantum Composer and Qiskit", Kindle Edition Packt, 2019

Reference Books:

1. Chris Bernhardt, "Quantum Computing for Everyone", The MIT Press, Cambridge, 2019

2. Michael A. Nielsen and Issac L. Chuang, "Quantum Computation and Information", Cambridge, 2002.

3. Riley Tipton Perry, "Quantum Computing from the Ground Up", World ScientificPublishing Ltd, 2012.

4. Scott Aaronson, "Quantum Computing since Democritus", Cambridge, 2013.

e-Resources:

1. https://nptel.ac.in/courses/104104082/

2. https://swayam.gov.in/nd1_noc19_cy31/preview

SEMESTER-VII (ELECTIVE-III)	L	T	P	C
	3	-	-	3
19EC7E20 - IMAGE PROCESSING				

COURSE OUTCOMES:

After the completion of this course, students are able to

CO1: Define basic concepts of image processing and image geometry.

CO2: Apply various operations on image both in spatial and frequency domains to solve various real time problems by converting them between domains.

CO3: Differentiate different types of images, such as black & white, grayscale and color images, and can convert image from one color model to other.

CO4: Analyze different features of the images for the purpose of Compression, authentication and safety.

UNIT-I

BASICS OF DIGITAL IMAGE PROCESSING:

Origins of digital image processing, uses digital image processing, fundamental steps in digital image processing, components of an image processing system, digital image fundamentals, Elements of visual perception, light and electromagnetic spectrum, imaging sensing and acquisition, image sampling and quantization. Some basic relationships between pixels**.**

UNIT-II

INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING:

Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Filtering in the frequency domain: Preliminary concepts, the discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform. The Basic of filtering in the frequency domain, image smoothing and sharpening using frequency domain filters.

UNIT-III

IMAGE RESTORATION AND RECONSTRUCTION:

A model of the image degradation Restoration process, Noise models, restoration in the presence of noise only- Spatial Filtering - Mean filters, order statistic filters and adaptive filters.

Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean

square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter, image reconstruction from projections.

UNIT-IV

MULTI-RESOLUTION PROCESSING AND IMAGE COMPRESSION:

Image pyramids, sub-band coding & Haar transforms multi resolution expressions, wavelet transforms in one dimension. The fast wavelets transform, wavelet transforms in two dimensions, wavelet packets. Image compression: Fundamentals, various compression methods-coding techniques, digital image water marking.

UNIT-V

MORPHOLOGICAL IMAGE PROCESSING, SEGMENTATION AND COLOR IMAGE PROCESSING:

Preliminaries Erosion and dilation, opening and closing, the Hit-or-miss transformation, some Basic Morphological algorithms, Image segmentation- Fundamentals, point, line, edge detection thresholding, region -based segmentation, color fundamentals, color models, pseudo color image processing, basic of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression.

TEXT BOOKS:

1. R. C. Gonzalez and R. E. Woods, "Digital Image Processing, 3rd edition", Prentice Hall, 2008. (UNIT I-V)

REFERENCES:

1. R. C. Gonzalez, R. E. Woods and Steven L. Eddins , "Digital Image Processing Using MATLAB" 2nd edition, Prentice Hall, 2009.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, "Digital Image Processing", Tata   McGraw-Hill Education, 2011.

E-REFERENCES:

1. Digital Image Processing, Tutorialspoint https://www.tutorialspoint.com/dip/index.htm
2. Digital Image Processing, Javatpoint
   https://www.javatpoint.com/digital-image-processing-tutorial

SEMESTER-VII (ELECTIVE-III)	L	T	P	C
	3	0	0	3
19CS7E09-SOCIAL NETWORKS				

COURSE OUTCOMES

On completion of the course the student will be able to

1. An ability to identify metrics used in network analysis.
2. An ability to classify the network related data's.
3. Identify the aim of graph in computational models.
4. Apply the knowledge in predicting the user behaviors.
5. Visualization of a social network using tools.
6. Ability to analyze metrics in social network analysis.

UNIT I:

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web Social Network Analysis: Social Networks Perspective - Analysis of Network Data –Key concepts and measurements in network analysis- Interpretation of Network Data - Social Network Analysis in the Social and Behavioral Sciences - Metrics in social network analysis.

UNIT II:

Social Network Analysis Software, Tools and Libraries: Modelling and aggregating social network data: Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data –(Advanced representations) Multi-Relational characterization of dynamic social network communities -Social network analysis software - Tools - Libraries.

UNIT III:

Cliques, Clusters and Components: Components and Sub graphs: Sub graphs - Ego Networks, Triads, and Cliques, Hierarchical Clustering, Triads, Network Density and conflict. Density: Egocentric and Sociocentric - Digression on Absolute Density - Community structure and Density, Centrality : Local and Global - Centralization and Graph Centres, Cliques and their intersections, Components and Citation Circles - Positions, Sets and Clusters.

UNIT IV:

Predicting Human Behaviour and Privacy Issues: Development of Social Network Analysis - Understanding and predicting human behavior for social communities - User data management - policy, legal, and technical challenges. Inference and Distribution - Enabling new human experiences – Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V:

Visualization and Applications of Social Networks: Graph theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node-Link Diagrams – Hybrid representations – Modeling and aggregating social network data -Applications – Cover networks – Community welfare – Collaboration networks – Co-Citation networks.

Text Books:

1. Jeffrey C Johnson, Martin G Everett, Stephen P Borgatti, "Analyzing Social Networks", sage publication, 2013.
2. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking" Techniques and applications, First Edition, Springer, 2011.

Reference Books:

1. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
2. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access:Techniques for Improved user Modelling", IGI Global Snippet, 2009.
3. John Scott, "Social Network Analysis", Third Edition, SAGE Publications Ltd, 2013.
4. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer, 2007.
5. Maksim Tsvetovat, Alexander Kouznetsov, "Social Network Analysis for Startups", First Edition, O'Reilly Media, 2011.

	L	T	P	C
SEMESTER-VII (ELECTIVE-III)	**3**	**0**	**0**	**3**
19CS7E10-DATA ENGINEERING				

Course Outcomes:

Student able to state and analyze:

1. Preprocessing techniques for various datasets,
2. Standard database systems concepts like tables, relations, query, NoSQL
3. Information retrieval techniques such as **Relevance Ranking, Indexing etc**
4. Data processing algorithms and data structures
5. Visualization techniques like Table, graph, histogram, pie-chart

UNIT- I:

Data Engineering: introduction, importance of data engineering, Data engineering vs data science
Data Collection: Various sources of data, types of data: text, video, audio, biology etc.
Data Preprocessing: data Cleaning: missing values, noise elimination, data integration, data transformation: Normalization, Data Reduction: data cube aggregation, dimensionality reduction.

UNIT-II

Data bases: Database Schema, ER diagram, introduction to SQL, functions and stored procedures, indexing: B+tree index files, data base system architecture: Client-Server Architecture, introduction to MongoDB,
NoSQL: The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL

UNIT-III

Information Retrieval: Relevance Ranking Using Terms, Relevance Using Hyperlinks, Synonyms, Homonyms, and Ontologies, Indexing of Documents, Measuring Retrieval Effectiveness**,** Crawling and Indexing the Web, Information Retrieval: Beyond Ranking
of Pages, Directories and Categories

UNIT-IV

Data Analysis: correlation analysis: bivariate correlation, partial correlation, correlation coefficients. Regression: simple linear regression, multiple linear regression, principal component analysis, analysis of variance

UNIT- V

Data Visualization: Table, graph, histogram, pie-chart, area-plot, box-plot, scatter-plot, bubble-plot, waffle charts, word clouds.

Text Books:

1. Data mining concepts and techniques Jiawei Han and Micheline Kamber (UNIT-I)

2. Silberschatz, Korth, Sudarshan, "Database System Concepts" McGraw Hill Education, Sixth edition, 2010, ISBN-13: 978-9332901384 (UNIT-II, UNIT-III)

3. "NoSQL distilled" A Brief Guide to the Emerging World of Polyglot Persistence Pramod J. Sadalage Martin Fowler, Addison Wesley (UNIT-II)

4. correlation and regression analysis by Dr. Mohamed Ahmed Zaid (UNIT-IV)

Reference Books:

1. Brian Shive, "Data Engineering: A Novel Approach to Data Design", Technics Publications, 2013. ISBN-13: 978-1935504603.

2. Joel Grus, "Python Data Science Handbook: Essential Tools for Working with Data", 1st Edition, O'Reilly, 2016. ISBN-13: 978-9352134915.

   Web links:

   https://chartio.com/learn/charts/essential-chart-types-for-data-visualization/(UNIT-V)

SEMESTER-VII	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**
FULL STACK WEB DEVELOPMENT LAB				

Course Outcomes:

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

1. To design static web pages for online book store using HTML.

2. To create web pages using Cascading Styles sheets (internal or inline or external) and HTML.

3. To develop web pages using AngularJS directives and filters.

4. To build applications using PHP to manipulate data in MySql database.

5. To manipulate the data of MongoDB.

List of Experiments:

1. Home Page:

The static home page must contain three *frames*.

Top frame: Logo and the college name and links to Home page, Login page, Registration page, Catalogue page and Cart page (the description of these pages will be given below).

Left frame: At least four links for navigation, which will display the catalogue of respective links.

For e.g.: When you click the link *"B.Tech"* the catalogue for B.Tech Books should be displayed in the Right frame.

Right frame: The pages to the links in the left frame must be loaded here. Initially this page contains description of the web site.

Logo	Web site Name			
Home	Login	Registration	Catalogue	Cart
B.Tech M.Tech MCA MBA	Description of Website			
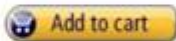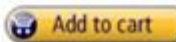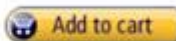
1. Login Page:

Logo	Web site Name			
Home	Login	Registration	Catalogue	Cart
B.Tech M.Tech MCA MBA	Login: Password:	Username ******** Submit Reset		

2. Catalogue Page:

The catalogue page should contain the details of all the books available in the web site in a table. The details should contain the following:

1. Snap shot of Cover Page.
2. Author Name.
3. Publisher.
4. Price.
5. Add to cart button.

3. Registration Page:

Create a "*registration form* "with the following fields

- Name (Text field)

- Password (password field)

- E-mail id (text field)
- Phone number (text field)

- Sex (radio button)
- Date of birth (3 select boxes)
- Languages known (check boxes – English, Telugu, Hindi, Tamil)
- Address (text area)

4. Design a web page using CSS (Cascading **S**tyle **S**heets**)** which includes the following:

1) Use different font, styles:

In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles

5. *Write a JavaScript that calculates the squares and cubes of the numbers from 0 to 10 and outputs HTML text that displays the resulting values in an HTML table format.*

6. Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays "TEXT-SHRINKING" in BLUE color. Then the font size decreases to 5pt.

7. Write a simple Hello program using AngularJS library.

8. Write a program that the AngularJS application consists of following three importantparts:

      1. ng-app
      2. ng-model
      3. ng-bind

9. Write a program that includes AngularJS directives?

10. Write a program by using filters to convert the following

      4. uppercase
      5. lowercase
      6. currency
      7. orderBy
      8. filter
      9. date

11. Example PHP program for contact-us page.

12. **User Authentication:**

Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a PHP for doing the following.

- Create a Cookie and add these four user ids and passwords to this Cookie.

- Read the user id and passwords entered in the login form and authenticate with the values (user id and passwords) available in the cookies.

  If he is a valid user (i.e., user-name and password match) you should welcome him by name (user-name) else you should display "You are not an authenticated user ".

  Use init-parameters to do this.

13. Example PHP program for registering users of a website and login.

14. Install a database (Mysql or Oracle).

- Create a table which should contain at least the following fields: name, password, email-id, phone number (these should hold the data from the registration form).

- Write a PHP program to connect to that database and extract data from the tables and display them. Experiment with various SQL queries.

- Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration page.

15. Write a PHP which does the following job:

Insert the details of the 3 or 4 users who register with the web site by using registration form. Authenticate the user when he submits the login form using the user name and password from the database (instead of cookies).

16. Design and Implement any 5 query using MongoDB.

17. Implement aggregation and indexing with suitable example using MongoDB.

18. Create simple objects and array objects using JSON

19. Encode and Decode JSON Objects using Java/Perl/PHP/Python/Ruby

	L	T	P	C
SEMESTER-VII	**0**	**0**	**3**	**1.5**
MACHINE LEARNING AND DEEP LEARNING LAB				

COURSE OUTCOMES:

After the completion of the course the student can able to:

1. Understand complexity of Machine Learning algorithms and their limitations;
2. Identify Machine Learning algorithms to solve real world problems.
3. Apply Statistical approaches for multiple Learning techniques.
4. Implement models for Clustering techniques
5. Construct models for Classification

List of Programs:

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

4. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.

6. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Calculate the accuracy, precision, and recall for your data set.

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

8. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering.

9. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

11. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions

12. Analysis of Company's ideal Customers using Kaggle data sets

	L	T	P	C
SEMESTER-VIII (ELECTIVE-IV)	**3**	**0**	**0**	**3**
19CS8E11 -- CLOUD COMPUTING				

Course Outcomes:

1. Understand the concepts, characteristics, delivery models and benefits of cloud computing

2. Understand the key security and compliance challenges of cloud computing

3. Understand the key technical and organisational challenges

4. Understand the different characteristics of public, private and hybrid cloud deployment models.

UNIT – I:

Systems Modeling, Clustering and virtualization: Distributed system Models and Enabling Technologies, Computer Clusters for scalable parallel computing, Virtual Machines and Virtualization of clusters and data centers

UNIT- II:

Foundations: Introduction to cloud computing, Migrating into a Cloud, Enriching the 'Integration as a Service' Paradigm for the cloud era, The Enterprise Cloud computing paradigm

UNIT - III:

Infrastructure as a service: Virtual machines provisioning and Migrations services, On the Management of Virtual machines for Cloud Infrastructures, Enhancing cloud computing environments using a cluster as a service, secure distributed data storage in cloud computing Platform as a service: Aneka, Comet cloud, T-systems Work flow engine for cloud, Understanding scientific Applications for cloud Environments

UNIT - IV:

Monitoring and Management: An Architecture Federated cloud commuting, SLA Management in cloud computing, Performance Prediction for HPC on Clouds, Best Practices in Architecting cloud applications in the AWS cloud, Building content delivery networks using clouds, Resource cloud Mashups

UNIT- V:

Governance and case studies: Organizational Readiness and change Management in the cloud age, Data security in the cloud, Legal Issues in cloud computing, Achieving production readiness for cloud services.

Text Books

1. Rajkumar Buyya, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
2. Kai Hwang, Geoffrey C. Fox, Jack J. Donnagarra, "Distributed and cloud computing", Elsevier,2012

Reference Books:

1. Michael Miller "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online", Que Publishing, 2008.
2. Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, "Cloud Computing for Dummies", 1st edition, Wiley publishing inc, For Dummies, 2009
3. George Reese," Cloud Application Architecture", 1st edition, O'Reilly Media Inc, 2009.
4. Haley Beard, "Cloud computing best practices", Second edition, Emereo Pty Ltd; 2009.

	L	T	P	C
SEMESTER-VIII (ELECTIVE-IV)	3	-	-	3
19CS8E12 - AUGMENTED REALITY AND VIRTUAL REALITY				

COURSE OUTCOMES:

At the end of the course student are able to

1. Adopt various principles and concepts of Virtual Reality and its Application.

2. Apply appropriate method of Geometric Modelling

3. Analyse various VR Hardware and Software

4. Describe the concepts of Augmented Reality.

5. Define Augmented Reality Contents and its Applications

UNIT – I

Virtual Reality & Virtual Environment: Introduction – Computer graphics – Real time computer graphics –Flight Simulation – Virtual environments –requirement – Benefits of Virtual Reality - Historical development of VR : 3D Computer Graphics - Human Factors – Vision - Vision and Display Technology – Hearing – Tactile - Equilibrium.

UNIT – II

Geometric Modeling : Introduction – From 2D to 3D – 3D space curves – 3D boundary representation – Other modeling strategies – Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances – Picking – Flying – Scaling the VE – Collision detection – A Generic VR system : Introduction – The virtual environment – The Computer environment – VR Technology – Model of interaction – VR System.

UNIT – III

VR Hardware, Software and Applications: Introduction-Computers-Tracking-Input Devices-Output Devices-Glasses-Displays-Audio-VR-Software Features-Web-based VR-Division's dVISE, Blueberry 3D-Boston Dynamics-Multigen-Introduction-Industrial-Training Simulators-Entertainment-VR Centres.

UNIT – IV

Introduction to Augmented Reality: Definition and Scope-A Brief History of AR-Examples-Related Fields- Augmented Reality Concepts-How does AR Work-Concepts

Related AR-Ingredients of an AR-AR Hardware and Software-Major Hardware Components for AR Systems- Major Software Components for AR Systems.

UNIT – V

AR Content-Introduction-What is Content-Creating Visual Content-Creating Audio Content-Creating Content for Other Senses-Representation and Perceptual Issues-**AR Interaction**-Introduction-What is Interaction-Mobile AR-**AR Applications**-Introduction-Application Areas-Collaborative AR-Applying AR to a Problem-Evaluating AR Applications-Example AR Applications-The Future of Augmented Reality.

Text Books:

1. John Vince, "Virtual Reality Systems", Pearson Education Asia, 2016.

2. John Vince, "Introduction to Virtual Reality", Springer London, 2016.

3. Dieter Schmalsteig, Tobias Hollerer, "Augmented Reality, Principles and Practice", Pearson Education, 2016.

4. Alan B. Craig, "Understanding Augmented Reality Concepts and Applications", Elsevier - Morgan Kaufmann Publications, 2013.

Reference Books:

1. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.

2. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley-Interscience, First Edition,1994

3. Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009.

e-Resources:

1. https://nptel.ac.in/courses/106105195/13

2. https://www.mooc-list.com/course/making-your-first-virtual-reality-game-coursera

	L	T	P	C
SEMESTER-VIII (ELECTIVE-IV)	**3**	**-**	**-**	**3**
19CS8E13 - BLOCK CHAIN TECHNOLOGY				

Course Objectives:

1. To understand the mechanism of Blockchain and Cryptocurrency.

2. To understand the functionality of current implementation of blockchain technology.

3. To understand the required cryptographic background.

4. To explore the applications of Blockchain to cryptocurrencies and understanding limitations of current Blockchain.

5. An exposure towards recent research.

Course Outcome:

1. To Understand and apply the fundamentals of Cryptography in Cryptocurrency

2. To gain knowledge about various operations associated with the life cycle ofBlockchain and Cryptocurrency

3. To deal with the methods for verification and validation of Bitcoin transactions

4. To demonstrate the general ecosystem of severalCryptocurrency

5. To educate the principles, practices and policies associated Bitcoin business

UNIT - I:

Introduction to Cryptography and Cryptocurrencies: Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency.

UNIT - II:

How Blockchain Achieves and How to Store and Use: Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus with- out identity using a blockchain, Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

UNIT - III:

Mechanics of Bitcoin: Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bit- coin network, Limitations and improvements.

Bitcoin Mining: The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies

UNIT - IV:

Bitcoin and Anonymity: Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash.

UNIT - V:

Community, Politics, and Regulation: Consensus in Bitcoin, Bitcoin Core Software, Stakeholders: Who"s in Charge, Roots of Bitcoin, Governments Notice on Bitcoin, Anti Money Laundering Regulation, New York"s Bit License Proposal. Bitcoin as a Platform: Bitcoin as an Append only Log, Bitcoins as Smart Property, Secure Multi Party Lotteries in Bitcoin, Bitcoin as Public Randomness, Source-Prediction Markets, and Real World Data Feeds.

Text Book:

1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S, "Bitcoin and cryptocurrency technologies: a comprehensive introduction", Princeton University Press. 2016

Reference Books:

1. Antonopoulos, A. M, "Mastering Bitcoin: unlocking digital cryptocurrencies", OReilly Media, Inc., 2014.
2. Franco, P, "Understanding Bitcoin: Cryptography, engineering and economics", John Wiley and Sons, 2014

	L	**T**	**P**	**C**
SEMESTER-VIII (ELECTIVE-IV)	**3**	**0**	**0**	**3**
19CS8E14-ADVANCED DATA STRUCTURES				

COURSE OUTCOMES:

At the end of the course student are able to

1. Illustrate several sub-quadratic sorting algorithms.

2. Demonstrate various Hashing methods.

3. Apply advanced data structures such as priority queues,Heaps.

4. Demonstrate an understanding of various search trees.

6. Describe and implement a variety of advanced data structures and its Applications

UNIT – I:

Introduction: Data Structure – Design of Data Structure- Analysis of Data Structure – Amortized Complexity-Computational Models – Bounds of Fundamental Data Structures .The String Abstract Data Type- Introduction- Pattern Matching. Sorting - External Sorting, Introduction, K-way Merging, Buffer Handling for parallel Operation, Run Generation-Searching.

UNIT – II:

Hashing: Basic Hashing- Perfect Hashing –Universal Hashing. Static Hashing, Hash Table, Hash Functions, Secure Hash Function, Overflow Handling, Theoretical Evaluation of Overflow Techniques, Dynamic Hashing- Motivation for Dynamic Hashing, Dynamic Hashing Using Directories, Directory less Dynamic Hashing, Alternate hash functions (mid-square, folding, digit analysis).

UNIT – III:

Priority Queues and Advance Heaps: Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut.

UNIT – IV:

ADVANCED SEARCH TREES I

Advanced and Efficient Binary Search Trees: Optimal Binary Search Trees, AVL Trees- rotations, insertion, deletion operations, Red-Black Trees, Definition, Representation of a Red-Black Tree, Searching a Red-Black Tree, Inserting into a Red Black Tree, Deletion from a Red-Black Tree, Joining Red-Black Trees, Splitting a Red-Black tree. Multi-way Search Trees: M-Way Search Trees, Definition and Properties, Searching an M-Way Search Tree.

UNIT – V

ADVANCED SEARCH TREES II AND APPLICATIONS

Digital Search Structures: Digital Search Trees: Definition, Search, Insert and Delete ,B and B+ Tree - Searching - Insertion - Removal - Amortized analysis of B trees - B+ tree. Tries- Insertion- Searching- Deletion- Complexity- Compact trie- Patricia- Suffix tree.Applications-Block Chains, Digital Signature, Data Science, Cloud and IOT, Databases - Database Problems -   B trees in databases and file systems.

Text Books:

1. Horowitz , Sahani, Anderson-freed, "Fundamentals of Data Structures in C", 2nd edition, Universities Press,2008.

2. Richard F Gilberg, Behrouz A Forouzan, "Data Structures a Pseudo code Approach with C", 2nd edition Cengage, 2005.

3. Suman Saha, Shailendra Shukla, "Advanced Data Structures: Theory and Applications", CRC Press, Taylor & Francis, 2020.

Reference Books:

1. Mark Allen Weiss, Pearson, "Data structures and Algorithm Analysis in C", 2nd edition, Tata McGraw Hill, 2000.

2. T. Cormen, R.Rivest, C. Stein, C. Leiserson," Introduction to Algorithms", Second Edition, PHI publication, 2004.

e-Resources:

1. http://lcm.csa.iisc.ernet.in/dsa/dsa.html
2. http://utubersity.com/?page_id=878
3. http://freevideolectures.com/Course/2519/C-Programming-and-Data-Structures
4. http://freevideolectures.com/Course/2279/Data-Structures-And-Algorithms
5. https://nptel.ac.in/courses/106/102/106102064

	L	T	P	C
SEMESTER-VIII (ELECTIVE-IV)	**3**	**0**	**0**	**3**
19CS8E18-COMPUTER VISION				

COURSE OUTCOMES

On completion of the course the student will be able to

1. Implement fundamental image processing techniques required for computer vision
2. Understand Image formation process
    1. Extract features form images and do analysis of images
2. Generate 3D model from images
3. Understand video processing, motion computation and 3D vision and geometry
4. Develop applications using computer vision techniques

UNIT I:

Introduction: Image Processing, Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High- level , Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality

UNIT II:

Image Formation Models: Monocular imaging system , Radiosity: The 'Physics' of Image Formation, Radiance, Irradiance, BRDF, color etc, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading , Photometric Stereo, Depth from Defocus , Construction of 3D model from images

UNIT III:

Image Processing and Motion Estimation: Image preprocessing, Image representations (continuous and discrete), Edge detection. Regularization theory, Optical computation, Stereo Vision, Motion estimation, Structure from motion.

UNIT IV:

Shape Representation And Segmentation: Contour based representation, Region based representation, Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, and Multiresolution analysis.

UNIT V:

Object Recognition and Image Understanding: Hough transforms and other simple object recognition methods, Shape correspondence and shape matching, Principal Component Analysis, Shape priors for recognition, Pattern recognition methods, HMM, GMM and EM, Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books:

1. David A. Forsyth, Jean Ponce. "Computer Vision: A Modern Approach", 2nd Edition Pearson Education Limited, 2015.
2. E. Trucco and A. Verri, "Introductory Techniques for 3D Computer Vision", Prentice Hall, 1998.

Reference Books:

1. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", 3rd Edition, Academic Press, 2012.
2. E. R. Davies, "Computer & Machine Vision", 4th Edition, Academic Press, 2012.
3. Richard Szeliski, "Computer Vision: Algorithms and Applications (CVAA)", Springer, 2010.
4. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.

	L	T	P	C
SEMESTER-VIII (ELECTIVE-V)	3	0	0	3
19CS8E15-DISTRIBUTED AND HIGH PERFORMANCE COMPUTING				

COURSE OUTCOMES:

1. Define the concept of distributed systems and various distributed models.

2. Analyze inter-process communication mechanisms used in distributed systems.

3. Describe the knowledge on RPC and RMI.

4. Analyze the various metrics involved in achieving high performance with the available computational systems

5. Identify design issues related to architectural characteristics and performance of HPC systems

UNIT- I:

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

System Models: Introduction, Physical Models, Architectural Models and Fundamental Models

UNIT- II:

Inter Process Communication (IPC): Introduction, the API for the Internet Protocols, External Data Representation and Marshalling, ClientServer Communication, Group Communication, and Case Study: IPC in UNIX

UNIT- III:

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

UNIT- IV:

Principles of Scalable Performance and Processor Hierarchy: Performance Metrics and Measures, Parallel Processing Applications, Speedup Performance Laws, Scalability Analysis and Approaches, Advanced Processor and Memory Hierarchy Technology, Distributed Shared Memory

UNIT -V:

Requirement and general issues of High Performance Computing: Dependable clustered computing

Meta Computing: Harnessing Informal Supercomputers, Specifying Resources and Services in Meta computing Systems, High Speed Networks,Lightweight Messaging Systems,Xpress Transport Protocol,Load Balancing over Networks,Job and FResoource Management Systems

TEXT BOOKS:

1. George Coulouris, J Dollimore and Tim Kindberg, "Distributed Systems, Concepts and Design", Pearson Education, 4th Edition. 2009.

2. Kai Hwang, "Advance Computer Architecture : Parallelism, Scalability, Programmability" , MGGraw Hill International Edition,1993

3. Buyya, Rajkumar, "High Performance Cluster Computing: Programming and Applications", Pearson Education, 1999

REFERENCE BOOKS:

1. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems, Principles and Paradigms", 2nd Edition, PHI, 2007.

2. Sukumar Ghosh, "Distributed Systems, An Algorithm Approach", Chapman & Hall/CRC, Taylor & Fransis Group, 2007

2. Georger Hager and Gerhard Wellein, "Introduction to High Performance Computing for Scientists and Engineers", CRC Press, 2010

VIII Semester	L	T	P	C
	3	0	0	3
19ME8E25 ROBOTICS				

COURSE OBJECTIVE:

1. Understand classification of robots and basic components

2. Get ability to calculate Degree of Freedom and summarize various drives of the Robots.

3. Get acquainted with performing spatial transformations and solve kinematics of the robot.

4. Analysis skills associated with trajectory planning.

5. Understand the present &future applications of a robot.

COURSE OUTCOMES: Students will be able to

CO1: Summarize principles of Automation, Classification of industrial Robot   [K2]

CO2: Classify Robotic Arms, calculate Degree of Freedom and summarize various drives of the Robots.
[K2]

CO3: Apply various motion analysis principles to solve problems involving Manipulator Kinematics.
[K2]

CO4: Summarize different types of trajectories and apply their principles for trajectory planning and Robot Programming Methods.   [K2]

CO5: Summarize Industrial Applications of Robots in various fields.   [K2]

UNIT – I

INTRODUCTION: Automation and Robotics - CAD/CAM and Robotics - over view of Robotics - Robot Generations - Robot Anatomy - Classification of Robots.

UNIT – II

FUNDAMENTALS OF ROBOT TECHNOLOGY: Function line diagram representation of Robot Arms - Work Volume – Robot Drive Systems – Control Systems and Dynamic Performance – Precision of Movement – End Effectors – Robotic Sensors – Robot Actuators – Feedback Components.

UNIT – III

MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation, problems– Direction Cosine Representation, Euler Angles.

MANIPULATOR KINEMATICS: D-H Notations, joint coordinates and world coordinates, Forward and inverse kinematics, problems of simple robotic manipulators.

UNIT – IV

TRAJECTORY PLANNING: Path Planning, Skew motion, joint integrated motion, straight line motion.

ROBOT PROGRAMMING:Programming Methods – Motion Interpolation – WAIT, SIGNAL & DELAY Commands - Robot Languages.

UNIT – V
ROBOT APPLICATIONS IN MANUFACTURING: Material Transfer, Machine loading and un-loading Operations, Processing Operations - Assembly Operations – Inspection – Safety in Robotics – Training - Maintenance.

TEXT BOOKS:

1.Industrial Robotics -Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey/TATA McGraw-Hill Education 1986

2. Robotics and Control - R.K. Mittal, I. J. Nagrath / Tata Mc Graw Hill Publishing Company Ltd 2003

3. Introduction to Robotics / John J. Craig/ Pearson 2019

REFERENCES:

1. Robotics, control Sensing, vision and intelligence - K.S. Fu, R.C.Gonzalez, C.S.G Lee / Tata Mc Graw Hill Education. 1987

2. Introduction to Robotics – Analysis, Systems, Applications – Saeed B. Niku / Pearson Education 2011

3. Robot Analysis – Mechanics of Serial and Parallel Manipulators - Lung-Wen Tsai, John-Wiley Publications, New York.1999

Web resources:

1.http://nptel.ac.in/downloads/112101098/

	L	T	P	C
SEMESTER-VIII (ELECTIVE-V)	**3**	**-**	**-**	**3**
19CS8E16 - CRYPTOGRAPHY AND NETWORK SECURITY				

Course Outcomes:

By the end of the course the student

1. Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts of finite fields and number theory

2. Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication

3. Apply the knowledge of cryptographic checksums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.

4. Apply different digital signature algorithms to achieve authentication and create secure applications

5. Apply network security basics, analyse different attacks on networks and evaluate the performance of firewalls and security protocols like SSL, IPSec, and PGP

6. Apply the knowledge of cryptographic utilities and authentication mechanisms to design secure applications

UNIT - I:

The OSI security architecture - Security Attacks, Services and Mechanisms - Classical Encryption Techniques - Symmetric Cipher Model, Substitution Techniques –caesar cipher , monoalphabetic ciphers , playfair cipher, hill chipher ,polyalphabetic ciphers, one-time pad-Transposition Techniques-Steganography-Block Ciphers Principles- Stream cipher and block cipher

UNIT – II:

Symmetric Key Cryptography: Data Encryption Standard (DES), Advanced Encryption Standard (AES), Block Cipher Modes of Operations. Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms.

UNIT - III:

Public Key Cryptography: Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography. Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements & Security, Secure Hash Algorithm, Message Authentication Functions, Requirements & Security, HMAC, Digital Signatures: NIST Digital Signature Algorithm

UNIT – IV:

User Authentication- Remote User Authentication Principles, Kerberos. Electronic Mail Security: Pretty Good Privacy (PGP) and S/MIME. IP Security- IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT – V:

Transport Level Security- Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS)- Malicious software –viruses, viruses countermeasures, worms- Firewalls- Characteristics, Types of Firewalls.

Text Books:

1. William Stallings, "Cryptography and Network Security", Pearson Education, 7th Edition, 2017.
2. Bernard Menezes, "Cryptography, Network Security and Cyber Laws" Cengage Learning, 2010.

Reference Books:

1. Behrouz A Forouzan, Debdeep Mukhopadhyaya,"Cryptography and Network Security" Mc-GrawHill, 3rd Edition, 2015.
2. Jason Albanese and Wes Sonnenreich, "Network Security Illustrated", MGH Publishers, 2003.

e-Resources:

1. Dr. Sourav Mukhopadhyay https://nptel.ac.in/courses/106/105/106105162, IIT Kharagpur [Video Lecture]
2. https://www.mitel.com/articles/web-communication-cryptography-and-network-security
   web articles Mitel Power Connections

	L	**T**	**P**	**C**
SEMESTER-VIII (ELECTIVE-V)	**3**	**0**	**0**	**3**
19CS8E17 - MULTICORE ARCHITECTURE				

COURSE OUTCOMES:

At the end of the course student are able to

1. Describe multicore architectures and identify their characteristics.

2. Discuss Multicore Processors

3. Identify the issues in programming Parallel Processors.

4. Describe the concepts of Memory Hierarichy of Multicore Processors.

5. Critically analyze the different types of inter connection networks

UNIT – I:

INTRODUCTION TO MULTI-CORE ARCHITECTURE

The Origin of the Multicore Architecture - Perspectives on Parallel Computers- Future Multicore Architectures - Motivation for Concurrency in software - Parallel Computing Platforms - Parallel Computing in Microprocessors - Differentiating Multi-core Architectures from Hyper - Threading Technology -Multi-threading on Single-Core versus Multi-Core Platforms - Understanding Performance - Amdahl's Law-Growing Returns: Gustafson's Law.

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UNIT – II:

MULTI-CORE PROCESSORS

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks -Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance Issues – Parallel program design.

UNIT – III:

FUNDAMENTAL CONCEPTS OF PARALLEL PROGRAMMING

Parallel Programming Models- Steps in Parallel Programming - Dependence Analysis - Identifying Parallel Tasks in Loop Structures- Identifying Parallelism at Other Levels- Identifying Parallelism through Algorithm Knowledge- Determining the Scope of Variables- Synchronization- Assigning Tasks to Threads-Mapping Threads to Processors- A Brief Introduction to OpenMP.

UNIT – IV:

MULTICORE MEMORY HIERARCHY ORGANIZATION

Motivation for Memory Hierarchy- Basic Architectures of a Cache- Cache Performance- Prefetching- Cache Design in Multicore Architecture- Physical Cache Organization- Logical Cache Organization- Case Studies- Shared Memory Multiprocessors.

UNIT – V:

INTERCONNECTION AND EXAMPLE ARCHITECTURES

Interconnection Network Architecture- SIMT Architecture- The SPARC Processor Architecture.

TEXT BOOKS:

1. Yan Solihin, "Fundamentals of Parallel Multicore Architecture", Chapman and Hall/CRC Press, Taylor and Francis, 2015.
2. Peter S. Pacheco, "An Introduction to Parallel Programming", Morgan-Kauffman/Elsevier, 2011.
3. Shameem Akthar, Jason Roberts, "Multicore Programming- Increased Performance through Software Multi-threading", Intel Press, Intel Corporation, 2016.
4. Sanguthevar Rajasekaran, Lance Fiondella, Mohamed Ahmed, Reda A. Ammar, "Multicore Computing Algorithms, Architectures and Applications", Chapman and Hall/CRC Press, Taylor and Francis, 2014.

REFERENCE BOOKS:

1. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier, 5th edition, 2012.
2. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill Education, 2003
3. Richard Y. Kain, "Advanced Computer Architecture a Systems Design Approach", Prentice Hall, 2011.
4. David E. Culler, Jaswinder Pal Singh, "Parallel Computing Architecture : A Hardware/ Software Approach" , Morgan Kaufmann / Elsevier, 1997
5. Yan Solihin, "Fundamentals of Parallel Computer Architecture Multichip and Multicore Systems", Solihin Publishing & Consulting LLC, 2009.
6. https://nptel.ac.in/courses/ 106/103/106103183/

OPEN ELECTIVE	L	T	P	C
	3	-	-	3
19EEXO01 :: ELECTRICAL SAFETY MANAGEMENT				

COURSE OUTCOMES:

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

CO1 : Explain the Electrical Safety precautions and Prevention. (K2)

CO2 : Illustrate Safety aspects during Installation of Plant and Equipment. (K2)

CO3 : Estimate the electrical safety in residential, commercial and agricultural installations.(K5)

CO4 : Categorize various Electrical Safety in Hazardous Areas (K4)

CO5 : List the electrical systems safety management and IE rules.(K1)

SYLLABUS

UNIT-I : ELECTRICAL SAFETY, SHOCKS AND THEIR PREVENTION

Terms and definitions, objectives of safety and security measures, Hazards associated with electric current, and voltage, who is exposed, principles of electrical safety, Approaches to prevent Accidents, scope of subject electrical safety.

Primary and secondary electrical shocks, possibilities of getting electrical shock and its severity, medical analysis of electric shocks and its effects, shocks due to flash/ Spark over's, prevention of shocks, safety precautions against contact shocks, flash shocks, burns, residential buildings and shops.

UNIT-II : SAFETY DURING INSTALLATION OF PLANT AND EQUIPMENT

Introduction, preliminary preparations, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switch yard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT-III : ELECTRICAL SAFETY IN RESIDENTIAL, COMMERCIAL AND AGRICULTURAL INSTALLATIONS

Wiring and fitting – Domestic appliances – water tap giving shock – shock from wet wall – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT-IV : ELECTRICAL SAFETY IN HAZARDOUS AREAS

Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations – Classification of equipment enclosure for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

EQUIPMENT EARTHING AND SYSTEM NEUTRAL EARTHING: Introduction, Distinction between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, description of a earthing system, , neutral grounding(System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

: SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS

UNIT-V

Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees.

REVIEW OF IE RULES AND ACTS AND THEIR SIGNIFICANCE: Objective and scope – ground clearances and section clearances – standards on electrical safety - safe limits of current, voltage –Rules regarding first aid and fire fighting facility. The Electricity Act, 2003, (Part1, 2, 3,4 & 5)

TEXT BOOKS:

1. S. Rao, Prof. H.L. Saluja, "Electrical safety, fire safety Engineering and safety management", Khanna Publishers. New Delhi, 1988.(units-I to V)
2. www.apeasternpower.com/downloads/elecact2003.pdf (Part of unit-V)

REFERENCE BOOKS:

1. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997.
2. The Electricity Act, 2003 MINISTRY OF LAW AND JUSTICE (Legislative Department) New Delhi, the 2nd June, 2003.Jyaistha 12, 1925 (Saka)

OPEN ELECTIVE	L	T	P	C
	3	-	-	3
19EEXO02 :: NON CONVENTIONAL ENERGY SOURCES				

COURSE OUTCOMES:

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

- CO1 : Show the need of energy conversion and the analysis of solar radiation. (K1)
- CO2 : Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface and solar thermal systems. (K4)
- CO3 : Identify the methods and analysis of Wind energy generation and its maximum power point techniques. (K3)
- CO4 : Explain basic principle and working of hydro and tidal energy systems. (K2)
- CO5 : Explain the Biomass, Fuel cells and Geothermal energy, its mechanism of production and its applications (K2)

SYLLABUS

UNIT-I : FUNDAMENTALS OF ENERGY SYSTEMS:

Energy conservation principle – Energy scenario (world and India) – Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

UNIT-II : SOLAR THERMAL SYSTEMS

Liquid flat plate collections: Performance analysis –Introduction to solar air heaters – Concentrating collectors and solar pond– Numerical problems.

Solar Photovoltaic Systems : Solar Photovoltaic cell, Module,Array – Construction– Efficiency of solar cells – Developing technologies – Cell I-V characteristics – Applications and systems – Maximum power point tracking.

UNIT-III : WIND ENERGY

Sources of wind energy – Wind patterns – Types of turbines – Horizontal axis and vertical axis machines – Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking.

UNIT-IV : HYDRO AND TIDAL POWER SYSTEMS

Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Numerical problems – Wave power – Basics – Kinetic energy equation.

UNIT-V : BIOMASS, FUEL CELLS AND GEOTHERMAL SYSTEMS

Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing. Fuel cell: Classification of fuel for fuel cell – Fuel cell voltage – Efficiency – VI characteristics. Geothermal: Classification – Dry rock and hot acquifer – Energy analysis.

TEXT BOOKS:

1. Renewable Energy Resoures, John Twidell and Tony Weir, Taylor and Francis -second edition, 2013
2. Non-conventional sources of Energy by G.D.Rai, Kanna Publications.
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa.

REFERENCE BOOKS:

1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford University Press, 2017**.**
2. Renewable Energy- Edited by Godfrey Boyle-oxford university, press, 3rd edition, 2013.
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore
4. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
5. Non-conventional energy source –B.H. Khan- TMH-2nd edition
6. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition

OPEN ELECTIVE	L	T	P	C
	3	-	-	3

19EEXO03::ELECTRICAL VEHICLE

COURSE OUTCOMES:

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

CO1 : Explain the basics of electric vehicles fundamentals.(K2)
CO2 : Discuss different energy storage concepts used for electric vehicles.(K6)
CO3 : Explain about fundamental of electrical Machines .(K2)
CO4 : Analyze various drive trains suitable for electric vehicles .(K4)
CO5 : Explain about different types of EV Systems.(K2)

SYLLABUS
UNIT-I : INTRODUCTION TO ELECTRIC VEHICLES

Components of an EV ,EV History, EV Advantages ,EV mechanics , Roadway Fundamentals , Laws of Motion , Vehicle Kinetics , Dynamics of Vehicle Motion , Propulsion Power, Velocity and Acceleration, Propulsion System Design

UNIT-II : BATTERY

Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Lead-Acid Battery, Alternative Batteries, Battery Parameters, Technical Characteristics, Targets and Properties of Batteries , Battery Modeling

UNIT-III : DC & AC ELECTRICAL MACHINES

Motor and Engine rating, Requirements, Fundamental concepts of DC machines- Three phase A/c machines- Induction machines- permanent magnet machines-switched reluctance machines

UNIT-IV : ELECTRIC VEHICLE DRIVE TRAIN

EV Transmission Configurations , Transmission Components, Ideal Gearbox, EV Motor Sizing

UNIT-V : HYBRID ELECTRIC VEHICLES

Types of Hybrids, Internal Combustion Engines , Design of an HEV ,Drive train, sizing of components.

TEXT BOOKS:

1 Iqbal Hussein, "Electric and Hybrid Vehicles: Design Fundamentals", CRC Press, 2003.

REFERENCE BOOKS:

1 James Larminie and John Lowry,"Electric Vehicle Technology Explained", Wiley, 2003.

2 Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay and Ali Emadi, ""Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.

3 Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design", CRC Press, 2004.

4 Introduction to hybrid and electric vehicles: Dr Praveen Kumar & Dr S Majhi, IIT Guwahati , https://nptel.ac.in/courses/108/103/108103009/ .

OPEN ELECTIVE	L	T	P	C
	3	-	-	3
19EEXO04:: ELECTRICAL ENERGY CONSERVATION AND AUDITING				

COURSE OUTCOMES:

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

CO1 : Explain energy efficiency, conservation and various technologies [K2]
CO2 : Identify the concepts of energy management and energy audit [K3]
CO3 : Explain energy conservation in HVAC systems.[K2]
CO4 : Analyze the concepts of different energy efficient devices [K4]
CO5 : Estimate life cycle costing analysis and energy efficient Technologies [K5]

SYLLABUS

UNIT-I : BASICS OF ENERGY AND ITS VARIOUS FORMS

Energy consumption –choice of fuels. Energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity and humidity & heat transfer, units and conversion.

UNIT-II : ENERGY MANAGEMENT & AUDIT

Energy conservation schemes: Short term - Medium term - Long term energy conservation schemes – Industrial energy use - Energy index – Cost index. Representation of energy consumption: Pie charts - Sankey diagrams – Load Profile.
Energy auditing: General Auditing, Detailed Energy Audit. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

UNIT-III : ENERGY EFFICIENCY IN INDUSTRIAL & ELECTRICAL SYSTEMS

Heat – Heat content – Rate of heat transfer – Heat transfer coefficient - Conduction – Convention and radiation. Thermal insulation & its importance - space heating – HVAC system – Heating of Buildings. Energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

UNIT-IV : ENERGY EFFICIENT INSTRUMENTS

Digital Energy Meter – Data loggers – Thermo couples – Pyranometer – Lux meters – Tong testers – Power analyzers – Power factor – effects with non-linear loads – effect of harmonics on power factor – Power Factor Improvement – Capacitor rating - Effects of power factor improvements - Electric lighting – Types of lighting – Luminaries – Energy efficient lighting.

UNIT-V : ECONOMICAL ASPECTS & FINANCIAL ANALYSIS

Costing Techniques – cost factors – break-even charts – sources of capital and hire charges -capital recovery – depreciation – budgeting and standard costing – charging energy – cash flow
diagrams and activity charts. Financial appraisal and profitability : investment decision- methods of

investment appraisal discounted cash flow – summary of investment appraisal techniques – Cost optimization – optimization with one variable – optimization with more than one variable.

TEXT BOOKS:

1   Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications.
2   Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
3   Energy management hand book by W.C.Turner, John wiley and sons.
4   Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
5   Economic Analysis of Demand Side Programs and Projects - California Standard Practise Manual, June 2002 – Free download available online
6   Energy Efficiency And Management For Engineers, November 2020, TMH, by Mehmet Kanoglu , Yunus A. Cengel

REFERENCE BOOKS:

1   Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition,1998.
2   Energy management and conservation –k v Sharma and pvenkataseshaiah-I K International Publishing House pvt.ltd,2011
3   Fundamentals of Energy Engineering by Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey, 1984.
4   Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
5   Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)

OPEN ELECTIVE	L	T	P	C
	3	-	-	3
19CEXO01: DISASTER MANAGEMENT				

Course Outcomes:

Students are able to

1. identify the tools of integrating disaster management principles in disaster mitigation process.
2. discuss about different approaches needed to manage pre and post- disaster activities.
3. prepare the process of risk management and develop a basic understanding method for the role of public in risk management.
4. administer the role of technology in Disaster management.
5. conclude the planning strategies for education and community preparedness programmes.

UNIT-I : Natural Hazards and Disaster management:

Introduction of DM – Inter disciplinary nature of the subject- Disaster Management cycle- Five priorities for action. Case study methods of the following: floods, draughts -Earthquakes- global warming, cyclones & Tsunamis- Post Tsunami hazards along the Indian coast - landslides.

UNIT-II: **Man Made Disaster and their management along with case study methods of the following**:

Fire hazards - transport hazard dynamics -Solid waste management- post disaster – Bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

UNIT-III: **Risk and Vulnerability**:

Building codes and land use planning - social vulnerability - environmental vulnerability - Macroeconomic management and sustainable development, climate change risk rendition - financial management of disaster - related losses.

UNIT-IV: **Role of Technology in Disaster managements**:

Disaster management for infra structures, taxonomy of infrastructure - treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes -flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training transformable indigenous knowledge in disaster reduction.

UNIT-V: **Education and Community Preparedness**

Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience- building community capacity for action.

Textbooks:

1. Rajib shah & R. Krishnamurthy, 'Disaster Management - Global Challenges and Local Solutions' Universities press-2009.
2. Tushar Bhattacharya, 'Disaster Science & Management', Tata McGraw Hill Education Pvt. Ltd., New Delhi.-2012
3. Jagbir Singh , 'Disaster Management - Future Challenges and Opportunities' , I K International Publishing House Pvt. Ltd-2017

References:

1. H K Gupta , 'Disaster Management', Universities press-2003
2. Prof. R.B. Singh , "Disaster Management and Mitigation", World Focus 2016

OPEN ELECTIVE	L	T	P	C
	3	-	-	3
19CEXO02: ENVIRONMENTAL POLLUTION AND CONTROL				

Course Outcomes:
Students are able to
1. Identify the air pollutant causes and control devices
2. Differentiate the treatment techniques used for sewage and industrial wastewater treatment methods.
3. Understand the fundamentals of solid waste management, practices adopted in his town/village and its importance in keeping the health of the city.
4. know the causes for noise pollution and ISO14000 standards
5. Treatment and management of hazardous waste

SYLLUBUS
UNIT – I : Air Pollution
Air pollution causes-control methods–particulate control devices – methods of controlling Gaseous Emissions – Air quality standards.

UNIT –II: Industrial wastewater Management
Strategies for pollution control – Volume and Strength reduction – Neutralization – Equalization – Proportioning – Common Effluent Treatment Plants – Recirculation of industrial wastes – Effluent standards.

UNIT – III : Solid Waste Management
Solid waste characteristics–basics of on-site handling and collection–separation and processing – Incineration- Composting-Solid waste disposal methods – fundamentals of land filling.

UNIT – IV: Noise Pollution
Noise standards, Measurement and control methods – Reducing residential and industrial noise – ISO14000

UNIT – V: Hazardous Waste
Characterization – Nuclear waste – Biomedical wastes – Electronic wastes – Chemical wastes – Treatment and management of hazardous waste-Disposal and Control methods.

Text/References books:
1. Ruth F. Weiner and Robin Matthews , 'Environmental Engineering', 4th Edition Elesevier, 2003.
2. J.G. Henry and G.W. Heinke,'Environmental Science and Engineering'– Pearson Education,2002
3. Mackenzie L Davis & David A Cornwell, "Environmental Engineering ',McGraw Hill Publishing,2002.
4. K. Sasi Kumar, S.A. Gopi Krishna ,"Solid Waste Management",PHI New Delhi,2014
5. D. Srinivasan, "Environmental Engineering", PHI Learning Private Limited, New Delhi, 2011.
6. Howard S. Peavy, Donald R. Rowe, Teorge George Tchobanoglus,"Environmental Engineering", Mc-Graw-Hill Book Company, New Delhi, 1985.

OPEN ELECTIVE	L	T	P	C
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19CEXO03: SOLID WASTE MANAGEMENT				

Course Outcomes:

Students are able to

1. Understand classification of solid waste generated
2. know the collection systems of solid waste of a town
3. analyze the importance of transfer and transport of solid waste
4. apply the knowledge in processing of solid waste
5. design treatment of municipal solid waste and landfill

SYLLUBUS:

UNIT- I

Introduction to Solid Waste Management:

Goals and objectives of solid waste management, Classification of Solid Waste - Factors Influencing generation of solid waste - sampling and characterization – Future changes in waste composition, major legislation, monitoring responsibilities.

UNIT- II

Collection of Solid Waste:

Type and methods of waste collection systems, analysis of collection system - optimization of collection routes– alternative techniques for collection system.

UNIT- III

Transfer and Transport:

Need for transfer operation, compaction of solid waste - transport means and methods, transfer station types and design requirements.

UNIT- IV

Processing and Treatment:

Processing of solid waste – Waste transformation through combustion and composting, anaerobic methods for materials recovery and treatment – Energy recovery – biogas generation and cleaning– Incinerators.

UNIT- V

Disposal of Solid Waste:

Methods of Disposal, Landfills: Site selection, design and operation, drainage and leachate collection systems –designated waste landfill remediation.

Text/ Reference books:

1. George Techobanoglous, Frank Kreith ,Integrated Solid Waste Management- McGraw Hill Publication, 1993.
2. R.Saravanan, R.Dinesh Kumar, A.Suriya , Muncipal solid waste management , Lakshmi publications- 2015.
3. Vesilind, P.A., Worrell, W., Reinhart, D.,"Solid Waste Engineering", Cenage learning, New Delhi, 2004.
4. Charles A. Wentz, "Hazardous Waste Management",; McGraw Hill Publication, 1995.

OPEN ELECTIVE	L	T	P	C
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19CEXO04: BUILDING PLANNING AND DRAWING				

COURSE OUTCOMES

Students are able to

1. Understand the building bye-laws, plan various buildings as per the building by-laws.
2. Plan the individual rooms with reference to functional and furniture requirements.
3. prepare different sign conventions and bonds
4. Learn the skills of drawing building elements like doors and windows.
5. Develop the skills of Drawing Plans, Sections and Elevations of different buildings.

SYLLABUS:

UNIT-I

BUILDING BYELAWS AND REGULATIONS: Introduction - terminology - objectives of building Bye laws - floor area ratio - floor space index - principles under laying building bye laws - classification of buildings - open space requirements - built up area limitations- height of buildings- wall thickness - lightening and ventilation requirements.

UNIT -II

RESIDENTIAL AND PUBLIC BUILDINGS

Residential buildings: Minimum standards for various parts of buildings -requirements of different rooms and their grouping- characteristics of various types residential buildings.

Public buildings: Planning of educational institutions, hospitals, dispensaries, office buildings, banks, industrial buildings, hotels & motels, buildings for recreation.

UNIT-III

SIGN CONVENTIONS AND BONDS : Brick, stone, plaster, sand filling, concrete, glass, steel, cast iron, copper alloys, aluminum alloys etc., lead, zinc, tin etc., earth, rock, timber and marbles. English bond and Flemish bond- odd and even courses for one, one-half, two and two & half brick walls in thickness at the junction of a corner.

UNIT- IV

DOORS, WINDOWS, VENTILATORS AND ROOFS: Panelled door, panelled and glassed door, glassed windows, paneled windows, swing ventilators, fixed ventilators, coupled roof, collar roofs. King Post truss, Queen Post truss Sloped and flat roof buildings: drawing plans, Elevations and Cross Sections of given sloped roof buildings.

UNIT-V

PLANNING AND DESIGNING OF BUILDINGS: Draw the Plan, Elevation and sections of a Residential & Public buildings from the given line diagram.

Text /Reference Books:

1. Y.S. Sane., Planning and Design of buildings, 2010.
2. Gurucharan Singh and Jagadish Singh , Planning, designing and scheduling, 2015.
3. M. Chakravarthi., Building planning and drawing, 2015.
4. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.
5. Shah and Kale , Building drawing, 2013.

OPEN ELECTIVE	L	T	P	C
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19MEXO01: 3D PRINTING				

COURSE OBJECTIVES:
- To explore technology used in additive manufacturing
- To acquire knowledge for selecting correct CAD formats in manufacturing process.
- To understand the operating principles and limitations of liquid, solid and laser based additive manufacturing system.
- To understand the operating principles and limitations of laser based additive manufacturing system.
- To acquire knowledge on important process parameters for bio-manufacturing

COURSE OUTCOMES: Students are able to

CO1: Explain the fundamentals of Additive Manufacturing Technologies for engineering applications. **[K2]**

 CO2: Select and use correct CAD formats in the manufacture of a 3D printed part **[K2**]

CO3: Describe the operating principles, capabilities, and limitations of liquid and solid based additive manufacturing system, including fused deposition modeling and stereo lithography [**K2**]

CO4: Describe the operating principles, capabilities and limitations of laser based additive manufacturing system. **[K2**]

CO5: Describe the important process parameters for bio-manufacturing and determine the suitable additive technique for bio-manufacturing, aerospace and manufacturing engineering. **[K2]**

UNIT I

INTRODUCTION

Overview, History, Need, Classification, Additive Manufacturing Technology in product development - Materials for Additive Manufacturing Technology

UNIT II
REVERSE ENGINEERING

Basic Concept –3D Scanning Digitization techniques , Model Reconstruction, Data Processing for Additive Manufacturing Technology, Part Orientation and support generation, Model Slicing, Tool path Generation.

UNIT III
LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS

Classification, Stereo lithography Apparatus (SLA) - Principle, Process, advantages, Fused Deposition Modeling – principle, process, advantages.

UNIT IV

LASER BASED ADDITIVE MANUFACTURING SYSTEMS
Selective Laser Sintering - Principle, Process, advantages, Three Dimensional Printing – Principle, process, advantages, Laser Engineered Net Shaping (LENS).

UNIT V

APPLICATIONS OF 3D PRINTING

Customized implants and prosthesis: Design and development, Bio-Additive Manufacturing, Computer Aided Tissue Engineering (CATE), Applications of 3D Printing in Aerospace, Automotive, Manufacturing and Architectural Engineering.

TEXT BOOKS

1. Chua C.K., Leong K.F., and Lim C.S., Rapid prototyping: Principles and applications, Third Edition, World Scientific Publishers, 2016.
2**.** Gebhardt A,Rapid prototyping, Hanser Gardener Publications, 2017.
3. Chee Kai Chua, Kah Fai Leong, 3D Printing and Additive Manufacturing: Principles and Applications, World Scientific Publishers, Fourth Edition of Rapid Prototyping, 2016.

REFERENCES

1. Liou L.W. and Liou F.W., Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press, 2017.
2. Kamrani A.K. and Nasr E.A., Rapid Prototyping: Theory and practice, Springer, 2016.
3. Hilton P.D. and Jacobs P.F., Rapid Tooling: Technologies and Industrial Applications, CRC press, 2015.

OPEN ELECTIVE	L	T	P	C
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19MEXO02 - FARM MACHINERY				

COURSE OBJECTIVES:
- To impart the students to understand the fundamentals of machinery in farming.
- To enable the students to acquire knowledge on tillage and equipment used.
- To introduce the students about various types of earth moving equipment.
- To enable the students to acquire knowledge on seeding and spraying equipment.
- To introduce the fundamentals of transplanting machinery and fertilizer equipment.

COURSE OUTCOMES: Students will be able to

CO1. Explain various types of machinery in farming. [K2]

CO2. Illustrate different types of farm operation for craft cultivation with scientific understanding. [K2]

CO3. Explain various types of earth moving equipment. [K2]

CO4. Summarize various seeding methods and sprayer types. [K2]

CO5. Explain transplanting methods and fertilizer equipment. [K2]

UNIT I
Farm Mechanization: Objectives of Farm Mechanization, sources of farm power, classification of farm machines. Materials of construction and heat treatment. Principles of operation and selection of machines used for production of crops - Field capacities of different implements and their economics. Problems on field capacities and cost of cultivation

UNIT II
Tillage and Equipment: Classification and types of tillage, Primary tillage implements-Mould board plough and its parts, Disc plough, and other ploughs, Secondary tillage equipment- Disc harrows, implements- Cultivators, and intercultural implements. Forces acting on tillage tools, Problems on forces analysis, Draft measurement of tillage equipment, Draft and unit draft related problems.

UNIT III
Earth Moving Equipment: Earth moving equipment-terminology, Earth moving equipment, construction and their working principles, Earth moving equipment- shovels, Bulldozers, Earth moving equipment- Trenches and elevators.

UNIT IV
Seed Drills and Sprayer:
Seeding methods, Different types of seed metering mechanism, different types of furrow openers. Calibration of Seed drills. Adjustment of Seed Drills - Objectives and uses of plant protection equipment. Types of sprayers and dusters. Sprayer calibration and selection. Constructional features of different components of sprayers and dusters and their adjustments.

UNIT V
Transplanting and Fertilizer: Transplanting methods, different types of Transplanting machinery and their working principle,adjustments in Transplanting equipment. Fertilizer application equipment – fertilizer meeting mechanism calibration of fertilizer equipment.

TEXTBOOKS

1. Triveni Prasad Singh, Farm Machinery. India, Prentice Hall India Pvt., Limited, 2016.
2. Jagadeshwar Sahay, Elements of Agricultural Engineering, Agro Book agency, Patna, 1992.
3. Borshahov Mansurov Sergecy, Land Reclamation Machinery, Mir Publishers, Moscow,1988.
4. Kepner R A, Bainer R and Barger E L, Principles of Farm Machinery, CBS Publishers and Distrubutors, New Delhi, 1987.
5. Michael A M and Ojha T P, Principles of Agricultural Engineering, Jain Brothers, New Delhi, 1985, Vol.I.
6. Smith H P, Farm Machinery and Equipment, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1971.
7. Stone A A, Farm Machinery, John Wiley & Sons, New York.

REFERENCES

1. Srivastaba A.C, Elements of Farm Machinery, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi, 1990.
2. Krutz, Gary, Thompson Lester and Claar, Paul, Design of Agricultural Machinery", John Wiley and Sons, 1984.
3. Lal, Radhey and Dutta, A.C. Agricultural Engineering through solved examples, Saroj Prakashan Publishers, Allahabad, 1971

OPEN ELECTIVE	L	T	P	C
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19MEXO03 - BIO-MECHANICAL ENGINEERING				

COURSE OBJECTIVES:
The student should be made to:
- Explain the principles of mechanics.
- Discuss the mechanics of musculoskeletal system.
- Explain the linear kinetics and angular kinetics
- Illustrate the mathematical models used in the analysis of biomechanical systems

COURSE OUTCOMES: Students are able to
CO1 Infer the introduction of Bio mechanics. [K4]
CO2 Learn about mechanics of musculoskeletal system. [K2]
CO3 Relate the concept of kinetics with human motion. [K3]
CO4 Develop knowledge on mechanical analysis of human motion. [K3]
CO5 Analyze human movements. [K4]

UNIT-I

INTRODUCTION TO BIO MECHANICS
Principles of mechanics in human movement, Qualitative and quantitative Analysis, Key mechanical concepts of mechanics and basic units, Nine fundamentals of biomechanics, Nine principles for application of Biomechanics.

UNIT-II
MECHANICS OF MUSCULOSKELETAL SYSTEM
Principles of joint motions, Muscle structures, Mechanical method of muscle action analysis, Tissue loads and forces, Biomechanics of bones and ligaments, Three mechanical characters of muscle, SSC.

UNIT-III
LINEAR KINETICS AND ANGULAR KINETICS
Vector analysis of angle of pull and muscle angle pull, Contact forces, Impulse-Momentum Relationship, Force-Time Principle, Work-Energy relationship, Segmental interaction principle, Torque, Equilibrium, Center of gravity and Principle of balance.

UNIT-IV
MECHANICAL ANALYSIS OF HUMAN MOTION
Linear kinematics - linear kinematic analysis, position and displacement, velocity and speed, acceleration, differentiation and integration, kinematics of running, kinematics of projectiles, equations of constant acceleration. Angular kinematics - angular motion, measurements of angles, types of angles, representation of angular motion vectors, lower extremity joint angles, relationship between angular and linear motion, angular kinematics of running.

UNIT-V
APPLICATIONS OF ENGINEERING EDUCATION & MEDICAL REHABITATION
Qualitative analysis of Kicking technique, batting, catching, throwing techniques, Injury risk assessment, Equipment design for strength training, Injury mechanics, Injury prevention.

TEXT BOOKS:

1. Ronald L.Huston, Principles of Biomechanics,1st edition CRC Press, 2019
2. Joseph E.Muscolino, " Kinesology", 3rd edition, Mosby, 2016.
3. Subrata Pal, "Textbook of Biomechanics", 1st edition, Springer US, 2016.

REFERENCE BOOKS:

1. Duane Knudson, "Fundamentals of Biomechanics", 2nd edition, Springer, 2013.
2. Ajay Bahl, "Basics of Biomechanics", 1st edition, Jaypee Brothers Medical Publishers, 2010.
3. Robert frost, "Applied Kinesiology", 1st edition, North Atlantic Books; 2013
4. David A. Winter, "Biomechanics and Motor Control of Human Movement", John Wiley & sons,Inc., 2009.

OPEN ELECTIVE	L	T	P	C
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19MEXO04- WASTE TO ENERGY CONVERSION				

COURSE OBJECTIVES:
- To enable students to understand of the concept of Waste to Energy.
- To link legal, technical and management principles for production of energy form waste.
- To learn about the best available technologies for waste to energy.
- To facilitate the students in developing skills in the decision making process.

COURSE OUTCOMES: Students will be able to

CO1.   Describe of the concept of Waste to Energy, classifications and principles.[K2]
CO2.   Explain the Technical and management principles for production of energy form waste.[K2]
CO3.   Explain the best available technologies for waste to energy.[K2]
CO4.   Describe the Waste to Energy Options Landfill gas, RDF,AFR andenergy from Plastics.[K2]
CO5.   Apply the knowledge in planning and operations of Waste to Energy plants[K3]

UNIT-I
Introduction: Principles of Waste Management and Waste Utilization, Waste Management Hierarchy and 3R Principle of Reduce, Reuse and Recycle, Waste as a Resource and Alternate Energy source.

UNIT-2
Waste Sources & Characterization: Waste production in different sectors such as domestic, industrial, agriculture, postconsumer, waste etc. Classification of waste – agro based, forest residues, domestic waste, industrial waste (hazardous and non-hazardous), Characterization of waste for energy utilization, Waste selection criteria.

UNIT- 3
Technologies for Waste:Energy Biochemical Conversion – energy production from organic waste through anaerobic digestion and fermentation, Thermo-chemical Conversion – combustion, incineration, heat recovery, pyrolysis, gasification, Plasma Arc Technology, other newer technologies.

UNIT- 4
Waste to Energy Options: Landfill gas, collection and recovery, Refuse Derived Fuel (RDF) – fluff, briquettes, pellets, Alternate Fuel Resource (AFR) – production and use in cement plants, thermal power plants, Industrial boilers, Conversion of wastes to fuel resources for other useful energy applications, Energy from Plastic Wastes – non-recyclable plastic wastes for energy recovery, Energy recovery from wastes and optimization of its use, benchmarking and standardization, Energy Analysis.

UNIT-5:
Waste to Energy Plants
Waste management activities – collection, segregation, transportation and storage requirements, Location and Siting of 'Waste to Energy' plants, Industry Specific Applications – In-house use
Waste to Energy & Environmental Implications: Environmental standards for Waste to Energy Plant operations and gas clean-up. Savings on non-renewable fuel resources, Carbon Credits- carbon foot calculations, carbon credits transfer mechanisms.

TEXT BOOKS:

1. B.T. Nijaguna, Biogas Technology, 1st Edition, New Age International Pvt Ltd, 2002.
2. Marc Rogoff Francois Screve, Waste-to-Energy, 3rd Edition, William Andrew,2019.
3. Vishal Prasad, BarkhaVaish, Advances in Waste-to-Energy Technologies, 1stEdition, CRC Press, 2019
4. Dev Vrat Kamboj, Manoj Kumar Solanki, Waste to Energy: Prospects and Applications, 1st Edition, Springer,2021

REFERENCE BOOKS:

1. Khandelwal, K. C. and Mahdi.S.S, Biogas Technology - A Practical Hand Book, 1st Edition, 1986.
2. Challal,D.S, Food Feed and Fuel from Biomass, 1st Edition, IBH Publishing Co. Pvt. Ltd, 1991.
3. C. Y. WereKo-Brobby and E. B. Hagan, Biomass Conversion and Technology, 1st Edition, John Wiley& Sons, 1996.

Desai, Ashok V, Non-Conventional Energy, 1st Edition, Wiley Eastern Ltd, 1990

OPEN ELECTIVE	L	T	P	C
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19CSXO01 - INTERNET OF THINGS AND APPLICATIONS				

Course Outcome:

At the end of the course students are able to

1. Explain Arduino IDE tool and Arduino Programming concept.
2. Illustrate concept hardware configuration with Firmata protocols.
3. Explain the knowledge Arduino pin configuration.
4. Differentiate various sensors configuration and workflows.
5. Define architecture of IoT.
6. Explain the knowledge in cloud based web application.

UNIT-I (Introduction to Arduino)
Introduction to Arduino, history of Arduino, variants, Uno board block diagram, installation of Arduino, Arduino IDE, Arduino programming, functions and statements.

UNIT-II (Configuration)
Connecting Arduino borad, introducing the Firmata Protocol, uploading a Firmata sketch to the Arduino board, testing the Firmata protocol.

UNIT-III (Components)
List of components, software flow design, hardware flow design, hardware prototyping software, designing the hardware prototype, Arduino sketch default functions and custom function, setting Arduino board, pin configuration, working with pins.

UNIT-IV (Prototype)
Potentiometer-continuous observation from an analog input connection, Buzzer-generating sound alarm pattern, DC motor-controlling motor speed using PWM, LED- controlling LED brightness using PWM, Servomotor- moving the motor to a certain angle.

UNIT-V (Networking and cloud)
Arduino and computer networking, networking fundamentals, Obtaining the IP address, Networking extensions for Arduino with libraries and class, architecture of IoT web applications, IoT cloud platforms, develop cloud-based IoT applications.

Textbooks:
1. Python programming for Arduino by Pratik desai, Packt Publishing.
2. Internet of Things with Arduino Cookbook by Marco Schwartz.
3. Introduction to Arduino by Alan G. Smith.

References
1. Beginning Arduino by Michael McRoberts, 2e.
2. Getting Started with Arduino Massimo Banzi Second Edition.

OPEN ELECTIVE	L	T	P	C
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19CSXO02 - FOUNDATION TO DATA ANALYTICS				

COURSE OUTCOMES:
1. To understand the basics of Excel as business analytics.
2. To use of basic functions and statistical functions in Excel
3. To obtain knowledge about using of pivot tables and charts
4. To understand the advanced business analytics related charts
5. To know about statistical concepts for data analysis and basics of Power BI.

UNIT – I
Introduction to spreadsheets: reading data, manipulating data. Basic spreadsheet operations and functions.
Introduction to Business analytics: Introduction, Types of Analytics, Area of Analytics.

UNIT – II
Spreadsheet Functions to Organize Data: Conditional formatting, Logical functions: Lookup and reference functions, IF, Nested IF, VLOOKUP, HLOOKUP, MATCH, INDEX and OFFSET functions in Excel.
Statistical functions: Introduction, SUMIFS, COUNTIF, PERCENTILE, QUARTILE, STDEV, MEDIAN and RANK Function

UNIT – III
Introduction to Filtering, Pivot Tables, and Charts: Introduction to the data filtering capabilities of Excel, the construction of Pivot Tables to organize data and introduction to charts in Excel.
Pivot Table Introduction: Creating a Pivot Table, Grouping in Pivot Table, Custom Calculated Field and Calculated Item, Slicer Introduction, Creating a Slicer

UNIT – IV:
Advanced Graphing and Charting: Constructing various Line, Bar and Pie charts. Using the Pivot chart features of Excel. Understanding and constructing Histograms and Scatterplots.
Business analytics with Excel: Introduction, Histogram, Data Table, Descriptive Statistics.

UNIT – V:
Data Analysis Using Statistics: Introduction, Moving Average, Hypothesis Testing, ANOVA, Covariance, Correlation, Regression, Normal Distribution.
Power BI: Introduction, Power Pivot, Power View, Power Query, Power Map.

Reference Books:
1. Advanced Analytics with Excel 2019: Perform Data Analysis using Excel's Most Popular Features (English Editions), 2020
2. Beginning Excel What-If Data Analysis Tools: Getting Started with Goal Seek, Data Tables, Scenarios, and Solver – Illustrated, Paul Cornell, 2005.

Website Link for Reference:
1. https://www.excel-easy.com/data-analysis.html

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OPEN ELECTIVE	**3**	**-**	**-**	**3**
19CSXO03 - DATA ENGINEERING				

COURSE OUTCOMES:

1. At the end of the course Students will be able to:
2. Apply the skills of data inspecting and cleansing.
3. Determine the relationship between data dependencies using statistics
4. Can handle data using primary tools used for data science in Python
5. Represent the useful information using mathematical skills
6. Can apply the knowledge for data describing and visualization using tools.

UNIT I   INTRODUCTION

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

UNIT II   DESCRIBING DATA I

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data

UNIT III   PYTHON FOR DATA HANDLING

 Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT IV   DESCRIBING DATA II

Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r^2 – multiple regression equations – regression toward the mean

UNIT V   PYTHON FOR DATA VISUALIZATION

 Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using statmodels and seaborn – graph plotting using Plotly – interactive data visualization using Bokeh

TEXT BOOKS:

4. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (first two chapters for Unit I)

5. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Chapters 1–7 for Units II and III)

6. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Parts of chapters 2–4 for Units IV and V)

REFERENCES:

2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

OPEN ELECTIVE	L	T	P	C
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19CSXO04 - MACHINE LEARNING				

Course outcomes:

At the end of the course students are able to

1. Define basic concepts of machine learning.
2. Evaluate and compare the performance or, other qualities of regression and logistic regression.
3. Describe concepts of artificial intelligence.
4. Design a supervised or unsupervised learning system.
5. Define the knowledge about SVM.
6. Demonstrate Instance based learning algorithms.

UNIT I: 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, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT II: Linear Regression & Logistic Regression

Predicting numeric values: regression – Finding the best fit lines with linear regression, locally weighted linear regression, Shrinking Coefficients, The bias / Variance tradeoff. Logistic Regression: Classification with logistic regression and the sigmoid function, using optimization to find the best regression coefficients.

UNIT III: Artificial Neural Networks

Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition, Advanced topics in artificial neural networks.

UNIT IV: Evaluation Hypotheses

Motivation, Estimation hypothesis accuracy, Basics of sampling theory, a general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms.

UNIT V: Support vector machines & Dimensionality Reduction techniques

Separating data with the maximum margin, finding the maximum margin, efficient optimization with SMO algorithm, speeding up optimization with full platt SMO, Using Kernels for more Complex data. Dimensionality Reduction techniques: Principal Component analysis, Example.

Instance-Based Learning

Introduction, k -Nearest Neighbor Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning.

TEXT BOOKS

1. Machine Learning, Tom M. Mitchell, MGH

2. Machine Learning in Action, Peter Harington, 2012, Cengage.`

REFERENCE BOOKS

1. Introduction to Machine Learning, Ethem Alpaydin, PHI, 2004

OPEN ELECTIVE	L	T	P	C
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19ECXO01: NANO TECHNOLOGY AND APPLICATIONS				

COURSE OUTCOMES:

Students are able to

CO1. Define Nano materials and Nano Technology with properties
CO2. Explain Synthesis as Fabrication methods of Nano Technology
CO3. Demonstrate Characterization techniques of Nano Materials
CO4. Analyze carbon Nano technology and application of Nano technology.

UNIT-I
INTRODUCTION: History of nano science, definition of nano meter, nano materials, nano technology, Classification of nano materials, Applications in material science, biology and medicine, surface science, energy and environment, Crystal symmetries, crystal directions, crystal planes, Band structure,

UNIT-II
PROPERTIES OF MATERIALS: Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

UNIT-III
SYNTHESIS & FABRICATIONMETHODS: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography.

UNIT-IV
CHARECTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

UNIT-V
CARBON NANO TECHNOLOGY: Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nanocrystalling diamond films, grapheme, applications of carbon nanotubes, carbon nanotubes for nanoelectronics devices.

TEXT BOOKS:

1. Nano science and nano technology by M.S RamachandraRao, Shubra Singh, Wiley publishers. **(UNITS-I,II&III)**
2. Fundamentals of nano electronics by George W Hanson Pearson publications, India 2008 **(Unit- I, IV&V)**

REFERENCE BOOKS:

1. Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.
2. Principles of Nanotechnology by Phani Kumar, Scitech.

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19ECXO02 - GLOBAL POSITIONING AND NAVIGATION SATELLITE SYSTEMS				

COURSE OUTCOMES:
Upon completion of this course, the student would be able to

CO1: Describe the concepts of GNSS based positioning methods, the core components of a satellite navigation system and their purposes**.**
CO2: Estimate and represent the GPS coordinate frames and GPS orbits.
CO3: Analyze the impact of various error sources on the precision of positioning.
CO4: Dramatize the examples of their role of goods and services based on the GSP in sustainable development.

UNIT - I
Overview of GPS: Basic concept, system architecture, space segment, user segment, services of GPS, applications of GPS.

UNIT - II
GPS Signals: Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT - III
GPS coordinate frames, Time references: Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS time.

UNIT - IV
GPS orbits and satellite position determination: GPS orbital parameters, description of receiver independent exchange format (RINEX)–Observation data and navigation message data parameters, GPS position determination.

UNIT - V
GPS Errors: GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

TEXT BOOKS:

1. G. S. RAO, Global Navigation Satellite Systems, 2nd Edition, McGraw-Hill publications, New Delhi, 2010. **(UNIT-I-V)**

REFERENCE BOOKS:

1. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice', 4th Edition, Springer – Wien, New York , 2001. (UNIT-I-III)
2. Sateesh Gopi, "Global Positioning System: Principles and Applications", 3rd Edition, TMH, 2005. (UNIT-I-II)
3. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software Approach', 3rd Edition, John Wiley & Sons, 2001. (UNIT-IV-V)
4. Elliot D. Kaplan, "Understanding GPS Principles and Applications", 2nd edition, Artech House, 2005. (UNIT-I-III)

E-REFERENCES:

1. http://www.unoosa.org/oosa/sk/ourwork/psa/gnss/gnss.html
   https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/gps/howitworks/
2. https://www.princeton.edu/~alaink/Orf467F07/GNSS.pdf
3. https://www.euspa.europa.eu/european-space/eu-space-programme/what-gnss

   https://www.gps.gov/systems/gnss/

E-REFERENCES:

1. http://www.unoosa.org/oosa/sk/ourwork/psa/gnss/gnss.html
   https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/techops/navservices/gnss/gps/howitworks/

OPEN ELECTIVE	L	T	P	C
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19ECXO03 - REMOTE SENSING				

COURSE OUTCOMES:

After Completion of this course, students are able to

CO1: Understand the subject of satellite communication and remote sensing with the core knowledge of space and satellite, communication and the international space laws.

CO2: Comprehend different remote sensing signaling techniques, capable of interpreting signature of satellite communication from bodies like soil, vegetation and ocean.

CO3: Analyze various components used in satellite communication and remote sensing applications.

CO4: Acquire and keep abreast of designing satellite remote sensing system and also analyze the sensor data for drawing inference and conclusions.

UNIT I

Introduction: Historical background, International space laws, Advantages of space based observations, Global coverage, Multiscale observation, repeat observation immediate transmission and digital format, Source of information on remote sensing region.

UNIT II

Principles of remote sensing: Fundamentals of remote sensing signals, Theelectromagnetic spectrum, Terms and units of measurements, EM radiation laws,Spectral signature in the solar spectrum, vegetation reflectance, soil reflectance,water in the solar spectrum, The thermal infrared domain, characteristics of EM radiation in thermal infrared, Thermal properties of vegetation, Soils thermal domain, thermal signature of water and snow, The microwave region, Atmospheric interaction.

UNIT III

Sensors and remote sensing satellite: Type of sensors, Resolution of sensor systems, spatial, spectral, radiometric, temporal, angular - resolution, passive sensors, photographic cameras, cross and along track - scanners, active sensors, Radar and Lidar, satellite remote missions, Satellite orbits, Landsat programs, SPOT satellites, IRS program, High resolution commercial satellites, Polar orbiting meteorological satellites, Terra Aqua, Geostationary meteorological satellites.

UNIT IV

Basis for interpretations of remote sensing images: Constraints in using remote sensing data, types of interpretation, Costs of data acquisitions, end-user requirements, Thematic classification, Generation of biophysical variables, Change detection, spatial patterns, organization of remote sensing project, interpretation phase, presentation of study cases.

UNIT V

Characteristic of photographic images, Feature identification, criteria for visual interpretation, Brightness, color, texture, spatial contexts, shadows, spatial patterns, shape and size, stereoscopic view, period of acquisition, elements of visual analysis, Geometric characteristics of satellite image, Color composites, Multitemporal approaches.

TEXTBOOKS:
1. Emilio Chuvieco, "Fundamentals of Satellite Remote Sensing", CRC press, Edition,2009.

REFERENCES:
1.C. H. Chen, "Signal Processing for Remote Sensing‖, CRC press, Edition-2007.
2. R. N Mutagi, "Satellite Communication Principles and Applications", Oxford University press, 2016.
3. Enrico Del Re, and Marina Ruggieri, "Satellite communications and navigation systems", Springer.

OPEN ELECTIVE	L	T	P	C
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19ECXO04 - MOBILE COMMUNICATION AND APPLICATIONS				

COURSE OUTCOMES:

Students are able to

CO1. Design Hexagonal shaped cells and how these are implemented in real world.

CO2. Explain different types of antenna systems in mobile communication.

CO3. Analyze Handoffs and different types of handoffs and Dropped call rates and their evaluation.

CO4. Describe the Parameters of Mobile multipath channels, Types of small scale fading.

UNIT-I

INTRODUCTION :

Evolution of Mobile Communications, Mobile Radio Systems around the world, First, Second, Third Generation Wireless Networks, Wireless Local Loop(WLL), Wireless LANs, Bluetooth, Personal Area Networks(PANs), A Simplified Reference Model, Applications.

UNIT-II

ELEMENTS OF MOBILE COMMUNICATIONS:

General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of Cellular system.

UNIT-III

THE MOBILE CONCEPT :

Introduction, Frequency reuse, Handoff strategies, Interference and System Capacity: Co- Channel Interference, Channel Planning, Adjacent Channel Interference, Power control for reducing interference, Trunking and Grade of Service, Cell Splitting, Sectoring.

UNIT-IV

MOBILE RADIO PROPAGATION :

Introduction, Free space propagation model, The three basic propagation models-Reflection, Diffraction and Scattering, Two-ray model, Outdoor propagation models, Indoor propagation models, Signal Penetration into building, Small scale multipath Propagation, Parameters of Mobile multipath channels, Types of small scale fading.

UNIT-V

FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:

Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

TEXTBOOKS:

1. Wireless Communications by Theodore S. Rappaport, principles and practice,2nd Editions. (**Unit-I, III, IV & V**)

2. Mobile Cellular Communication by Gottapu Sasibhushana Rao, Pearson International, 2012.
(UNIT - I, II, III &IV)

3. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006. **(UNIT - V & VI)**

REFERENCES:

1. Wireless and Mobile Communications-Lee, McGraw Hill, 3rd Edition, 2006.
2. Wireless Communications and Networks-William Stallings, Pearson Education, 2004.

OPEN ELECTIVE	L	T	P	C
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19ITXO01 : SOFTWARE ENGINEERING PRINCIPLES

COURSE OUTCOMES

After the completion of the course the students are able to

1. Identify, formulate, and solve software engineering problems.
2. Elicit, analyze and specify software requirements with various stakeholders of a software development project.
3. Implement the techniques for project planning and estimation.
4. Participate in design, development, deployment and maintenance of a medium scale software development project.
5. Evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of models, tools, and techniques.

UNIT-I
Introduction to Software Engineering: The evolving role of software, Software Characteristics, Changing Nature of Software, Software myths.

A Generic view of Process: Software engineering- A layered technology, a Process framework, The Capability Maturity Model Integration (CMMI), Process assessment, Product and Process.

UNIT-II
Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

Software Requirements: User requirements, System requirements, Functional and non-functional requirements, the Software Requirements Document (SRS).

UNIT-III
Requirements Engineering Process: Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

Project planning and estimation: Project Planning Activities, Software Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques: COCOMO, PERT/CPM method.

UNIT-IV
Design Engineering: Design process and Design quality, Design concepts, Software Architecture, Architectural Styles and Patterns.
Object-Oriented Design: Objects and object classes, An Object-Oriented design process, Design evolution

UNIT-V
Performing User Interface Design: Golden Rules, User interface analysis and design, interface design steps, Design evaluation.

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Validation testing, System testing , the art of Debugging, Black-Box and White-Box testing.

Text Books:
1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGrawHill International Edition.
2. Software Engineering- Sommerville , 9th edition, Pearson education.

References Books:
1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers
2. Software Engineering, an Engineering approach- James F. Peters, WitoldPedrycz, John Wiely.
3. Systems Analysis and Design- ShelyCashman Rosenblatt, Thomson Publications.
4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

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19ITXO02 : CLOUD COMPUTING PRINCIPLES				

COURSE OUTCOMES

After the completion of the course the students are able to

1. Explain basics of cloud computing technology.
2. Demonstrate the concept of virtualization and the development of Cloud Computing.
3. Analyze various cloud services and service providers.
4. Explain and Uses cloud scalability, security and disaster management.
5. Understand the different cloud platforms and its application.

UNIT-I

Introduction to Cloud: Cloud Computing at a Glance, the Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments.

UNIT-II

Virtualization: Introduction, Characteristics of Virtualized Environment, Classification of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples-VMware and Microsoft Hyper-V.

Before the Move into the Cloud: Know Your Software Licenses, The Shift to a Cloud Cost Model, Service Levels for Cloud Applications.

UNIT-III

Cloud Computing Architecture : Introduction, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance.

UNIT-IV

Defining the Clouds for Enterprise: Storage as a service, Database as a service, Process as a service, Information as a service, and Integration as a service and Testing as a service. Scaling cloud infrastructure - Capacity Planning, Cloud Scale. Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management.

UNIT-V

Cloud Applications: Scientific Applications – Health care, Geo science and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming.

Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google AppEngine-Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure- Azure Core Concepts, SQL Azure.

Text Books:

1. "Mastering Cloud Computing" by Rajkumar Buyya, Christian Vecchiola, S.Thamarai Selvi from TMH 2013.
2. George Reese "Cloud Application Architectures", First Edition, O'Reilly Media 2009.

Reference Books:

1. Cloud Computing and SOA Convergence in Your Enterprise, *A Step-by-Step Guide* by David S. Linthicum from Pearson 2010.
2. Cloud Computing, 2nd Edition by Dr. Kumar Saurabh from Wiley India 2012.
3. Cloud Computing, – web based Applications that change the way you work and collaborate Online – Micheal Miller.Pearson Education.

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19ITXO03 : E-COMMERCE				

COURSE OUTCOMES

After the completion of the course the students are able to

1. Define the fundamentals E-commerce framework.
2. Explain the basics of Consumer Oriented Electronic models.
3. Distinguish different electronic payment systems and their issues.
4. Demonstrate Inter-organizational and intra-organizational electronic commerce.
5. Explain advertising and marketing on the Internet, consumer search and resource discovery and key multimedia concepts.

UNIT-I

Electronic Commerce-Frame work, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT-II

Consumer Oriented Electronic commerce - Mercantile Process models, Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT-III

Inter Organizational Commerce - EDI, EDI Implementation, Value added networks. Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT-IV

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses. Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT-V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering.
Multimedia - key multimedia concepts, Digital Video and electronic Commerce, Desktop video processing, Desktop video conferencing.

Text Books:

1. Frontiers of electronic commerce – Kalakata, Whinston, Pearson.

References Books:

1. E-Commerce fundamentals and applications Hendry Chan, Raymond Lee, TharamDillon,Ellizabeth Chang, John Wiley.
2. E-Commerce, S.Jaiswal – Galgotia.E-Commerce, Efrain Turbon, Jae Lee, David King, H.Michael Chang.
3. Electronic Commerce – Gary P.Schneider – Thomson.
4. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol GuyericoTraver.

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19ITXO04 : WEB TECHNOLOGY PRINCIPLES				

COURSE OUTCOMES

After the completion of the course the students are able to

1. Basic Knowledge about World Wide Web.
2. Develop Simple HTML Web Pages
3. Create Style Sheets for HTML Pages.
4. Acquire Knowledge about Client – side validation through Java Script.
5. Basic Knowledge about XML Documents.

UNIT-I

Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, What is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP.

Web Design: Web site design principles, planning the site and navigation.

UNIT- II

HTML5: Introduction, Basic Formatting Tags, Block and inline elements, Lists, Image, Hyperlink, Table, Iframe, Form Elements, Layout Elements and Miscellaneous.

UNIT-III

CSS3: Introduction, CSS Syntax, Selectors, Add CSS to HTML : External, Internal and Inline, CSS Styling : Backgrounds, Text, Fonts, Links, Lists, Tables, CSS Box Model.

UNIT-IV

Javascript : Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition, Javascript own objects, the DOM and web browser environments, forms and validations.

UNIT-V

XML EXTENSIBLEMARKUP LANGUAGE: XML- Document type Definition, XML schemas, Document object model.

TEXT BOOKS:
1. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
2. Web Technologies – Black Book, Kogent Learning solutions Inc sol. Dreamtech press.

REFERENCE BOOKS:

- W3Schools Online Web Tutorials (https://www.w3schools.com/)

OPEN ELECTIVE	L	T	P	C
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19BMXO01 : INNOVATIONS AND ENTREPRENEURSHIP				

UNIT-I INNOVATION MANAGEMENT: Concept–Objectives-types of Innovation-process of Innovation- sources of Innovation-Levels of Innovation -barriers of Innovation-–Open and Closed Innovation-challenges faced while managing innovation.

UNIT-IICREATIVEINTELLIGENCE: Concept of Creativity-Importance-Characteristics-Types of Creativity-Traits Congenial to Creativity-Triarchic theory of Intelligence – Creative thinking –Types-process of creative thinking-Sources and techniques for generating ideas.

UNIT-III ENTREPRENEURSHIP: Concept- characteristics-Importance-classification-Theories of Entrepreneurship-entrepreneurship   development-entrepreneurial   process-   challenges-Women Entrepreneurs.

UNIT-IVPROJECT FORMULATION AND APPRAISAL: Concept -Need-Significance-steps - Economic Analysis; Financial analysis; Market analysis; Technical feasibility-project Appraisal-techniques of project appraisal.

UNIT-V INSTITUTIONS PROMOTING SMALL BUSINESS ENTERPRISES: Central level Institutions; SIDBI, NSIC, KVIC,SSIDC - State level Institutions- DICs – SFC- SSIDC- other financial assistance, Government policy and taxation benefits- government policy for SSIs

TEXT BOOKS:
  1. Vasanth Desai, ―Entrepreneurship, Himalaya Publishing House, New Delhi, 2012
  2. Arya Kumar: ―Entrepreneurship, Pearson, Publishing House, New Delhi, 2012.
  3. Keith Goffin and Rick Mitchell-Innovation Management,Springer,2016

REFERENCES BOOKS:
  1. Pradip N Khandwalla, Lifelong Creativity, An Unending Quest, Tata McGraw Hill, 2004.
  2. Vinnie Jauhari, Sudanshu Bhushan, Innovation Management, Oxford Higher Education, 2014

OPEN ELECTIVE	L	T	P	C
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19BMXO02 : INDUSTRIAL SOCIOLOGY AND PSYCHOLOGY				

UNIT I: Industrial Sociology: Nature and Scope of Industrial Sociology-Development of Industrial Sociology, Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social relations in industry.

UNIT II: Group Dynamics: Concept- factors influencing individual behaviour- Work Teams & Groups, Group Behavior, Group formation & development, Decision Making by Individuals, Groups Decision making process-techniques.

UNIT III Industrial Psychology: Nature and Meaning of Industrial Psychology, Role of Industrial Psychology, Organizational Attitude, Motivation at work-Theories of Motivation (Theory X and Y, McClelland's Theory, Maslow's Need Theory, Herzberg's Two Factor Theory), Cultural Differences in Motivation.

UNIT IV: Organizational Design and Leadership: Organizational Design & Structure- organizational design- process, Structural differentiations, factors influencing design of organizations, Leadership-concept, types, Leadership vs. Management, Leadership Theories, Emerging issues in Leadership.

UNIT V Organizational Conflictsand Change management: Concept - Causes and Consequences of Conflict-Conflict handling techniques, Managing Change, Forces for change in Organization, Resistance to change.

TEXT BOOKS:

1. Nelson, Quick and Khandelwal, ORGB : An innovative approach to learning and teaching Organizational Behaviour. A South Asian Perspective, Cengage Learning, 2012

2. Luthans, Fred, Organizational Behavior, McGraw Hill, 2008.

3.Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.

REFERENCES BOOKS:

 1. Gisbert Pascal, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.

2. Schneider Engno V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi,2011.

3.Ivancevich, Konopaske &Maheson, OrganisationalBehaviour& Management, 7th edition, Tata McGraw Hill, 2008.

OPEN ELECTIVE	L	T	P	C
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19BMXO03 : DIGITAL MARKETING				

UNIT I- Introduction to Digital Marketing: Concept – scope- importance of digital marketing - Traditional marketing versus digital marketing – Types of digital marketing-marketing mix and its implications for digital marketing--Challenges and opportunities for digital marketing

UNIT II- Content Marketing: Understanding Content Marketing, Content Creation Framework, Content marketing strategy and planning- Types of content marketing -Measuring and Analysing Your Content-Viral Marketing-Blog Marketing.

Unit III- Search Engine Optimization (SEO): What is SEO? SEO Importance and Its Growth in recent years, Ecosystem of a search Engine , kinds of traffic, Keyword Research & Analysis (Free and Paid tool & Extension), Recent Google Updates

UNIT IV-Email and Mobile Marketing: Introduction, process, design, content,email marketing metrics. Mobile Marketing: Concept, Process-tools-opportunities and challenges.

UNIT V-Social Media Marketing: Concepts- Process - Tools- Google and the Search Engine, Facebook, Twitter, YouTube and LinkedIn- Issues: Credibility, Fake News, Paid Influencers; social media and Hate/ Phobic campaigns.

TEXT BOOKS:
1. Puneet Singh Bhatia, "Fundamentals of Digital Marketing", Pearson Education Publications, 2nd edition 2019
2. Seema Gupta, "Digital Marketing", McGraw Hill Publications", 2nd edition 2020
3. Ryan Deiss, Russ Henneberry, "Digital Marketing For Dummies", Wiley Publications, 2020

REFERENCES BOOKS:
1. Joe Pulizzi, "Epic Content Marketing", McGraw Hill Education, 2019
2. Puneet Singh Bhatia , "Social Media & Mobile Marketing", Wiley Publications, 2019

OPEN ELECTIVE	L	T	P	C
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19BMXO04 : BUSINESS ENVIRONMENT				

Unit-I Business Environment: Components and Significance – Economic Scope – Factors Influencing Business Environment – Dimensions of International Business Environment – Challenges.

Unit-II: Structure of Indian Economy: Economic systems- Economic planning with special reference to last three plans, public, private joint and cooperative sectors - Industrial Policy - Policy Resolutions of 1991- Economic Reforms-PPP

Unit-III Indian Business Environment: Competitiveness, Changes and Challenges, Sustainable Development, Social Responsibilities, Ethics in Business- Competition Act 2002 - Emerging Trend in Indian Business Environment

Unit-IV: International Trade: Balance of Payments – Concepts, Disequilibrium in BOP: Methods of Correction - Trade Barriers and Trade Strategy - Free Trade vs. Protection -World Financial Environment: Foreign Exchange Market Mechanism, Exchange Rate Determination, and Euro Currency.

Unit-V: Globalisation: International Economic Integration, Country Evaluation and Selection, Foreign Market Entry Methods, International Trading Blocks – WTO Origin, Objectives, Organisation, Structure and Functioning – WTO and India.

TEXT BOOKS:

1. Chidambaram, Indian Business Environment, Vikas, New Delhi
2. Suresh Bedi: Business Environment, Excel, New Delhi.
3. K.V.Sivayya and VBM Das: Indian Industrial Economy, Sultan Chand Publishers, Delhi.

REFERENCES BOOKS:
1. Pandey G.N., Environmental Management, Vikas Publishing House.
2. Sundaram & Black, International Business Environment – The Text and Cases, Prentice Hall of India.
3. Ghosh PK., Business Environment,Sultan Chand & Sons, New Delhi
4. Daniel John D and Redebough, Lee. H., International Business, Addision Wesley India
5. Saleem, Business Environment, Pearson, New Delhi.
6. Bhalla, V.K., & S. Sivaramu, International Business Environment and Business, Annual Publications

OPEN ELECTIVE	L	T	P	C
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19MAXO01 : OPERATIONS RESEARCH				

COURSE OBJECTIVES:
1.Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals, materials, machines etc) more effectively.
2.Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry

UNIT—I
LINEAR PROGRAMMING:
Introduction**-**General formulation LPP- Formulation of LP problems - Graphical solution –Slack and Surplus and Artificial variables-simplex method (simple problems) - artificial variable techniques – twophase method, Big-M-method(simple problems) –Concept of Duality-general rules for converting any primal into its dual.

UNIT – II
TRANSPORTATION PROBLEM:
Introduction-mathematical formulation-Feasible, Basic Feasible and Optimum solution -Methods for initial basic feasible solution to transportation problem-optimal Test by u, v method(MODI)-Degeneracy in Transportation problems –.Unbalanced Transportation problems

UNIT – III
SEQUENCING PROBLEM:
Introduction –Johnson's Algorithm for n jobs 2 machines- Optimal Solution for processing n jobs through two machines- processing n jobs through three machines - processing n jobs through m machines - processing two jobsthrough m machines

UNIT – IV
REPLACEMENT PROBLEMS:
Introduction – replacement policy for items whose maintenance cost increases with time, and money value is constant – Money value, present worth Factor and Discount Rate- replacement policy when maintenance cost increases with time and money valuechanges with constant rate – Individual Replacement Policy-group replacement of items that fail completely.

UNIT – V
WAITING LINES:
Introduction- transient and steady states-Probability Distributions in Queening systems-Kendall's notation for Representing Queening models- Single channel-Poisson arrivalsExponential service times-with infinitepopulation model (M/M/1: FIFO/∞/∞)
INVENTORY:
Introduction – types of inventory models – Costs involved in Inventory problems-Variables in inventory problem-Classification of Inventory Models-Concept of EOQ-The EOQ model without shortage – Quantity Discounts-purchase inventory models with one price break - purchase inventory models with two price breaks- purchase inventory models with any number of price breaks-shortages are not allowed

COURSE OUTCOMES: Students can able to
CO1: Formulate the resourcemanagement problem andidentify appropriate methods to solve them. [K3]
CO2: Applytransportation model to optimize the industrial resources. [K3]
CO3: Solve sequencing problems using operation research techniques. [K3]
CO4: Apply thereplacement model to increase the efficiency of the system. [K3]
CO5: Apply theinventory and queuingmodel to increase the efficiency of the system. [K4]

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TEXT BOOKS:
1. Operations Research / S.D.Sharma, Ramnath co,Meerut
2. Operations Research, P.K.Gupta, D.S.Hira,S.Chand

REFERENCE BOOKS:
1. Operations Research /A.M.Natarajan,P.Balasubramani, A.Tamilarasi/PearsonEducation.
2. Operations Research / R. Pannerselvam, PHI Publications.

OPEN ELECTIVE	L	T	P	C
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19MAXO02 : OPTIMIZATION MODELS				

COURSE OBJECTIVES:
1.Ability to understand and analyze managerial problems in industry so that they are able to use resources (capitals,materials,machines etc.,) more effectively.
2.Knowledge of formulating mathematical models for quantitative analysis of managerial problems in industry

UNIT—I
INTRODUCTION TO LINEAR PROGRAMMING:
Introduction**-**Linear programming problem formulation – General formulation of Linear programming problem- formulation of LP problems - Graphical solution – simplex method (simple problems) - artificial variable techniques – twophase method, Big-M-method – general rules for converting any primal into its dual.

UNIT – II
ASSIGNMENT MODELS::
Formulation –mathematical formulation of assignment problem – Hungarian method for assignment problem- Unbalanced assignment Problems-variations in the assignment problem-Travelling Salesman problem.

UNIT – III
THEORY OF GAMES:
Introduction – minimax (maxmin) criterion and optimal strategy –solution of games with saddle points – rectangular games without saddle points –reduce game by dominance –-graphicmethod for m x 2 & 2 x n games-arithmetic method for finding optimum strategies and game value.

UNIT – IV
DECISION THEORY:
Introduction –decision making environments - decision making under conditions of certainty- decision making under conditions of uncertainty-Maximax criterion-maximin criterion-minimax regret criterion-Hurwitz criterion-Laplace criterion-decision making under conditions of risk-expected value criterion-expected opportunity loss criterion-expected value of perfect information.

UNIT-V
PROJECT MANAGEMENT:
Phases of project management-network logic-numbering the events(Fulkerson's rule)- – identifying critical path – probability of completing the project within given time- Project Evaluation and Review Technique.

COURSE OUTCOMES: Students are able to
CO1: Apply linear programming techniques to solve industrial optimization problems. [K3]
CO2: Solve assignment problems using operation research techniques. [K3]
CO3: Analyze game theory and apply them for optimization. [K4]
CO4: Solvethe decision theory problem through the applications of game theory. [K4]
CO5: Scheduling the production and manage the project [K4]

TEXT BOOKS:
1. Operations Research / S.D.Sharma, Ramnath co,Meerut
2. Operations Research / R.Pannerselvam,PHIPublications
REFERENCE BOOKS:
1. Operations Research /A.M.Natarajan,P.Balasubramani, A.Tamilarasi/PearsonEducation.
2. Operations Research, P.K.Gupta, D.S.Hira,S.Chand

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19BSXO01 : QUANTUM COMPUTING				

Pre-requisite: Basics of Quantum Mechanics and Computer Science

Objective of the course: The objective of this course is to provide the students an introduction to quantum computation. Much of the background material related to the algebra of complex vector spaces and quantum mechanics is covered within the course.

Unit – I
Background Mathematics, Physics and Introduction to Quantum Computation: Hilber space, Probabilities and measurements, entanglement, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis, Quantum bits, Bloch sphere representation of a qubit, multiple qubits.   **(8 Hours)**

Unit – II
Quantum Circuits: Single Qubit gates, multiple qubit gates, design of quantum circuits. **(8Hours)**

Unit – III
Quantum Information and Cryptography: Comparison between classical and quantum information theory. Bell states. Quantum teleportation.QuantumCryptography, no cloning theorem. **(8 Hours)**

Unit – IV
Quantum Algorithms: Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Data base Search, FFT and prime factorization, Deutsch's Algorithm. **(8 Hours)**

Unit – V
Noise and error correction: Graph states and codes, Quantum error correction, fault-tolerant computation, Physical implementation of quantum computers.   **(8 Hours)**

Text Books:

1. Nielsen M. A., Quantum Computation and Quantum Information, Cambridge University Press (2002).
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computationand Information, Vol. I: Basic Concepts, Vol II: Basic Tools and Special Topics, World Scientific (2004).
3. Pittenger A. O., An Introduction to Quantum Computing Algorithms (2000).

OPEN ELECTIVE	L	T	P	C
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19BSXO02 : OPTOELECTRONICS				

COURSE OBJECTIVES:
A deep understanding of the fundamentals of optoelectronics including Optical emission from semiconductors ,quantum efficiency, heterojunction, quantum well, Optoelectronic modulators. Be familiar with recent trends in optoelectronics.

COURSE OUTCOME:
Students who successfully complete this course will have an
- ability to understand the fundamental concepts of Optoelectronics;
- ability to understand the concept of optoelectronic modulators
- ability to design single-mode junction lasers at different wavelengths to meets specs;
- ability to incorporate heterostructures and quantum wells to improve device performance;
- ability to design junction & avalanche photodiodes to meet specs

UNIT – I
Electronic properties of Semiconductors:
Effect of temperature on band gap, density of carriers in intrinsic and extrinsic semiconductors, conduction processes in semiconductors, electron-hole pair formation and recombination, PN junction, carrier recombination and diffusion, Injection efficiency, heterojunction, internal quantum efficiency, double heterojunction, quantum well and super lattices.

UNIT – II
Opto Electronic Modulators: Basic principles, Polarization, birefringence. Electro-optic Modulators- electro optic effect, integrated optical modulator, EO materials. Kerr modulators, scanning and switching.
Magneto Optic Modulators: Faraday effect, Accusto-optic Modulators, Magneto-optic modulators.

UNIT – III
Opto-electronic devices: Injection luminescence and LED, LED structures, LED-Materials, Power and efficiency, hetereostructure LED. Laser: Basic concepts, Optical emission from semiconductors- Hetero junction lasers. Semiconductor Injection Lasers, Injection laser structures- gain guided lasers, index guided lasers, Distributed Feedback Lasers.

UNIT – IV
Opto-electronic Display devices: Photo luminescence, cathode luminescence, Electro luminescence, CRT, Plasma panel display, LCD and LED displays- liquid crystals, properties, Numeric displays

UNIT – V
Optoelectronic detectors: Thermal detectors, Photon devices- Photo emissive detectors, Photo conductive detectors, Photomultipliers (PMT), Image intensifiers, Photo diodes- PIN & APD, photo transistors.
Design of detector arrays: CCD, Solar cells.

Text Books:
1. Opto electronics - An introduction - J Wilson and J F B Hawkes. (PHI)
2. Optical fiber communication - J M Senior (Pearson, 2nd Ed)
3. Fiber Optics and Optoelectronics – R P Khare, (Oxford University Press, 4th Ed)

References:
1. Solid State Electronic Devices - Ben G Streetman, Sanjaykumar Banerjee, PHI, 6th Ed, 2006)
2. Fundamentals of Photonics- B E A Saleh and M C Teich, (John Wiley, 2007)