ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS

R20 Regulation

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable for batches admitted from 2020-2021)

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY
(Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUK,

NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

DETAILED SYLLABUS

R20 Regulation

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

(Applicable for batches admitted from 2020-2021)

VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

(Autonomous)

Approved by AICTE, Permanently Affiliated to JNTUK,

NAAC Accredited with 'A' Grade, ISO 9001:2015 Certified

Nambur (V), Pedakakani (M), Guntur (Dt.), Andhra Pradesh – 522 508

About Institute

Vasireddy Venkatadri Institute of Technology (VVIT) was established in the year 2007, with an intake of 240 students in four B. Tech programs under Social Educational Trust in Nambur village, Guntur, AP, by Er. Vasireddy Vidya Sagar. It is located strategically between Guntur and Vijayawada in the capital region of Amravati, AP. In a short span of ten years, with an annual intake capacity of 1260 and 81 students into B.Tech (CE, EEE, ME, ECE, CSE, IT, CSM, CSO, CIC and AID) and M. Tech (CSE, VLSI&ES, PEED, MD, SE) programs respectively, today almost 4000 students, 345 teaching staff and 225 non-teaching staff strive to fulfill the vision of VVIT.

VVIT has emerged as one of the top ten Engineering Colleges from the 200 engineering colleges affiliated to JNTU Kakinada. The Institute signed MoUs with Industry and Training & Placement Companies like Infosys, Tech Mahindra, Social AGRO, EFFTRONICS, AMCAT and COCUBES. Centre of Excellence (CoE) by Siemens India was established in the year 2016 by APSSDC to promote Industry Institute interface and strengthen employability skills in students, Google Inc. USA for establishing Google Code labs, University Innovative Fellowship (UIF) program by Stanford University USA and VDC established by Northeastern University

On achieving permanent affiliation to JNTUK, Kakinada, NAAC 'A" grade certification (CGPA 3.09) and B. Tech programs (CE, EEE, ME, ECE, CSE, IT) accredited by NBA, VVIT has set its sight on centrally funded research projects with 10 completed and 6 running DST projects and consultancy service from other departments. VVIT as part of its commitment to research, has published 13 patents, 16 books and nearly 690 journal papers and also has a 'Research Centre affiliated to JNTUK'.

Institute Vision

To impart quality education through exploration and experimentation and generate socially conscious engineers, embedding ethics and values, for the advancement in science and technology.

Institute Mission

- To educate students with a practical approach to dovetail them to industry-needs.
- To govern the institution with a proactive and professional management with passionate teaching faculty.
- To provide holistic and integrated education and achieve over all development of students by imparting scientific and technical, social and cognitive, managerial and organizational skills.
- To compete with the best and be the most preferred institution of the studious and the scholarly.
- To forge strong relationships and linkage with the industry.

Department Vision

Providing quality education to enable the generation of socially conscious software engineers who can contribute to the advancement in the field of computer science and engineering.

Department Mission

- To equip the graduates with the knowledge and skills required to enable them to be industry ready.
- To train socially responsible, disciplined engineers who work with good leadership skills and can contribute for nation building.
- To make our graduates proficient in cutting edge technologies through student centric teaching-learning process and empower them to contribute significantly to the software industry
- To shape the department into a center of academic and research excellence

Program Educational Objectives (PEOs)

PEO 1 : To provide the graduates with **solid foundation** in Computer Science and Engineering along with the fundamentals of Mathematics and Sciences with a view to impart in them **high quality technical skills** like **modelling, analysing, designing, programming and implementation** with **global competence** and helps the graduates for **life-long learning**.

PEO 2 : To prepare and motivate graduates with **recent technological developments related to core subjects** like Programming, Databases, Design of Compilers and Network Security aspects and future technologies so as to contribute effectively for Research & Development by participating in professional activities like publishing and seeking copy rights.

PEO 3 : To train graduates to choose a **decent career option either in high degree of employability/Entrepreneur or, in higher education** by empowering students with ethical administrative acumen, ability to handle critical situations and training to excel in competitive examinations.

PEO 4 : To train the graduates to have basic **interpersonal skills** and **sense of social responsibility** that paves them a way to become good team members and leaders.

Program Outcomes (POs)

PO1 : Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2 : 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.

PO3 : 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.

PO4 : 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.

PO5 : 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.

PO6 : 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.

PO7 : 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.

PO8 : Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9 : Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10 : 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.

PO11 : 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.

PO12 : Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO-1: Professional Skills: The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient design of computer-based systems of varying complexity.

PSO-2: Successful Career and Entrepreneurship: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur and a zest for higher studies/employability in the field of Computer Science & Engineering.

ACADEMIC REGULATIONS (R20) FOR B. TECH (REGULAR)

Applicable for the students of B.Tech from the Academic Year 2020 – 21 onwards

1.Award of B. Tech. Degree

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

- Pursues a course of study in not less than four and not more than eight academic years.
- After eight academic years from the year of their admission, he/she shall forfeit their seat in B. Tech course and their admission stands cancelled.
- Registers for 160 credits and must secure all the 160 credits.
- A student shall be eligible for the award of **B.Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 160 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.**

2. Courses of Study: The following courses of study are offered at present as specializations for the B. Tech. Courses

S. No.	Branch	Branch Short Form	Branch Code
1	Civil Engineering	CIV	01
2	Electrical and Electronics Engineering	EEE	02
3	Mechanical Engineering	MEC	03
4	Electronics and Communication Engineering	ECE	04
5	Computer Science and Engineering	CSE	05
6	Information Technology	INF	12
7	CSE (Artificial Intelligence and Machine Learning)	CSM	42
8	CSE (Internet of Things and Cyber Security with Block Chain Technology)	CIC	47
9	CSE (Internet of Things)	CSO	49
10	Artificial Intelligence and Data Science	AID	54

3. **Medium of Instruction:** The medium of instruction of the entire B. Tech undergraduate programme in Engineering & Technology (including examinations and project reports) will be in English only.

4. **Admissions:** Admission to the B. Tech Programme shall be made subject to the eligibility, qualifications and specialization prescribed by the A.P. State Government/University from time to time. Admissions shall be made either on the basis of the merit rank obtained by the student in the common entrance examination conducted by the A.P. Government/University or on the basis of any other order of merit approved by the A.P. Government/University, subject to reservations as prescribed by the Government/University from time to time.

5. **Structure of the Undergraduate Engineering program:** Every course of B. Tech. Program shall be placed in one of the nine categories as listed in table below:

S.No.	Category	Breakup of Credits
1	Humanities and social science including Management courses	10.5 - 12
2	Basic Science courses	21 - 25
3	Engineering science courses	24
4	Professional core Courses	48 - 51
5	Open Elective Courses	12 - 18
6	Professional Elective Courses	15 - 18
7	Internship, seminar, project wok	15 – 16.5
8	Mandatory courses	NC
9	Skill Oriented Courses	----
	Total Credits	160

****** Breakup of Credits based on AICTE /APSCHE

Assigning of Credits

- Hr. Lecture (L) per week - 1 credit
- Hr. Tutorial (T) per week - 1 credit
- Hr. Practical (P) per week - 0.5 credits

6. Programme Pattern

i. Total duration of the of B. Tech (Regular) Programme is four (three for lateral entry) academic years

ii. Each Academic year of study is divided in to two semesters.

iii. Minimum number of instruction days in each semester is 90.

iv. Grade points, based on percentage of marks awarded for each course will form the basis for calculation of SGPA (Semester Grade Point Average) and CGPA (Cumulative Grade Point Average).

v. The total credits for the Programme are 160.

vi. A three-week induction program is mandatory for all first year UG students (Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations etc.,) and shall be conducted as per AICTE/UGC/APSCHE guidelines.

vii. Student is introduced to "Choice Based Credit System (CBCS)".

viii. A pool of interdisciplinary and job-oriented mandatory skill courses which are relevant to the industry are integrated into the curriculum of concerned branch of engineering (total five skill courses: two basic level skill courses, one on soft skills and other two on advanced level skill courses)

ix. A student has to register for all courses in a semester.

x. All the registered credits will be considered for the calculation of final CGPA.

xi. Each semester has - Continuous Internal Evaluation (CIE) and Semester End Examination (SEE). Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as indicated by UGC and course structure as suggested by AICTE are followed.

xii. A 10 months industry/field mandatory internship, both industry and social, during the summer vacation and also in the final semester to acquire the skills required for job and make engineering graduates to connect with the needs of the industry and society at large.

xiii. All students shall be mandatorily registered for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during second and third semesters. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

xiv. Courses like Environmental Sciences, Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal

evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

xv. College shall assign a faculty advisor/mentor after admission to each student or group of students from same department to provide guidance in courses registration/career growth/placements/opportunities for higher studies / GATE / other competitive exams etc.

xvi. Departments may swap some of the courses between first and second semesters to balance the work load.

xvii. The concerned Board of studies can assign tutorial hours to such courses wherever it is necessary, but without change in the total number of credits already assigned for semester.

8. Registration for Courses

i. The college shall invite registration forms from the students at the beginning of the semester for the registration for courses each semester. The registration process shall be closed within one week. If any student wishes to withdraw the registration, he/she shall submit a letter to the principal through the class teacher/instructor and HOD. The principal shall communicate the registration and withdraw details courses of each student in a consolidated form to the college examination section and University without fail.

ii. There are four open electives in each branch. All Open Electives are offered to students of all branches in general. A student shall choose an open elective, by consulting the HOD/advisor, from the list in such a manner that he/she has not studied the same course in any form during the Programme. The college shall invite registration forms from the students at the beginning of the semester for offering professional and open elective courses. There shall be a limit on the minimum and maximum number of registrations based on class/section strength.

iii. A student shall be permitted to pursue up to a maximum of two elective courses under MOOCs during the programme. Students are advised to register for only for minimum 12 weeks in duration MOOCs courses. Student has to pursue and acquire a certificate for a MOOC course only from the SWAY/NPTE through online with the approved by the BoS in order to earn the 3 credits. The Head of the department shall notify the list of such courses at the beginning of the semester. The details of the MOOCs courses registered by the students shall be submitted to the University examination center as well as college examination center. The Head of the Department shall appoint a mentor for each of the MOOC subjects registered by the students to monitor the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

iv. Two summer internships each with a minimum of six weeks duration shall be mandatorily done/completed respectively at the end of second and third years (during summer vacations). The internship can be done by the students at local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs. After completing the summer internship, the students shall register in the immediate respective odd semester and it will be evaluated at the end of the semester as per norms of the autonomy. The student has to produce the summer internship satisfactory report and certificate taken from the organization to be considered for evaluation. The College shall facilitate and monitor the student internship programs. Completion of internships is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student shall repeat and complete the internship.

v. In the final semester, the student should mandatorily register and undergo internship and in parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner.

vi. Curricular Framework for Skill oriented courses

a. There are five (05) skill-oriented courses shall be offered during III to VII semesters and students must register and pass the courses successfully.

b. For skill oriented/skill advanced course, one theory and 2 practical hours (1-0-2) or two theory hours (2-0-0) may be allotted as per the decision of concerned BOS.

c. Out of the five skill courses; (i) two shall be skill-oriented courses from the same domain and shall be completed in second year (ii) Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining two shall be skill-advanced courses either from the same domain or job-oriented skill courses, which can be of inter disciplinary nature.

d. Students may register the interdisciplinary job-oriented skill courses based on the prerequisites and eligibility in consultation with HoD of the college.

e. The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies. However, the department has to assign mentors in the college to monitor the performance of the students.

f. If a student chooses to take a certificate course offered by industries/Professional bodies/APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the department, then the department shall mark overall attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate. However, the student is deemed to have fulfilled the attendance requirement of the

course, if the external agency issues a certificate with satisfactory condition. If the certificate issued by external agency is marked with unsatisfactory condition, then the student shall repeat the course either in the college or at external agency. The credits will be awarded to the student upon producing the successful course completion certificate from the agency/professional bodies and after passing in the viva-voce examination conducted at college as per BoS norms at the end of the semester.

9. Attendance Requirements:

i. A student is eligible to write the semester-end examinations if he acquires a minimum of 40% in each subject and 75% of attendance in aggregate of all the subjects.

ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned. Students whose shortage of attendance is not condoned in any semester are not eligible to take their end semester examination of that class and their registration shall stand cancelled.

iii. Condonation for shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted by the College Academic Committee.

iv. A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester, as applicable. They may seek readmission for that semester when offered next.

v. A student will be promoted to the next semester if he satisfies the(a) attendance requirement of the present semester and (b) minimum required credits (from V^{th} Semester onwards).

vi. If any candidate fulfills the attendance requirement in the present semester, he shall not be eligible for readmission into the same class.

vii. For induction programme attendance shall be maintained as per AICTE norms.

viii. For non-credit mandatory courses the students shall maintain the attendance similar to credit courses.

10. Evaluation-Distribution and Weightage of marks

Paper setting and evaluation of the answer scripts shall be done as per the procedures laid down by the Academic Council of the institute from time to time.

i. A student is deemed to have satisfied the minimum academic requirements if he/she has earned the credits allotted to each theory/practical design/drawing subject/ project etc. by securing not less than 35% of marks in the end semester exam and minimum 40% of marks in the total of the internal marks and end semester examination marks together.

ii. For non-credit mandatory courses, like Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge, the student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses.

iii. **Distribution and Weightage of marks:** The assessment of the student's performance in each course will be based on Continuous Internal Evaluation (CIE) and Semester-End Examination (SEE). The performance of a student in each semester shall be evaluated subject–wise with a maximum of 100 marks for theory subject, 50 marks for practical subject/Mini Project/Internship/Industrial Training/ Skill Development programmes /Research Project, and 200 marks for end Project Work.

iv. Guide lines for Continuous Internal Evaluation (CIE)

a. For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination (ii) one descriptive examination (iii) one assignment and (iv) one Subject Seminar. The online examination (objective) shall be 10 marks with duration of 20 minutes, descriptive examination shall be for 10 marks with a duration of 1 hour 30 minutes, assignment test shall be 5 marks with duration of 50 minutes (Open book system with questions of L4 standard on Bloom's scale) and 90 minutes for descriptive paper) and Subject Seminar 5 marks.

b. The first online examination (objective) is set with 20 multiple choice questions for 10 marks (20 questions x 1/2 marks) from first two and half units (50% of the syllabus).

c. The descriptive examination is set with 3 full questions for 10 marks each from first two and half units (50% of the syllabus), the student has to answer all questions.

d. The Assignment Test from first two and half units conducted for 20 Marks and will be scaled down to 5 Marks. The test is open book system and the duration of the exam is 50 minutes. Students can bring a maximum of three printed text books related to that subject. (Soft copies of the text books will not be allowed.) The assignments have to provide broadened exposure to the course. The questions shall include problem solving approach, problem analysis & design, implementation, case studies etc.

e. For the subject seminar 5 marks, each student shall be evaluated based on the presentation on any topic of his/her choice in the subject duly approved by the faculty member concerned.

f. For the subject having design and / or drawing (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for continuous Assessment (day–to–day work) and 15 marks for internal tests).

In the similar lines, the mid-2 examinations shall be conducted on the rest of the syllabus.

f. For practical subjects there shall be continuous evaluation during the semester for 25 marks. The internal 25 marks shall be awarded as follows: day to day work 5 marks, record 5 marks and the remaining 15 marks are to be awarded by conducting an internal laboratory test of 3 hours duration.

g. The mid marks submitted to the examination section shall be displayed in the concerned department notice boards for the benefit of the students. If any discrepancy found in the displayed Mid marks, it shall be brought to the notice of examination section within two working days from the date of display.

h. Internal marks can be calculated with 80% weightage for better of the two mid examinations and 20% Weightage for another mid exam.

Example:

Mid-1 marks = Marks secured in (online examination-1+descriptive examination-1 +one assignment-1 + Seminar-1)

Mid-2 marks = Marks secured in (online examination-2+descriptive examination-2 +one assignment-2 + Seminar-2)

Final internal Marks = (Best of (Mid-1/Mid-2) marks x 0.8 + Least of (Mid-1/Mid-2) marks x 0.2)

v. **Semester End Examinations Evaluation:**

a. The semester end examinations for theory subjects will be conducted autonomous examination section for 70 marks consists of five questions carrying 14 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice, which means that there will be two questions from each unit and the student should answer either of the two questions.

b. For practical subjects shall be conducted for 35 marks by the teacher concerned and external examiner appointed by Chief superintendent/ Controller of Examinations (CoE), VVIT. All the laboratory records and internal test papers shall be preserved in respective departments as per autonomous norms and shall be produced to the Committees as and when they ask for.

c. Evaluation of the summer internships: It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of concerned specialization of the UG programme. Students shall pursue this internship during summer vacation just before its offering as per course structure. The minimum duration of this course shall be at least 6 weeks. The student shall register for the internship as per course structure after commencement of academic year. A supervisor/mentor/advisor has to be allotted to guide the students for taking up the summer internship. The supervisor shall monitor the attendance of the students while taking up the internship. Attendance requirements are as per the norms of the academic regulations. After successful completion, students shall submit a summer internship technical report to the concerned department and appear for an oral presentation before the departmental committee consists of an external examiner appointed by Chief superintendent/ CoE; Head of the Department, supervisor of the internship and a senior faculty member of the department. A

certificate from industry/skill development center shall be included in the report. The report and the oral presentation shall carry 40% and 60% weightages respectively. It shall be evaluated for 50 external marks at the end of the semester. There shall be no internal marks for Summer Internship. A student shall secure minimum 40% of marks for successful completion. In case, if a student fails, he/she shall reappear as and when semester supplementary examinations are conducted by the examination section.

d. The job-oriented skill courses may be registered at the college or at any accredited external agency. A student shall submit a record/report on the on the list skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of the semester for 50 marks (record: 15 marks and viva-voce: 35 marks) along with laboratory end examinations in the presence of external (appointed by the Chief superintendent/ CoE) and internal examiner (course instructor or mentor). There are no internal marks for the job-oriented skill courses.

e. Mandatory Course (M.C): Environmental Sciences, Universal Human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc. non-credit (zero credits) mandatory courses. Environmental Sciences shall be offered compulsorily as mandatory course for all branches. A minimum of 75% attendance is mandatory in these subjects. There shall be an external examination for 70 marks and it shall be conducted by the department internally. Two internal examinations shall be conducted for 30 marks and a student has to secure at least 40% of the marks for passing the course. There is no online internal exam for mandatory courses. No marks or letter grade shall be printed in the transcripts for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified.

f. Procedure for Conduct and Evaluation of MOOC: There shall be a Discipline Centric Elective Course through Massive Open Online Course (MOOC) as Program Elective course. The student shall register for the course (Minimum of 12 weeks) offered by SWAYAM/NPTEL/etc., through online with the approval of Head of the Department. The Head of the Department shall appoint one mentor for each of the MOOC subjects offered. The student needs to register the course in the SWAYAM/NPTEL portal. During the course, the mentor monitors the student's assignment submissions given by SWAYAM/NPTEL. The student needs to submit all the assignments given and needs to take final exam at the proctor center. The student needs to earn a certificate by passing the exam. The student will be awarded the credits given in curriculum only by submission of the certificate. In case if student does not pass subjects registered through SWAYAM/NPTEL, the same or alternative equivalent subject may be registered again through SWAYAM/NPTEL in the next semester with the recommendation of HOD and shall be passed.

g. Major Project (Project - Project work, seminar and internship in industry): In the final semester, the student should mandatorily register and undergo internship and in

parallel he/she should work on a project with well-defined objectives. At the end of the semester the candidate shall submit an internship completion certificate and a project report. A student shall also be permitted to submit project report on the work carried out during the internship. The project report shall be evaluated with an external examiner. Evaluation: The total marks for project work 200 marks and distribution shall be 60 marks for internal and 140 marks for external evaluation. The supervisor assesses the student for 30 marks (Report: 15 marks, Seminar: 15 marks). At the end of the semester, all projects shall be showcased at the department for the benefit of all students and staff and the same is to be evaluated by the departmental Project Review Committee consisting of supervisor, a senior faculty and HOD for 30 marks. The external evaluation of Project Work is a Viva-Voce Examination conducted in the presence of internal examiner and external examiner appointed by the Chief superintendent/ CoE and is evaluated for 140 marks.

vi. Recounting/ Revaluation/ Revaluation by Challenge in the End Semester Examination: A student can request for recounting/ revaluation/ revaluation by challenge of his/her answer book on payment of a prescribed fee as per autonomous norms.

vii. Supplementary Examinations: A student who has failed to secure the required credits can appear for a supplementary examination, as per the schedule announced by the examination section.

viii. Malpractices in Examinations: Disciplinary action shall be taken in case of malpractices during Mid/End examinations as per the rules framed by the academic council.

ix. If the student is involved in indiscipline/malpractices/court cases, the result of the student will be withheld.

11. Promotion Rules:

i. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirements.

ii. A student will be promoted from II year to III year if he fulfills the academic requirement of 40% of credits up to either II year I-Semester or II year II-Semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II-year II semester.

iii. A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III-year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III-year II semester.

12. **Course Pattern**

i. The entire course of study is for four academic years; all years are on semester pattern.

ii. A student eligible to appear for the end semester examination in a subject, but absent from it or has failed in the end semester examination, may write the exam in that subject when conducted next.

iii. When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the same semester/year in which he has been detained. However, the academic regulations under which he was first admitted shall continue to be applicable to him.

13.Grading:

The grade points and letter grade will be awarded to each course based on students' performance as per the grading system shown in the following Table.

% of Marks	Letter Grade	Level	Grade Points
≥ 90	**A+**	Outstanding	10
80 to 89	**A**	Excellent	9
70 to 79	**B**	Very Good	8
60 to 69	**C**	Good	7
50 to 59	**D**	Fair	6
40 to 49	**E**	Satisfactory	5
<40	**F**	Fail	0
ABSENT	**Ab**	Absent	0

14. Computation of SGPA and CGPA

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

$SGPA(S_i) = \Sigma (C_i \times G_i) / \Sigma C_i$

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

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.

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

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

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. While computing the SGPA/CGPA, the subjects in which the student is awarded Zero grade points will also be included.

v. Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

vi. Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters A+, A, B, C, D, E and F.

vii. As per AICTE regulations, conversion of CGPA into equivalent percentage as follows:

Equivalent Percentage = (CGPA – 0.75) x 10

viii. Illustration of Computation of SGPA and CGPA

Illustration for SGPA: Let us assume there are 6 subjects in a semester. The grades obtained as follows:

Course	Credit	Grade Obtained	Grade point	Credit x Grade Point
Subject 1	3	B	8	3 X 8 = 24
Subject 2	4	C	7	4 X 7 = 28
Subject 3	3	D	6	3 X 6 = 18
Subject 4	3	A^+	10	3 X 10 = 30
Subject 5	3	E	5	3 X 5 = 15
Subject 6	4	D	6	4 X 6 = 24
	20			139

Thus, SGPA (S_i) =139/20 =6.95=6.9 (approx.)

Illustration for CGPA:

	Sem-1	**Sem-2**	**Sem-3**	**Sem-4**	**Sem-5**	**Sem-6**	**Sem-7**	**Sem-8**
Credits	20	22	25	26	26	25	21	23
SGPA	6.9	7.8	5.6	6.0	6.3	8.0	6.4	7.5

$$\boldsymbol{CGPA} = \frac{\mathbf{20\,X6.9 + 22X7.8 + 25X5.6 + 26X6.0 + 26X6.3 + 25X8.0 + 21X6.4 + 23X7.5}}{\mathbf{188}}$$

$$= \frac{\mathbf{1276.3}}{\mathbf{188}} = \mathbf{6.78}$$

15. Award of Class:

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

Class Awarded	CGPA to be secured
First Class with distinction*	≥7.5
First Class	≥6.5 &<7.5
Second Class	≥5.5 &<6.5
Pass Class	≥4 &<5.5
Fail	<4

* Awarded only if all the credit courses prescribed are cleared within four years for regular candidates and three years for lateral entry candidates

The students who are approved for break in study for entrepreneurships / startups will also be considered for award of first class with distinction

For the purpose of awarding First, Second and Pass Class, CGPA obtained in the examinations appeared within the maximum period allowed for the completion of the program shall been considered

16.Gap - Year:

Gap Year – concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I year/II year/III year to pursue entrepreneurship full time. This period shall be counted for the maximum time for graduation. An evaluation committee at university level shall be constituted to evaluate the proposal submitted by the student and the committee shall decide on permitting the student for availing the Gap Year.

17. Transitory Regulations

A candidate, who is detained or discontinued a semester, on re-admission shall be required to pass all the courses in the curriculum prescribed for such batch of students in which the student joins subsequently and the academic regulations be applicable to him/her which are in force at the time of his/her admission. However, exemption will be given to those candidates who have already passed in such courses in the earlier semester(s) and additional courses are to be studied as approved by Board of Studies and ratified by Academic Council.

18.Curricular Framework for Honors Programme

i. Students of a Department/Discipline are eligible to opt for Honors Programme offered by the same Department/Discipline.

ii. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of 8.0 SGPA up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme stands cancelled and he/she shall continue with the regular Programme.

iii. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

iv. In addition to fulfilling all the requisites of a Regular B.Tech programme, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e., 160 credits).

v. Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

vi. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

vii. The concerned BoS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

viii. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall explore the possibility of introducing virtual labs for such courses with lab component.

ix. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the university/academic council.

x. The concerned BoS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

xi. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

xii. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xiii. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

19. Curricular Framework for Minor Programme

i. Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

ii. Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B. Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

iii. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE, CE, ME etc., or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

iv. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BoS.

v. There shall be no limit on the number of programs offered under Minor. The college can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

vi. The concerned BoS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BoS.

vii. A student shall be permitted to register for Minors program at the beginning of 4th semester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) up to the end of 2nd semester without any history of backlogs. It is expected that the 3rd semester results may be announced after the commencement of the 4th semester. If a student fails to acquire 8 SGPA up to 3rd semester or failed in any of the courses, his registration for Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors registration active.

viii. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e., 160 credits).

ix. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BoS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Programme.

x. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the University/academic council.

xi. Student can opt for the industry relevant minor specialization as approved by the concerned departmental BoS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

xii. A committee should be formed at the level of college / department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BoS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

xiii. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a “pass (P)” grade and also choose to omit the

mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript or None of the courses done under the dropped Minor will be shown in the transcript.

xiv. In case a student fails to meet the CGPA requirement for B. Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

xv. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

20. Industrial Collaborations (Case Study)

Institution-Industry linkages refer to the interaction between firms and universities or public research centers with the goal of solving technical problems, working on R&D, innovation projects and gathering scientific as well as technological knowledge. It involves the collaboration of Industries and Universities in various areas that would foster the research ecosystem in the country and enhance growth of economy, industry and society at large.

The Institutions are permitted to design any number of Industry oriented minor tracks as the respective BoS feels necessary. In this process the Institutions can plan to have industrial collaborations in designing the minor tracks and to develop the content and certificate programs. Industry giants such as IBM, TCS, WIPRO etc., may be contacted to develop such collaborations. The Institutions shall also explore the possibilities of collaborations with major industries in the core sectors and professional bodies to create specialized domain skills.

21. Amendments to Regulations: The college may from time-to-time revise, amend or change the Regulations, Curriculum, Syllabus and Scheme of examinations through the Board of Studies with the approval of Academic Council and Governing Body of the college.

22. Transferred Students: The students seeking transfer to VVIT from various Universities/ Institutions have to obtain the credits of any equivalent subjects as prescribed by the Academic Council. Only the internal marks obtained in the previous institution will be considered for evaluation of failed subjects.

*****

ACADEMIC REGULATIONS (R20) FOR B. TECH.

(LATERAL ENTRY SCHEME)

Applicable for the students admitted into II-year B. Tech. from the Academic Year 2021-22 onwards

1. **Award of B. Tech. Degree:** A student will be declared eligible for the award of B. Tech. Degree if he fulfills the following academic regulations:

- A student shall be declared eligible for the award of the B. Tech Degree, if he pursues a course of study in not less than three academic years and not more than six academic years.
- The candidate shall register for 121 credits and secure all the 121 credits.
- A student shall be eligible for the award of B. Tech degree with Honors or Minor if he/she earns 20 credits in addition to the 121 credits. A student shall be permitted to register either for Honors or for Minor and not for both simultaneously.

2. The attendance regulations of B. Tech. (Regular) shall be applicable to B. Tech Lateral Entry Students.

3. **Promotion Rule**

- A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.
- A student shall be promoted from III year to IV year if he fulfills the academic requirements of 40% of the credits up to either III year I semester or III-year II semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III-year II semester.

4. **Award of Class**

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

Class Awarded	CGPA to be secured
First Class with distinction*	≥7.5
First Class	≥6.5 &<7.5
Second Class	≥5.5 &<6.5
Pass Class	≥4 &<5.5
Fail	<4

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

MALPRACTICE RULES

DISCIPLINARY ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S. No	Nature of Malpractices/Improper conduct	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The

		performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practical and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent /Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case

	person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.

9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Prohibition of ragging in educational institutions Act 26 of 1997

Salient Features

- Ragging within or outside any educational institution is prohibited.
- Ragging means doing an act which causes or is likely to cause Insult or Annoyance of Fear or Apprehension or Threat or Intimidation or outrage of modesty or Injury to a student

	Imprisonment upto		Fine Upto
Teasing, Embarrassing and Humiliation	6 Months	+	Rs. 1,000/-
Assaulting or Using Criminal force or Criminal intimidation	1 Year	+	Rs. 2,000/-
Wrongfully restraining or confining or causing hurt	2 Years	+	Rs. 5,000/-
Causing grievous hurt, kidnapping or Abducts or rape or committing unnatural offence	5 Years	+	Rs. 10,000/-
Causing death or abetting suicide	10 Months	+	Rs. 50,000/-

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

ABSOLUTELY NO TO RAGGING

1. Ragging is prohibited as per Act 26 of A.P. Legislative Assembly, 1997.
2. Ragging entails heavy fines and/or imprisonment.
3. Ragging invokes suspension and dismissal from the College.
4. Outsiders are prohibited from entering the College and Hostel without permission.
5. Girl students must be in their hostel rooms by 7.00 p.m.
6. All the students must carry their Identity Cards and show them when demanded
7. The Principal and the Wardens may visit the Hostels and inspect the rooms any time.

In case any emergency call Toll Free No. 1800 425 1288

LET US MAKE VVIT A RAGGING FREE CAMPUS

COURSE STRUCTURE

Definition of Credit (C)

1 Hour Lecture (L) per week	1 Credit
1 Hour Tutorial (T) per week	1 Credit
1 Hour Practical (P) per week	0.5 Credit

Structure of B. Tech program Regulation R20

S.No.	Category	Code	Suggested Breakup of Credits by AICTE	Suggested Breakup of Credits by APSCHE	Breakup of Credits
1	Humanities and Social Sciences including Management courses	HS	12	10.5	10.5
2	Basic Science courses	BS	25	21	21
3	Engineering Science courses including workshop, drawing, basics of electrical/ mechanical/ computer etc.,	ES	24	24	22.5
4	Professional core courses	PC	48	51	52.5
5	Professional Elective courses relevant to chosen specialization/ branch	PE	18	15	15
6	Open subjects – Electives from other technical and /or emerging subjects	OE	18	12	12
7	Project work, seminar and internship in industry or elsewhere	PR	15	16.5	16.5
8	Mandatory Courses [Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge]	NC	Non-Credit	Non-Credit	Non-Credit
9	Skill Oriented Courses	SC	--	10	10
Total			**160**	**160**	**160**

SEMESTER-WISE STRUCTURE OF CURRICULUM

Course structure for eight semesters during four years of study is as follows

I Year I Semester (Semester-1)

S No.	Course Code	Course Name	L	T	P	C
1	BS1101	Mathematics-I	2	1	0	3
2	BS1102	Applied Chemistry	3	0	0	3
3	ES1101	Basic Electrical and Electronics Engineering	2	1	0	3
4	ES1102	Computer Engineering Workshop	1	0	4	3
5	ES1103	Problem Solving using C	2	1	0	3
6	BS1102L	Applied Chemistry Lab	0	0	3	1.5
7	ES1101L	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
8	ES1102L	Problem Solving using C Lab	0	0	3	1.5
9		Life Skills-I				0
					Total	**19.5**

Category		Credits
BS	Basic Science Courses	3+3+1.5=7.5
ES	Engineering Science Courses	3+3+3+1.5+1.5=12
	Total Credits	**19.5**

I Year II Semester (Semester-2)

S. No.	Course Code	Course Name	L	T	P	C
1	BS1201	Mathematics – II	2	1	0	3
2	BS1202	Applied Physics	2	1	0	3
3	HS1201	Communicative English	3	0	0	3
4	ES1201	Problem Solving using Python	3	0	0	3
5	ES1202	Digital Logic Design	2	1	0	3
6	BS1202L	Applied Physics Lab and Virtual Lab	0	0	3	1.5
7	HS1201L	Communicative English Lab	0	0	3	1.5
8	ES1201L	Problem Solving using Python Lab	0	0	3	1.5
9	MC1201	Environmental Science	2	0	0	0
10		Life Skills – II				0
					Total	**19.5**

21.5

Category		Credits
BS	Basic Science Courses	3+3+1.5=7.5
HS	Humanities and Social Science Courses	3+1.5=4.5
ES	Engineering Science Courses	3+3+1.5=7.5
	Total Credits	**19.5**

II Year I Semester (Semester-3)

S. No	Course Code	Course Name	L	T	P	C
1	BS2101	Mathematics – III	2	1	0	3
2	PC2101	Mathematical Foundations of Computer Science	2	1	0	3
3	PC2102	Data Structures	3	0	0	3
4	PC2103	Java Programming	3	0	0	3
5	PC2104	Software Engineering	3	0	0	3
6	PC2101L	Data Structures Lab	0	0	3	1.5
7	PC2102L	Java Programming Lab	0	0	3	1.5
8	PC2103L	Software Engineering Lab	0	0	3	1.5
9	SOC2101	Advanced Python Programming (SOC)	1	0	2	2
10	MC2101	Essence of Indian Traditional Knowledge	2	0	0	0
11		Life Skills – III				
					Total	**21.5**

Category		Credits
BS	Basic Science Courses	3
PC	Professional core courses	3+3+3+3+1.5+1.5+1.5=16.5
SOC	Skill Oriented Course	2
	Total Credits	**21.5**

II Year II Semester (Semester-4)

S No.	Course Code	Course Name	L	T	P	C
1	BS2201	Probability and Statistics	2	1	0	3
2	ES2201	Computer Organization	3	0	0	3
3	PC2201	Operating Systems	3	0	0	3
4	PC2202	Database Management Systems	3	0	0	3
5	PC2203	Advanced Java Programming	3	0	0	3
6	PC2201L	Operating Systems Lab	0	0	3	1.5
7	PC2202L	Database Management Systems Lab	0	0	3	1.5
8	PC2203L	Advanced Java Programming Lab	0	0	3	1.5
9	SOC2201	Mobile App Development (SAC)	1	0	2	2
10		Life Skills – IV				0
					Total	**21.5**
		Internship/Community Service Project 2 Months (Mandatory) during summer vacation				
	Minor	Data Structures / DBMS	3	1	0	4
	Honor	Any subject from the given pool	3	1	0	4

Category		Credits
BS	Basic Science Courses	3
ES	Engineering Science Courses	3
PC	Professional core courses	3+3+3+1.5+1.5+1.5=13.5
SOC	Skill Oriented Course	2
	Total Credits	**21.5**

III Year I Semester

S. No	Course Code	Course Name	L	T	P	C
1	PC3101	Computer Networks	3	0	0	3
2	PC3102	Artificial Intelligence	3	0	0	3
3	PC3103	Formal Languages and Automata Theory	3	0	0	3
4	PE3101	**Professional Elective-1** **1. Data Warehousing and Data Mining** 2. Software Testing Methodologies 3. Social Networks 4. Unix & Shell Programming 5. Computer Graphics	3	0	0	3
5	OE3101	**Open Elective-1/ Job Oriented Course** Open Electives offered by other departments / Front End Development (Job Oriented Course)	3	0	0	3
6	PC3101L	Front End Development Lab	0	0	3	1.5
7	PC3102L	Artificial Intelligence Tools and Techniques Lab	0	0	3	1.5
8	SAC3101	**.NET Programming**	1	0	2	2
9	MC3101	Constitution of India	2	0	0	0
10	PR	Summer Internship 2 Months (Mandatory) after second year (To be evaluated during V semester)	0	0	0	1.5
Total Credits						**21.5**
	Minor	Operating Systems / Java Programming	3	1	0	4
	Honor	Any course from the pool as per the opted track	4	0	0	4

Category		Credits
PC	**Professional Core**	3+3+3+1.5+1.5=12
PE	Professional Electives	3
OE	Open Elective Courses	3
SAC	Skill Advanced Courses	2
PR	Summer Internship	1.5
	Total Credits	**21.5**

III Year II Semester

S No.	Course Code	Course Name	L	T	P	C
1	HS3201	Engineering Economics & Management	3	0	0	3
2	PC3201	Design and Analysis of Algorithms	3	0	0	3
3	PC3202	Compiler Design	3	0	0	3
4	PE3201	**Professional Elective-II** 1. R Programming **2. Object Oriented Analysis and Design using UML** 3. Information Retrieval Systems 4. Cyber Security 5. MOOCs Course	3	0	0	3
5	Open Elective/ Job Oriented	**Open Elective-2 / Job Oriented Course** Open Electives offered by other departments	2	0	2	3
6	PC3201L	Design and Analysis of Algorithms Lab	0	0	3	1.5
7	PC3202L	UML Lab	0	0	3	1.5
8	PC3203L	Secure Coding Lab	0	0	3	1.5
9	SAC3201	Soft Skills	1	0	2	2
10	MC3201	Entrepreneurial Skill Development	2	0	0	0
Total credits						**21.5**
		Industrial/Research Internship 2 Months (Mandatory) during summer vacation				
	Minor	Advanced Java Programming	3	0	2	4
	Honors	Any course from the pool as per the opted track	4	0	0	4

Category		Credits
HS	**Humanities**	3
PC	Professional Core	3+3+1.5+1.5+1.5=10.5
PE	Professional Elective	3
OE	Open Elective Courses	3
SAC	Skill Advanced Courses	2
Total Credits		**21.5**

IV Year I Semester

S. No.	Course Code	Course Name	L	T	P	C
1	HS4101	Universal Human Values -2: Understanding Harmony	3	0	0	3
2	PE4101	**Professional Elective-3** 1. No SQL Databases **2. Design Pattern** 3. Micro Processors and Micro Controllers 4. Cyber Forensics 5. Digital Image Processing	3	0	0	3
3	PE4102	**Professional Elective-4** **1. Big Data Analytics** 2. Software Project Management 3. Advanced Computer Architecture 4. Wireless Sensor Networks 5. Computer Vision	3	0	0	3
4	PE4103	**Professional Elective-5** **1. Machine Learning** 2. MEAN Stack Technologies 3. Embedded Systems 4. Blockchain Design and their Use cases 5. Deep Learning	3	0	0	3
5	OE4101	**Open Elective-3** Open Electives offered by other departments / Data Science (Job Oriented Course	3	0	0	3
6	OE4102	**Open Elective-4** Open Electives offered by other departments / Devops (Job Oriented Course)	3	0	0	3
7	SAC4101	Power BI/ Contemporary Technical Skill Course (Competitive Coding Lab)	1	0	2	2
8	PR	Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester)	0	0	3	3
					Total	**23**
	Minor	Software Engineering / Object Oriented Software Engineering	3	0	2	4
	Honors	Any course from the pool as per the opted track	4	0	0	4

Category		Credits
HS	**Humanities**	3
PE	Professional Electives	**3+3+3=9**
OE	Open Elective Courses	3+3=6
SAC	Skill Advanced Courses	2
PR	Industrial Internship	3
	Total Credits	**23**

IV Year II Semester (Semester-8)

S. No	Subject code	Course Name	L	T	P	C
1	PROJ4201	Major Project - Viva Voce with Seminar Internship (6 months)	0	0	0	12
					Total	**12**

***CSP (Community Service Project) is evaluated in the Final Year and 4 credits will be awarded by splitting the credits from the IV Year- II Semester major project as per the Proceedings No. JNTUK/DAP/CSP/Distribution of Credits/2022 dated on 24-09-2022.**

Professional Elective Courses

Professional Elective- I (3-1)	Professional Elective- II (3-2)	Professional Elective- III (4-1)	Professional Elective- IV (4-1)	Professional Elective- V (4-1)
Data Warehousing and Data Mining	R Programming	NO SQL Databases	Big Data Analytics	Machine Learning
Software Testing Methodologies	Object Oriented Analysis and Design using UML	Design Pattern	Software Project Management	Mean Stack Technologies
Social Networks	Information Retrieval Systems	Microprocessors and Micro Controllers	Advanced Computer Architecture	Embedded Systems
Unix & Shell Programming	Cyber security	Cyber Forensics	Wireless Sensor Networks	Block chain Design and their Use cases
Computer Graphics	MOOCS (NPTEL SWAYAM)	Digital Image Processing	Computer Vision	Deep Learning

Open Elective Courses (To other Departments)

Open Elective – I	Open Elective – II
1. Object Oriented Programming through C++ 2. Computer Graphics 3. Computer Organization 4. Unix & Shell Programming 5. Advanced Python Programming	1. Computer Networks 2. Web Programming Tools 3. Distributed Computing 4. Open-Source Software 5. Cloud Computing
Open Elective – III	**Open Elective –IV**
1. Design and Analysis of Algorithm 2. Advanced Java Programming 3. Software Project Management 4. Database Management System 5. Information Security	1. Human Computer Interaction 2. Software Testing 3. Cyber Security 4. Data Science 5. Introduction to Machine Learning

Courses for Honors Degree

POOL-1	POOL-2	POOL-3	POOL-4
Advanced Python Programming	Advanced Database Systems	Advanced Operating Systems	Database Security
Script Programming	Introduction to MongoDB	Web Programming in React JS	Cloud Essentials
Semantic Web & Social Networks	FOG Computing	Network Programming	High Performance Computing
Natural Language Processing	Information Retrieval Systems	TCP/IP Protocol Suite	Distributed Computing
Sentiment Analysis	Data Modelling and Visualization	Storage Area Networks	Quantum Computing
MOOC-1* (NPTEL/SWAYAM) Duration: 12 Weeks minimum			
MOOC-2* (NPTEL/SWAYAM) Duration: 12 Weeks minimum			

*Course/subject title can't be repeated

Note:

1. **Students has to acquire 16 credits with minimum one subject from each pool**
2. **Compulsory MOOC/NPTEL course for 4 credits (2 course, each 2 credited)**

General Minor degree courses offered by CSE department

1. Data Structures
2. Database Management Systems
3. Java Programming
4. Advanced Java Programming
5. Operating Systems
6. Computer Networks
7. Cloud Computing
8. Data Science
9. Design and Analysis of Algorithms
10. Software Engineering / Object Oriented Software Engineering

Note:

i. A Student can select four subjects from the above 10 subjects @ 3-0-2-4 credits per subject.
ii. Compulsory MOOC/NPTEL courses for 04 credits (02 courses @ 02 credits each)

VVIT Life skill courses

The following courses are admitted to be the **courses beyond curriculum** to improve individual life skills. These courses and will be demonstrated in the class room and will be having an internal assessment for satisfactory.

S. No	Year and Semester	Course Name
1	I Year I Semester (Semester-1)	Quantitative Aptitude
2	I Year II Semester (Semester-2)	Verbal Ability
3	II Year I Semester (Semester-3)	Understanding Self for Effectiveness
4	II Year II Semester (Semester-4)	Design Thinking
5	III Year I Semester (Semester-5)	Stress and Coping Strategies
6	III Year II Semester (Semester-6)	Research Skills

***

I- Year I - Semester	Name of the Course	L	T	P	C
BS1101	Mathematics -I	2	1	0	3

Course Objectives

1. This course will illuminate the students in the concepts of calculus.
2. To enlighten the learners in the concept of differential equations and multivariable calculus.
3. 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 real-world problems and their applications.

Unit-1

Differential equations of first order and first degree

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

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

Unit-2

Linear differential equations of higher order

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 of Variation of Parameters.

Applications: LCR circuit – Simple harmonic motion

Unit-3

Mean value theorems

Mean value theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

Unit-4

Partial differentiation

Introduction – Homogeneous function – Euler's theorem **-** Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and Mc Laurent's series expansion of functions of two variables.

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

Unit-5

Multiple integrals

Double integrals (Cartesian and Polar) – Change of order of integration – Change of variables (Cartesian to Polar) –Triple integrals.

Applications: Areas by double integrals and Volumes by triple integrals.

TEXT BOOKS

1. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.

REFERENCE BOOKS

1. **H. K. Das,**Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
2. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

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

CO1. solve the differential equations related to various engineering fields.
CO2. utilize mean value theorems to real life problems.
CO3. familiarize with functions of several variables which is useful in optimization.
CO4. apply double integration techniques in evaluating areas bounded by region.
CO5. learn important tools of calculus in higher dimensions. Students will become familiar with 2-dimensional and 3 – dimensional coordinate systems.

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year I - Semester	Name of the Course	L	T	P	C
BS1102	Applied Chemistry	3	0	0	3

Pre-Requisites:

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

Course Objectives

1. Significance of various types of plastic materials in household appliances and composites (FRP) in aerospace and automotive industries.
2. Understand the basic concepts of electrochemistry, which are useful to construct the electrochemical cells, batteries and fuel cells.
   Illustrate the theories and mechanism of corrosion and its prevention.
3. Importance of advanced materials and their engineering applications.
4. Make use of molecular machines in supramolecular chemistry and need of green chemistry.
5. Design and construction of advanced instrumental techniques and recall their importance.

Unit-1

POLYMER TECHNOLOGY

Polymerisation*:* Introduction-Methods of polymerisation-(emulsion and suspension)-Physical and mechanical properties.

Plastics*:* Compounding-Fabrication (compression, injection, blown film, extrusion)-Preparation, properties and applications of PVC, ploycarbonates and Bakelite-Mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste.

Elastomers*:* Natural rubber-Drawbacks-Vulcanization-Preparation-Properties and applications of synthetic rubbers (Buna S, thiokol and polyurethanes)

Composite Materials: Fiber reinforced plastics-CFRP and GFRP

Conducting polymers: Polyacetylene, doped conducting polymers -p-type and n-type doping.

Bio degradable polymers: Biopolymers and biomedical polymers.

Unit-2

ELECTROCHEMICAL CELLS AND CORROSION

Single electrode potential-Electrochemical series and uses of series-Standard hydrogen electrode, calomel electrode, concentration cell, construction of glass electrode, Batteries: Dry cell, Ni-Cd cells, Ni-Metal hydride cells, Li-ion battery, Zinc air cells, Fuel cells-H_2 –O_2, CH_3OH-O_2, phosphoric acid, molten carbonate.

Corrosion: Definition-theories of corrosion (chemical and electrochemical)-galvanic corrosion, differential aeration corrosion, stress corrosion, water-line corrosion- passivity of metals-galvanic series-factors influencing rate of corrosion-corrosion control: (proper designing, cathodic protection)-protective coatings: cathodic and anodic coatings, electroplating, electroless plating (nickel), paints (constituents and its functions).

Unit-3

MATERIAL CHEMISTRY

Non-elemental semiconducting materails: Stoichiometric, controlled valency & chalcogen photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling technique) – Semiconductor devices (p-n junction diode as rectifier, junction transistor)

Nano materials: Introduction, sol-gel method, characterization by BET, SEM and TEM methods, applications of graphene-carbon nanotubes and fullerenes: Types, preparation of carbon nanomaterials by carbon-arc, laser abalation methods.

Liquid crystals: Introduction-types-applications.

Superconductors: Meissner effect, type- I and type- II superconductors, characteristics and applications.

Unit-4

ADVANCED CONCEPTS AND GREEEN CHEMISTRY

Molecular switches and machines: Introduction to supramolecular chemistry, characteristics of molecular motors and machines. Rotaxanes and Catenanes as artificial molecular machines. Protypes linear motions in Rotaxanes, and acid-base controlled molecular shuttle, a molecular elevator, an autonomous light –powered molecular motors, natural molecular motors and machine.

Green chemistry: Principles of green chemistry, green synthesis – aqueous phase, microwave assisted chemical reactions and phase transfer catalysis (PTC).

Unit-5

SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES

Spectroscopic Techniques: Electromagneticspectrum-types of molecular spectra and their absorption criteria.

UV-visible spectroscopy (electronic spectroscopy), Frank-Condon principle, Beer-Lambert's law and its limitations, chromophores and auxochromes – *applications of UV visible spectroscopy.

IR spectroscopy – functional group and finger print region – molecular vibrations – stretching and bending vibrations – *applications of IR.

NMR (Nuclear magnetic resonance): Working principle and instrumentation of NMR – chemical shift(δ) – *applications of NMR.

(*only general applications – without any spectroscopic problems regarding quantitative and qualitative analysis.)

Non-conventional energy sources: Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell, organic photo-voltaic, hydropower, geothermal power, tidal, ocean thermal energy conversion (OTEC) – open cycle OTEC, closed cycle OTEC and hybrid cycle OTEC.

REFERENCE BOOKS

1. A text book of Engineering Chemistry by S.S. Dara, S. S. Umare; S. Chand & Co., Ltd., Latest Edition.
2. Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publicating Co., Latest Edition.

TEXT BOOKS

1. Engineering Chemistry by Jain & Jain; Dhanpat Rai Publicating Co., Latest Edition
2. Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 Edition.
3. Engineering Chemistry by Prasanth Rath, B. Ramadevi, Ch. Venkata Ramana Reddy, Subendu Chakravarthy; Cengage Publications, 2019 Edition.

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

CO1. **explain** the preparation, properties and applications of thermoplastics, thermosettings, elastomers and conducting polymers.
CO2. **know** the importance of various materials and their uses in the construction of batteries and fuel cells.
CO3. **know** the applications of advanced materials in various industries.
CO4. **apply** the principles of supramolecular chemistry in the applications of molecular machines, need of green chemistry.
CO5. **explain** the principles of spectrometry such as UV, IR, and NMR.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2					3					
CO2	2	2					2					
CO3	2	2					2					
CO4	2	2					3					
CO5	2	2					3					

(Strong – 3; Moderate – 2; Weak – 1)

I- Year I - Semester	Name of the Course	L	T	P	C
ES1101	Basic Electrical & Electronics Engineering	2	1	0	3

Course Objectives

1. To introduce basics of electric circuits and to teach DC and AC electrical circuit analysis.
2. To explain the working principles DC machines and speed control of various DC motors.
3. To explain the working principles of transformers and AC machines and its applications.
4. To introduce the basics of semiconductor physics and operation and applications of Diodes.
5. To introduce the basics of transistors and explain the transistor configurations

Unit-1

DC & AC Circuits

DC Circuits: Electrical circuit elements (R - L and C) – Kirchhoff's laws -Voltage and Current division rules-series, parallel circuits and star-delta and delta-star transformations- [Elementary treatment only]

AC Circuits: Representation of sinusoidal waveforms - Peak and RMS values - phasor representation - real power - reactive power - apparent power - power factor. [Elementary treatment only]

Unit-2

DC Machines

DC Generator: Construction-Principle and operation of DC Generator - EMF equation -Types– Applications [Elementary treatment only]

DC Motor: Principle and operation of DC Motor – types-Torque equation - Speed control of DC Motor-Brake test- Swinburne's test-Applications. [Elementary treatment only]

Unit-3

AC Machines

Single Phase Transformer: Construction, Principle and operation of Single-Phase Transformer – EMF Equation-Losses-Efficiency. [Elementary treatment only]

Three Phase Induction Motor: Construction- Principle and operation of three phase Induction Motor-Types- Applications. [Elementary treatment only].

Unit-4

Semiconductor Devices

Semiconductor Physics, PN Junction Diode &Zener Diode-characteristics- Applications: Rectifiers (Half Wave Rectifier & Full Wave Rectifier) [Elementary treatment only], Clippers and Clampers.

Unit-5

Bipolar Junction Transistors

Construction and working of bipolar junction transistor, CB, CE and CC Configurations and characteristics.[Elementary treatment only], Transistors as amplifiers, op-amp basics.

Text Books

1. D. P. Kothari and I. J. Nagrath- "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

References

1. L. S. Bobrow- "Fundamentals of Electrical Engineering" - Oxford University Press - 2011.
2. E. Hughes - "Electrical and Electronics Technology" - Pearson - 2010.

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

CO1. Apply concepts of KVL/KCL in solving DC circuits.(Apply, Find, Solve)
CO2. Choose correct machine for a specific application. (Understand, Apply)
CO3. Illustrate working principles of DC and AC Machines. (Understand, Apply)
CO4. Describe working principles of diodes and transistors. (Understand, Apply)
CO5. Understand the applications of diodes and transistors. (Understand, Analyze)

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3											1
CO4	3	2										1
CO5	3											1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year I - Semester	Name of the Course	L	T	P	C
ES1102	Computer Engineering Workshop	1	0	4	3

Course Objectives

1. To make the students aware of the basic hardware components of a computer and installation of operating system.
2. To introduce Raptor Tool for flowchart creation.
3. Each student will familiar with Productivity tool: LaTeX and Microsoft (MS) office
4. To get knowledge in awareness of cyber hygiene that is protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.
5. To introduce the usage of Productivity tools in crafting professional word documents, excel spreadsheets and power point presentations using open office tools.

Unit-1

Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Software and people. Peripheral Devices: Input, Output and storage, Data Preparation, Factors affecting input, Input devices, Output devices, Secondary devices, Communication between the CPU and Input/ Output devices.

Unit-2

Problem Solving and Programming: Algorithm development, Flowcharts, Looping, some programming features, Pseudo code, the one-zero game, some structured programming concepts, documents. Programming Languages: Machine Language and assembly language, high -level and low-level languages, Assemblers, Compilers, and Interpreters

Unit-3

Operating systems: Introduction, Evolution of operating systems, Command Interpreter, Popular operating systems- Microsoft DOS, Microsoft Windows, UNIX and Linux.

Introduction to Unix Shell Commands, directory management commands, file operations, users commands, Time and Date commands.

Unit-4

Computer Networks: Introduction to computer Networks, Network topologies-Bus topology, star topology, Ring topology, Mesh topology, Hybrid topology, Types of Networks: Local area Network, Wide Area Networks, Metropolitan Networks, Campus/ Corporate Area Network, Personal Area Network, Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Network interface Card, Basic Networking Commands.

Unit-5

Introduction to HTML: Basics in Web Design, Brief History of Internet,World Wide Web Why create a web site,Web Standards, HTMLDocuments, Basic structure of an HTML document Creating an HTML document, Mark up Tags, Heading-Paragraphs, LineBreaks, HTML Tags.

Elements of HTML: Introduction to elements of HTML, Working with Text, Working with Lists, Tables and Frames, Working with Hyperlinks, Images and Multimedia, Working with Forms and controls.

List of Tasks

TASK 1: PC Hardware: PC Hardware introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows, Linux and the required device drivers. In addition, hardware and software level troubleshooting process, tips and tricks would be covered.

Every student should identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor. Every student should disassemble and assemble the PC back to working condition.

TASK 2: Hardware Troubleshooting: Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition.

Software Troubleshooting: Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition.

TASK 3: **Drawing flowcharts (Raptor Tool)**

1. Create flowcharts for take-off landing of an aero plane.
2. Create a flowchart to validate an email id entered by user.
3. Create flowchart to print first 50 prime numbers.

TASK 4: Productivity tool:LaTeX and Microsoft (MS) office: Importance of MS office, Details of the three tasks and features that should be covered in each, MS word, Power Point, Excel.

TASK 5: Operating System Installation: Every student should individually install operating system like Linux or MS windows on the personal computer. The system should be configured as dual boot with both windows and Linux.

TASK 6: Basic Commands: Unix Shell Commands, directory management commands, file operations, user's commands, Time and Date commands.

TASK 7: Orientation & Connectivity Boot Camp: Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally, students should demonstrate how to access the websites and email.

TASK 8: Networking Commands:

ping, ssh, ifconfig, scp, netstat, ipstat, nslookup, traceroute, telnet, host, ftp, arp, wget, route

TASK 9: Basic HTML tags

1. Head Section and Elements of Head Section, Paragraphs, Formatting Styles.

2. Color tags, Creating Hyperlinks, Images, Tables, lists

3. HTML Forms, Form Attributes, Form Elements.

TASK 10: Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop-up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured. Search Engines & Netiquette: Students should know what search engines are and how to use the search engines. Usage of search engines like Google, Yahoo, ask.com and others should be demonstrated by student.

TASK 11: Cyber Hygiene: Students should learn about viruses on the internet and install antivirus software. Student should learn to customize the browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

Text Books

1. Fundamentals of Computers –ReemaThareja-Oxford higher education
2. Computer Fundamentals, Anita Goel, Pearson Education, 2017
3. PC Hardware Trouble Shooting Made Easy, TMH
4. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson, 2013.

Reference Books

1. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda S Katila, Cengage Learning, 2003.
2. An Introduction to Computer studies –Noel Kalicharan-Cambridge

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

CO1. Identify various hardware components of a system and apply their knowledge about computer peripherals to identify / rectify problems onboard.
CO2. Assemble the computer.
CO3. Use various Microsoft tools.
CO4. Integrate the PCs into local area network and re-install operating system and various application programs.
CO5. Manage data backup and restore operations on computer and update application software.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5
CO1	3	2			
CO2	3		2		
CO3			3		3
CO4	2		2		
CO5				3	

(Strong – 3; Moderate – 2; Weak – 1)

I- Year I - Semester	Name of the Course	L	T	P	C
ES1103	Problem Solving Using C	2	1	0	3

Course objectives:

The main objectives are

1. To familiarize to notion of an algorithm, editing and executing programs in Linux.
2. To Understanding branching, iteration.
3. To represent Data using arrays.
4. To use Modular programming and recursive solution formulation.
5. To familiarize pointers and dynamic memory allocation.
6. To handle data through files

Unit-1

Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, Storing Real Numbers

Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers.

Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.

Unit-2

Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators.

Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions

Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples

Unit-3

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code

Enumerated, Structure, and Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application

Unit-4

Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value

Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application

Processor Commands: Processor Commands

Unit-5

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter-Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion

Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input / Output Functions, Character Input / Output Functions

Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.

TEXT BOOKS

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE
2. The C Programming Language, Brian W.Kernighan, Dennis M. Ritchie, 2e, Pearson

REFERENCES

1. Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill
2. Programming in C, Ashok N. Kamthane, AmitKamthane, Pearson
3. Computer Fundamentals and Programming in C, PradipDey, ManasGhosh, OXFORD

Course Outcomes: After completing this course, Students will be able to-

CO1. **Comprehend** algorithms and basic terminology of C (K1)
CO2. **Solve** problems using control structures and modular approach (K2)
CO3. **Demonstrate** 1D and 2D arrays along with strings for linear data handling (K3)
CO4. **Determine** the use of pointers and structures (K3)
CO5. **Implement** various operations on data files. (K3)

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	3	2	1	-	-	-	3	3	1	2	1	2
CO2	2	3	3	2	-	-	-	-	1	1	2	2	2	2
CO3	3	3	3	2	-	-	-	-	2	1	2	2	2	3
CO4	2	2	2	2	-	-	-	-	2	1	2	2	2	2
CO5	2	2	2	2	-	-	-	-	2	1	2	2	1	2

(Strong – 3; Moderate – 2; Weak – 1)

I- Year I - Semester	Name of the Course	L	T	P	C
BS1101L	Applied Chemistry Lab	0	0	3	1.5

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

Course Objectives

1. To furnish the students with a solid foundation in Chemistry Laboratory required to solve the Engineering problems.
2. To expose the students in practical aspects of the theoritical concepts like pH, hardness of water etc.
3. To guide the students on how to handle the instruments like UV-visible spectrophotometer, potentiometer and conductometer.

List of Experiments

Students should do any 10 experiments listed below

1. Determination of HCl using standard Na_2CO_3 solution.
2. Determination of alkalinity of a sample containing Na_2CO_3 and NaOH.
3. Determination of Mn (II) using standard oxalic acid solution.
4. Determination of ferrous iron using standard $K_2Cr_2O_7$ solution.
5. Determination of Copper (II) using standard EDTA solution.
6. Determination of temporary and permanent hardness of water using standard EDTA solution.
7. Determination of Iron (III) by colorimetric method.
8. Determination of the concentration of acetic acid using sodium hydroxide (pH-metric method).
9. Determination of concentration of strong acid vs strong base (by conductometric method).
10. Determination of strong acid vs strong base (by potentiometric method).
11. Determination of Mg^{+2} present in an antacid.
12. Determination of $CaCO_3$ presence in an egg shell.
13. Estimation of vitamin- C.
14. Determination of phosphoric content in soft drinks.
15. Adsorption of acetic acid by charcoal.
16. Prepatation of nylon-6, 6 and Bakelite (demonstration only)

Reference Books:

A Text Book of Quantitative Analysis, Arthur J. Vogel.

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

CO1. To estimate the amount of metal ions present in different solutions (L4 & L3)
CO2. To analyze the quality parameters of water (L4)
CO3. To determine the strength of different solutions by using different instrumentation techniques (L3)

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3							2			
CO2	2	2							2			
CO3	2	3							2			

(Strong – 3; Moderate – 2; Weak – 1)

****

I- Year I - Semester	Name of the Course	L	T	P	C
ES1102L	Basic Electrical Engineering Lab	0	0	3	1.5

Course Objectives

- To Verify Kirchhoff's laws, Voltage and Current division rules.
- To learn speed control and testing of DC Shunt Motor.
- To learn and understand the operation of induction motor.
- To learn applications of diodes and transistors.

List of Experiments

Cycle-1

1. Verification of Kirchhoff laws.
2. Verification of Voltage division rule and current division rule.
3. Speed control of DC Shunt Motor.
4. Perform Brake test on DC Shunt Motor.
5. Conduct Swinburne's test on DC Shunt Motor.
6. Brake test on 3-phase Induction Motor.

Cycle-1I

1. V-I characteristics of P-N Junction Diode.
2. Understand Zener Diode Characteristics.
3. Understand Half wave rectifier and Full wave rectifier with and without filter.
4. Characteristics of BJT in Common Base Configuration.
5. Characteristics of BJT in Common Emitter Configuration.
6. Zener diode as voltage regulator.

Text Books

1. D. P. Kothari and I. J. Nagrath- "Basic Electrical Engineering" - Tata McGraw Hill - 2010.
2. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, 9th edition, PEI/PHI 2006.

References

3. L. S. Bobrow- "Fundamentals of Electrical Engineering" – Oxford University Press – 2011.
4. E. Hughes – "Electrical and Electronics Technology" – Pearson – 2010.

Course Outcomes: Able to

CO1. Verify Kirchhoff's Laws and voltage and current division rules for DC supply.
CO2. Analyze the performance of AC and DC Machines by testing.
CO3. Perform speed control of DC shunt motor.
CO4. Perform the half wave and full wave rectifier.

CO PO MAPPING:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										1
CO2	3	2										1
CO3	3											1
CO4	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year I - Semester	Name of the Course	L	T	P	C
ES1102L	Problem Solving Using C Lab	0	0	3	1.5

Course Objectives

1. Apply the principles of C language in problem solving.
2. To design flowcharts, algorithms and knowing how to debug programs.
3. To design & develop of C programs using arrays, strings pointers & functions.
4. To review the file operations, pre-processor commands.

Exercise 1

1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters.

2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches.

3. Write a C program to display multiple variables.

Exercise 2

1. Write a C program to calculate the distance between the two points.

2. Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

Exercise 3

1. Write a C program to convert a string to a long integer.

2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.

3. Write a C program to calculate the factorial of a given number.

Exercise 4

1. Write a program in C to display the n terms of even natural number and their sum.

2. Write a program in C to display the n terms of harmonic series and their sum.

1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.

3. Write a C program to check whether a given number is an Armstrong number or not.

Exercise 5

1. Write a program in C to print all unique elements in an array.

2. Write a program in C to separate odd and even integers in separate arrays.

3. Write a program in C to sort elements of array in ascending order.

Exercise 6

1. Write a program in C for multiplication of two square Matrices.

2. Write a program in C to find transpose of a given matrix.

Exercise 7

1. Write a program in C to search an element in a row wise and column wise sorted matrix.

2. Write a program in C to print individual characters of string in reverse order.

Exercise 8

1. Write a program in C to compare two strings without using string library functions.

2. Write a program in C to copy one string to another string.

Exercise 9

1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

2. Write a program in C to demonstrate how to handle the pointers in the program.

Exercise 10

1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator.

2. Write a program in C to add two numbers using pointers.

Exercise 11

1. Write a program in C to add numbers using call by reference.

2. Write a program in C to find the largest element using Dynamic Memory Allocation.

Exercise 12

1. Write a program in C to swap elements using call by reference.

2. Write a program in C to count the number of vowels and consonants in a string using a pointer.

Exercise 13

1. Write a program in C to show how a function returning pointer.

2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 14

1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc( ) function. Understand & write the difference.

2. Write a program in C to convert decimal number to binary number using the function.

Exercise 15

1. Write a program in C to check whether a number is a prime number or not using the function.

2. Write a program in C to get the largest element of an array using the function.

Exercise 16

1. Write a program in C to append multiple lines at the end of a text file.

2. Write a program in C to copy a file in another name.

3. Write a program in C to remove a file from the disk.

Course Outcomes: By the end of the Lab, the student able to

CO1. Comprehend the various concepts of a C language
CO2. Develop algorithms and flowcharts
CO3. Design and development of C problem solving skills.
CO4. Acquire modular programming skills.

CO-POS MAPPING

Correlation of Course Outcomes with Program Outcomes and Program Specific Outcomes (PO's & PSO's)														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	2	3	2	1	-	-	-	3	3	1	2	1	2
CO2	2	3	3	2	-	-	-	-	1	1	2	2	2	2
CO3	3	3	3	2	-	-	-	-	2	1	2	2	2	3
CO4	2	2	2	2	-	-	-	-	2	1	2	2	2	2

(Strong – 3; Moderate – 2; Weak – 1)

I- Year II - Semester	**Name of the Course**	**L**	**T**	**P**	**C**
BS1201	**Mathematics-II**	**2**	**1**	**0**	**3**

Course Objectives

- To elucidate the different numerical methods to solve nonlinear algebraic equations
- To disseminate the use of different numerical techniques for carrying out numerical integration
- 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 real-world problems and their applications

Unit-1

Iterative methods

Introduction–Bisection method–Method of false position–Iteration method–Newton-Raphson method (one variable)–Jacobi and Gauss-Seidel methods for solving system of equations.

Unit-2

Interpolation

Introduction–Errors in polynomial interpolation–Finite differences–Forward differences–Backward differences–Central differences –Relations between operators–Newton's forward and backward formulae for interpolation–Gauss's forward and backward formulae for

Interpolation – Interpolation with unequal intervals–Lagrange's interpolation formula–Newton's divide difference formula.

Unit-3

Numerical integration and solution of ordinary difference equations

Trapezoidal rule–Simpson's $1/3^{rd}$ and $3/8^{th}$ rule–Solution of ordinary differential equations by Taylor's series–Picard's method of successive approximations–Euler's method–Modified Euler's method–Runge-Kutta method (second and fourth order).

Unit-4

Laplace Transforms

Laplace transforms of standard functions – Shifting theorems – Transforms of derivatives and integrals – Unit step function – Dirac's delta function –Periodic function - Inverse Laplace transforms – Convolution theorem (without proof)

Applications: Evaluation of integrals using Laplace transforms - Solving ordinary differential equations (Initial value problems) using Laplace transforms.

Unit-5

Fourier series and Fourier Transforms

Fourier series: Introduction – Periodic functions – Fourier series of periodic function – Dirichlet's conditions – Even and odd functions – Change of interval – Half-range sine and cosine series.

Fourier Transforms: Fourier integral theorem (without proof) - Fourier sine and cosine integrals – Sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

Text Books

1. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books

1. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
2. **H.K.Das,**Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
3. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

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

CO1. Evaluate approximate in the roots of polynomial and transcendental equations by different algorithms (EVALUATE)

CO2. Solve system of linear algebraic equations using Gauss Jacobi, Gauss Seidel and apply Newton's forward and backward interpolation and Lagrange's formulae for equal and unequal intervals (SOLVE,APPLY, FIND)

CO3. Apply different algorithms for approximating the solutions of ordinary differential equations to its analytical computations and also by Laplace the transforms for solving differential equations (SOLVE,APPLY, FIND)

CO4. Find or compute the Fourier series of periodic signals (SOLVE, APPLY, FIND, ANALYSE)

CO5. Know and be able to apply integral expressions for the forwards and inverse Fourier transform to range of non-periodic waveforms (SOLVE, APPLY, FIND)

CO – PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year II - Semester	Name of the Course	L	T	P	C
BS1202	Applied Physics	2	1	0	3

Course Objectives

Applied Physics curriculum which is re-oriented to the needs of Circuital branches of graduate engineering courses offered by Vasireddy Venkatadri Institute of Technology, which serves as a transit to understand the branch specific advanced topics. The course is designed to:

- Impart Knowledge of Physical Optics phenomena like Interference and Diffraction required to design instruments with higher resolution.
- Understand the physics of Semiconductors and their working mechanism for their utility in electronic devices.
- Impart the knowledge of materials with characteristic utility in appliances.

Unit-1: Wave Optics

Interference: Principle of Superposition-Interference of light – Conditions for sustained Interference-Interference in thin films (reflected geometry) - Newton's Rings (reflected geometry) **Diffraction:** Fraunhofer Diffraction:- Diffraction due to single slit (quantitative), double slit(qualitative), N –slits(qualitative) and circular aperture (qualitative) – Intensity distribution curves - Diffraction grating – Grating spectrum – missing order– resolving power – Rayleigh's criterion – Resolving powers of Microscope(qualitative), Telescope(qualitative) and grating (qualitative).

Unit-2: LASERs and Holography

LASERs: Interaction of radiation with matter – Spontaneous and Stimulated emission of radiation – population inversion – Einstein's coefficients & Relation between them and their significance - Pumping Mechanisms - Ruby laser – Helium-Neon laser – Applications.

Holography: Introduction – principle – differences between photography and holography – construction and reconstruction of hologram – applications of holograms

Unit-3: Magnetism and Dielectrics

Magnetism: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment - Bohr Magneton-Classification of magnetic materials: Dia, para& Ferro – Domain concept of Ferromagnetism - Hysteresis – soft and hard magnetic materials – applications of Ferromagnetic material.

Dielectrics: Introduction- Dielectric Polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic (Quantitative), Orientation Polarizations (Qualitative) - Lorentz Internal field- Claussius – Mossotti's equation- Frequency dependence of polarization - Applications of dielectrics.

Unit-4: Quantum Mechanics

Introduction– matter waves – de Broglie's hypothesis – Davisson-Germer experiment – G. P. Thomson experiment – Heisenberg's Uncertainty Principle–Schrödinger time independent and time dependent wave equations – physical significance of Schrödinger wave function – Particle in a potential box (determination of energy).

Unit-5: Semiconductor Physics

Origin of energy bands (qualitative) –Classification of solids based on energy bands–Intrinsic semiconductors-density of charge carriers –Electrical conductivity-Fermi level – extrinsic semiconductors-P-type & N-type – Density of charge carriers- Dependence of Fermi energy on carrier concentration and temperature- Hall effect-Hall coefficient- Applications of Hall effect- Drift and Diffusion currents - Einstein's equation.

TEXT BOOKS

1. "Engineering Physics" by B. K. Pandey, S. Chaturvedi - Cengage Publications, 2012
2. "A Text book of Engineering Physics" by M.N. Avadhanulu, P.G.Kshirsagar - S.Chand, 2017.
3. "Engineering Physics" by D.K.Bhattacharya and PoonamTandon, Oxford press (2015).
4. "Engineering Physics" by R.K Gaur. and S.L Gupta., - DhanpatRai publishers, 2012.

REFERENCE BOOKS

1. "Engineering Physics" by M.R.Srinivasan, New Age international publishers (2009).
2. "Optics" by AjoyGhatak, 6th Edition McGraw Hill Education, 2017.
3. "Solid State Physics" by A.J.Dekker, McMillan Publishers (2011).

Course Outcomes: The students will be able to

CO1. Understand the principles such as interference and diffraction to design and enhance the resolving power of various optical instruments.
CO2. Learn the basic concepts of LASER light Sources and Apply them to holography
CO3. Study the magnetic and dielectric materials to enhance the utility aspects of materials.
CO4. Learn the fundamental concepts of Quantum behavior of matter.
CO5. Identify the type of semiconductors using Hall Effect.

CO PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year II - Semester	Name of the Course	L	T	P	C
HS1201	Communicative English	3	0	0	3

Course Objectives

1. Adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions.
2. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers
3. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials
4. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
5. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
6. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Unit 1

Detailed Study: A Proposal to Girdle the Earth (Excerpt) by Nellie Bly

Theme: Exploration

Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.

Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.**Reading:** Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.

Non-Detailed Study:

1. “How to Fashion Your Own Brand of Success” by Howard Whitman

2. “How to Recognize Your Failure Symptoms” by Dorothea Brande

Unit 2

Detailed Study: An excerpt from The District School as It Was by One Who Went to It by Warren Burton

Theme: On Campus

Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters.

Grammar and Vocabulary: Cohesive devices - linkers, signposts and transition signals; use of articles and zero article; prepositions.

Non-detailed Study:

3. "How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock

4. "How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz

Unit 3

Detailed Study: The Future of Work?

Theme: Working Together

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Non-Detailed Study:

5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand

6. "How to Raise Your Self-Esteem and Develop Self-confidence" by James W Newman

Unit 4

Detailed Study: H.G Wells and the Uncertainties of Progress by Peter J. Bowler

Theme: Fabric of Change

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role-plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Non-Detailed Study

7. "How to Win Your War against Negative Feelings" by Dr Maxwell Maltz

8. "How to Find the Courage to Take Risks" by Drs. Tom Rusk and Randy Read

Unit 5

Detailed Study: Leaves from the Mental Portfolio of a Eurasian by Sui Sin Far

Theme: Tools for Life

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Reading: Reading for comprehension.

Writing: Writing structured essays on specific topics using suitable claims and evidences

Grammar and Vocabulary: Editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Non-Detailed Study

9. "How to Become a Self-Motivator" by Charles T Jones

10. "How to Eliminate Your Bad Habits" by OgMandino

Text Books

1. English All Round: Communication Skills for Undergraduate Learners-Volume 1, Orient Black Swan, 2019
2. University of Success by OgMandino, Jaico, 2015.

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

AICTE Recommended Books

1. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Oxford University Press, 2018.
2. Pushplata and Sanjay Kumar. Communication Skills, Oxford University Press, 2018.
3. Kulbushan Kumar. Effective Communication Skills. Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing

1-language.com
http://www.5minuteenglish.com/
https://www.englishpractice.com/

Grammar/Vocabulary

English Language Learning Online
http://www.bbc.co.uk/learningenglish/
http://www.better-english.com/
http://www.nonstopenglish.com/
https://www.vocabulary.com/
BBC Vocabulary Games
Free Rice Vocabulary Game

Reading

https://www.usingenglish.com/comprehension/
https://www.englishclub.com/reading/short-stories.htm
https://www.english-online.at/

Listening

https://learningenglish.voanews.com/z/3613
http://www.englishmedialab.com/listening.html

Speaking

https://www.talkenglish.com/
BBC Learning English – Pronunciation tips
Merriam-Webster – Perfect pronunciation Exercises

All Skills

https://www.englishclub.com/
http://www.world-english.org/
http://learnenglish.britishcouncil.org/

Course Outcomes

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

CO1. identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and formulate sentences using proper grammatical structures and correct word forms **(Describe, relate, tell, find L-3)**
CO2. speak clearly on a specific topic using suitable discourse markers in informal discussions **(Discuss, outline, explain, predict – L3)**
CO3. write summaries based on global comprehension of reading/listening texts **(Use, categorize, complete, solve L-3)**
CO4. produce a coherent paragraph interpreting a figure/graph/chart/table **(Identify, compare, explain, illustrate- L4)**
CO5. take notes while listening to a talk/lecture to answer questions **(explain, relate, outline, complete -L3)**

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1									2	3		1
CO2									2	3		1
CO3									2	3		1
CO4									2	3		1
CO5									2	3		1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year II - Semester	Name of the Course	L	T	P	C
ES1201	Problem Solving using Python	3	0	0	3

Course Objectives

- To learn about Python programming language syntax, semantics, and the runtime environment
- To be familiarized with universal computer programming concepts like data types, containers
- To be familiarized with general computer programming concepts like conditional execution, loops & functions
- To be familiarized with general coding techniques and object-oriented programming

Unit-1

Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output.

Data Types, and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules.

Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.

Unit-2

Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration, While Loop

Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.

Unit-3

List and Dictionaries: Lists, Defining Simple Functions, Dictionaries

Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top-Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program's Namespace, Higher Order Function.

Modules: Modules, Standard Modules, Packages.

Unit-4

File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations

Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support

Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism

Unit-5

Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions.

Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI -Based, Programs, Coding Simple GUI-Based Programs, Other Useful GUI Resources.

Programming: Introduction to Programming Concepts with Scratch.

TEXT BOOKS:

1. Fundamentals of Python First Programs, Kenneth. A. Lambert, Cengage.
2. Python Programming: A Modern Approach, VamsiKurama, Pearson.

REFERENCES:

1. Introduction to Python Programming, Gowrishankar.S, Veena A, CRC Press.
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

Course Outcomes: After completing this course, Students will be able to-

CO1: Develop essential programming skills in computer programming concepts like data types, containers (K1)
CO2: Solve coding tasks related to conditions, loops and String processing (K2)
CO3: Experiment with various Data structures in interpreted Language and to build modules and packages for real software needs. (K2)
CO4: Implement Files and object-oriented principles in Python (K3)
CO5: Identify solutions using GUI in Python. (K3)

CO – PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	-	-	-	-	-	-	-	-
CO2	1	2	2	1	-	-	-	-	-	-	-	-
CO3	1	3	3	2	1	-	-	-	-	-	-	-
CO4	1	2	2	2	-	-	-	-	-	-	-	-
CO5	1	2	2	2	1	-	-	-	-	-	-	1

[1-Slight (low), 2-Moderate (Medium), 3-Substantial (High)]

I- Year II - Semester	Name of the Course	L	T	P	C
ES1202	Digital Logic Design	2	1	0	3

Course Objectives

1. To understand common forms of number representation in digital circuits and Boolean algebra.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems and simplify logic expressions using basic theorems, K-map and Tabular methods.
3. To understand the concept of Combinational logic design and realize logic expressions using MUXand Decoder
4. Illustrate the concept of sequential logic design; analyze the operation of flip-flop and conversion from one flip-flop to another, and application of flip-flop.
5. To impart to student the concepts of sequential machines of digital system.

Unit-1

Number Systems and Boolean Algebra

Number systems: Introduction to different number system and their conversions, complement of number system and subtraction using complement method, Floating-Point Representation, Weighted and Non-weighted codes and its properties.

Boolean Algebra: Boolean algebra and logic gates, Basic theorems and properties of Boolean Algebra, Boolean functions, canonical and standard forms, Universal Gates.

Unit-2

Minimization Methods of Boolean functions

Minimization of logic expressions by algebraic method, Sum of Products (SOP), Product of Sums (POS), K-Map Method, Don’t Care Combinations, Multilevel NAND/NOR realizations, Prime and essential Prime Implicants, Tabular Method, Prime Implicants Chart, Simplification Rules.

Unit-3

Combinational Circuits

Design procedure, Half/full adders, Half / full subtractors, carry look ahead adder, BCD adder, Multiplexer/De-Multiplexer, Encoder/Decoder, Priority encoders, Implementation of Higher-Order Device Using Lower Order devices, Implementation of combinational logic using MUX/Decoder, Magnitude Comparator, Error detection and correction codes.

Unit-4

Sequential Circuits

Sequential Circuits Fundamentals: Basic Architectural Distinctions between Combinational and Sequential circuits, SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

Registers and Counters: Shift Registers Left, Right and Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation of Asynchronous and Synchronous Counters.

Unit-5

Sequential Machines

Finite State Machines, Synthesis of Synchronous Sequential Circuits, Serial Binary Adder, Sequence Detector, Parity bit Generator, Synchronous Modulo N –Counters, Finite state machine capabilities and limitations, Mealy and Moore models.

Note: Case Studies / Small Projects of Digital Circuits and Logic Design

TEXT BOOKS

1. Digital Design by Mano, PHI

2. Modern Digital Electronics by RP Jain, TMH

3. Switching Theory and Logic Design by A. Anand Kumar, PHI.

REFERENCE

1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition

2. Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers

Course Outcomes

CO1. Distinguish the analog and digital systems, apply positional notations, number systems, computer codes in digital systems. **(Remember, Understand, and Apply)**
CO2. To understand the Boolean Algebra theorems, simplify and design logic circuits. **(Understand, Apply, Analyze and valuate)**
CO3. Implemented combinational logic circuit design and modular combinational circuits using encoders, decoders, multiplexers and demultiplexers. (**Apply, Analyze, valuate, and create)**
CO4. To understand the basic elements of sequential logic circuits. **(Understand, Apply, Analyze)**
CO5. Able to design and analyze sequential circuits. **(Apply, Analyse and create)**

CO-PO MAPPING

Mapping	PO1	PO2	PO3	PO10
CO1	3	2	2	1
CO2	3	2	2	1
CO3	3	2	2	1
CO4	3	2	2	1
CO5	3	2	2	1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year II - Semester	Name of the Course	L	T	P	C
BS1201L	Applied Physics and Virtual Lab	0	0	3	1.5

Course Objectives: The Applied Physics Lab is designed to

- **Understand** the concepts of interference and diffraction and their applications.
- **Apply** the concept of LASER in the determination of wavelength.
- **Recognize** the importance of energy gap in the study of conductivity and Hall Effect.
- **Illustrate** the magnetic and dielectric materials applications.
- **Apply** the principles of semiconductors in various electronic devices.

LIST OF EXPERIMENTS

(Any 10 of the following listed 15 experiments)

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence.

2. Newton's rings – Radius of Curvature of Plano - Convex Lens.

3. Determination of thickness of a spacer using wedge film and parallel interference fringes.

4. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.

5. Energy Band gap of a Semiconductor p - n junction.

6. Characteristics of Thermistor – Temperature Coefficients

7. Determination of dielectric constant by charging and discharging method

8. Variation of dielectric constant with temperature

9. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).

10. LASER - Determination of wavelength by plane diffraction grating

11. Determination of resistivity of semiconductor by Four probe method.

12. Determine the radius of gyration using compound pendulum

13. Rigidity modulus of material by wire-dynamic method (torsional pendulum)

14. Dispersive power of diffraction grating.

15. Determination of Hall voltage and Hall coefficients of a given semiconductor using Hall Effect.

Course Outcomes: The students will be able to:

CO1. **Operate** optical instruments like microscope and spectrometer
CO2. **Determine** thickness of a paper with the concept of interference
CO3. **Estimate** the wavelength of differentcolors using diffraction grating and resolving power
CO4. **Plot** the intensity of the magnetic field of circular coil carrying current with distance
CO5. **Calculate** the band gap of a given semiconductor

CO PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

(Strong – 3; Moderate – 2; Weak – 1)

I- Year II - Semester	Name of the Course	L	T	P	C
HS1201L	Communicative English Lab	0	0	3	1.5

Course Objectives

The main objective of the course is to adopt activity-based teaching-learning methods to ensure that learners would be engaged in use of language both in the classroom and laboratory sessions and appear confidently for competitive examinations for career development.

The specific objectives of the course are to

1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native and non-native speakers
2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials like newspapers, magazines, periodicals, journals, etc.
3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations
4. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information
5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing

Introduction to Sound system of English

Articulation - Airstream mechanism, Manners of Articulation, Places of Articulation, English phonetic symbols.

Accent - Syllabification, word stress and accent, stress rules and stress shift, exceptions to rules.

Intonation - Stress and accent in connected speech. Types and functions of Intonation in English.

I. **A. Speaking**: Introducing Yourself and Others
B. Listening: Conversation between two and more people.

II. **A. Speaking:** Speak for a minute in response to a question about personal experience / wish.
B. Listening: Identifying the main idea of a talk or a conversation

III. **A. Speaking: Group discussion** – 5 minutes followed by a summary –1 or 2 minutes: Topics- 1. Features that make a place beautiful, 2. The most challenging job you can think of, 3. Some skills that everyone should learn, 4. The best criteria to measure success, 5. A recent news story that is interesting, 6. Impact of technology on the music industry, 7. An app that has helped society, 8. Pros and Cons of after school tutorials, 9. How to stay safe on Social Media, 10. The most common reasons why friendships fall apart, 11. Interactions with seniors on campus, 12. Coping with peer pressure, 13. Others' opinion vs your belief, 14. Feeling that plants would express if they could, 15. Growing up alone vs Growing up with siblings, 16. Uniforms stifle individuality, 17. In India summer is the best and worst of times, 18. A good sense of humor is a definite perk, 19. All fast food is not junk food and 20. Ideas to make your common room in college more inviting. Question Answer sessions – 1. Idea of a Tech Startup, 2. Training

programme of T&P Cell, 3. Inter-college Cultural Fest, 4. 3-day Foreign University delegation visit to the campus, 5. Computer training programme by a reputed MNC, 6. Shifting your Dept or Classrooms to new location on campus, 7. How to manage attendance while attending additional courses (Minors/Honors), 8. How to choose placement offers? 9. Involvement in Student Affairs through SAC, 10. Planning an excursion.

B. Listening:1. Comprehension Exercise on Teamwork, 2. Predicting what the speaker would say from the title of the talk, 3. Comprehension based on a narrative or a short video, TED Talks

IV. **A. Speaking:** Preparing speech using picture clues, asking Q&A using pictures.
B. Listening: Listening Comprehension using short films, audio files, interviews of famous personalities

V. **A. Speaking:** Preparing 30-day planner, Using important phrasal expressions in speech, Oral Presentations on – 1. Setting goals is important2. Asking the right question is the skill you need to develop, 3. Do college students want their parents' attention4. Everyone needs to learn how to cook5. Doing household chores is everyone's responsibility 6. Study groups facilitate peer-monitoring7. Is it OK for students to do things just because they want to fit in? 8. Students should compulsorily make time for physical activity, 9. Taking breaks to pursue other interests improves academic performance, 10. Strategies to avoid stress, 11. How best to use the media for educational activities, 12. Why volunteer for service activities? 13. International student exchange programme, 15. Work-life balance 16. Strategies to build on your strength and overcome weaknesses, 17. Strategies to build confidence and self-esteem18. Procrastination kills opportunities, 19. Setting a budget and sticking to it, 20. Grooming and etiquette 21. Pros and Cons of being Competitive, 22. Virtual classroom vs real classroom, 23. Freedom brings more responsibility 24. To-do lists help you become more productive 25. Having a diverse group of friends is an asset 26. One thing you wish you had learnt in High school 27. Why is it important to be non-judgmental towards others? 28. Humans need empathy, 29. Public speaking is a necessary skill 30. How to build and maintain good professional relationships.
B. Listening: Listening Comprehension, Speeches by Famous personalities

Pair work, Role-play, conversational practice and Individual speaking activities based on following essays from University of Success.

1. "How to Fashion Your Own Brand of Success" by Howard Whitman
2. "How to Recognize Your Failure Symptoms" by Dorothea Brande
3. "How to Conquer the Ten Most Common Causes of Failure" by Louis Binstock
4. "How to Develop Your Strength to Seize Opportunities" by Maxwell Maltz
5. "How to Make the Most of Your Abilities" by Kenneth Hildebrand
6. "How to Raise Your Self-Esteem and Develop Self-Confidence" by James W. Newman
7. "How to Win Your War against Negative Feelings" by Dr Maxwell Maltz
8. "How to Find the Courage to Take Risks" by Drs. Tom Rust and Randy Reed
9. "How to Become a Self-Motivator" by Charles T Jones

10. "How to Eliminate Your Bad Habits"byOgMandino

Text Books

1. English All Round: Communication Skills for Undergraduate Learners-Volume 1, Orient Black Swan, 2019
2. University of Success by OgMandino, Jaico, 2015.

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skilful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

AICTE Recommended Books

1. Meenakshi Raman and Sangeeta Sharma. Technical Communication. Oxford University Press, 2018.
2. Pushplata and Sanjay Kumar. Communication Skills, Oxford University Press, 2018.
3. Kulbushan Kumar. Effective Communication Skills. Khanna Publishing House, Delhi

Sample Web Resources

Grammar / Listening / Writing

1. 1-language.com
2. http://www.5minuteenglish.com/
3. https://www.englishpractice.com/

Grammar/Vocabulary

4. English Language Learning Online
5. http://www.bbc.co.uk/learningenglish/
6. http://www.better-english.com/
7. http://www.nonstopenglish.com/
8. https://www.vocabulary.com/
9. BBC Vocabulary Games
10. Free Rice Vocabulary Game

Reading

11. https://www.usingenglish.com/comprehension/
12. https://www.englishclub.com/reading/short-stories.htm
13. https://www.english-online.at/

Listening

14. https://learningenglish.voanews.com/z/3613
15. http://www.englishmedialab.com/listening.html

Speaking

16. https://www.talkenglish.com/
17. BBC Learning English – Pronunciation tips
18. Merriam-Webster – Perfect pronunciation Exercises

All Skills

19. https://www.englishclub.com/

20. http://www.world-english.org/
21. http://learnenglish.britishcouncil.org/

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

CO1. identify the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English and speak clearly on a specific topic using suitable discourse markers in informal discussions (L3)

CO2. take notes while listening to a talk/lecture; to answer questions in English; formulate sentences using proper grammatical structures and correct word forms; and use language effectively in competitive examinations (L3)

CO3. write summaries based on global comprehension of reading/listening texts; produce a coherent write-up interpreting a figure/graph/chart/table; and use English as a successful medium of communication. (L3)

CO PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1									2	3		1
CO2									2	3		1
CO3									2	3		1

(Strong – 3; Moderate – 2; Weak – 1)

***

I- Year II - Semester	Name of the Course	L	T	P	C
ES1201L	Problem Solving using Python Lab	0	0	3	1.5

Course Objectives

- To acquire programming skills in core Python.
- To acquire Object Oriented Skills in Python
- To develop the skill of designing Graphical user Interfaces in Python
- To develop the ability to write database applications in Python

List of Problems

1. Write a program that asks the user for a weight in kilograms and converts it to pounds. There are 2.2 pounds in a kilogram.
2. Write a program that asks the user to enter three numbers (use three separate input statements). Create variables called total and average that hold the sum and average of the three numbers and print out the values of total and average.
3. Write a program that uses a *for* loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.
4. Write a program that asks the user for their name and how many times to print it. The program should print out the user's name the specified number of times.
5. Use a *for* loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

   *
   **
   ***
   ****
6. Generate a random number between 1 and 10. Ask the user to guess the number and print a message based on whether they get it right or not.
7. Write a program that asks the user for two numbers and prints *Close* if the numbers are within .001 of each other and not close otherwise.
8. Write a program that asks the user to enter a word and prints out whether that word contains any vowels.
9. Write a program that asks the user to enter two strings of the same length. The program should then check to see if the strings are of the same length. If they are not, the program should print an appropriate message and exit. If they are of the same length, the program should alternate the characters of the two strings. For example, if the user enters *abcde* and *ABCDE* the program should print out *AaBbCcDdEe*.Write a program that asks the user for a large integer and inserts commas into it according to the standard American convention for commas in large numbers. For instance, if the user enters 1000000, the output should be 1,000,000.
10. In algebraic expressions, the symbol for multiplication is often left out, as in 3x+4y or 3(x+5). Computers prefer those expressions to include the multiplication symbol, like 3*x+4*y or 3*(x+5). Write a program that asks the user for an algebraic expression and then inserts multiplication symbols where appropriate.
11. Write a program that generates a list of 20 random numbers between 1 and 100.
    a) Print the list.
    b) Print the average of the elements in the list.
    c) Print the largest and smallest values in the list.

d) Print the second largest and second smallest entries in the list
e) Print how many even numbers are in the list.

12. Write a program that asks the user for an integer and creates a list that consists of the factors of that integer.
13. Write a program that generates 100 random integers that are either 0 or 1. Then find the longest run of zeros, the largest number of zeros in a row. For instance, the longest run of zeros in [1,0,1,1,0,0,0,0,1,0,0] is 4.
14. Write a program that removes any repeated items from a list so that each item appears at most once. For instance, the list [1,1,2,3,4,3,0,0] would become [1,2,3,4,0].
15. Write a program that asks the user to enter a length in feet. The program should then give the user the option to convert from feet into inches, yards, miles, millimetres, centimetres, meters, or kilometres. Say if the user enters a 1, then the program converts to inches, if they enter a 2, then the program converts to yards, etc. While this can be done with if statements, it is much shorter with lists and it is also easier to add new conversions if you use lists.
16. Write a function called *sum_digits* that is given an integer num and returns the sum of the digits of num.
17. Write a function called *first_diff* that is given two strings and returns the first location in which the strings differ. If the strings are identical, it should return -1.
18. Write a function called *number_of_factors* that takes an integer and returns how many factors the number has.
19. Write a function called *is_sorted* that is given a list and returns True if the list is sorted and False otherwise
20. Write a function called root that is given a number x and an integer n and returns $x^{1/n}$. In the function definition, set the default value of n to 2.
21. Write a function called primes that is given a number n and returns a list of the first n primes. Let the default value of n be 100.
22. Write a function called merge that takes two already sorted lists of possibly different lengths, and merges them into a single sorted list.

a) Do this using the sort method. b) Do this without using the sort method.

23. Write a program that asks the user for a word and finds all the smaller words that can be made from the letters of that word. The number of occurrences of a letter in a smaller word can't exceed the number of occurrences of the letter in the user's word.
24. Write a program that reads a file consisting of email addresses, each on its own line. Your program should print out a string consisting of those email addresses separated by semicolons.
25. Write a program that reads a list of temperatures from a file called *temps.txt*, converts those temperatures to Fahrenheit, and writes the results to a file called ftemps.txt.
26. Write a class called Product. The class should have fields called name, amount, and price, holding the product's name, the number of items of that product in stock, and the regular price of the product. There should be a method *get_price* that receives the number of items to be bought and returns the cost of buying that many items, where the regular price is charged for orders of less than 10 items, a 10% discount is applied for orders of between 10 and 99 items, and a 20% discount is applied for orders of 100 or more items. There should also be a method called *make_purchase* that receives the number of items to be bought and decreases amount by that much.
27. Write a class called Time whose only field is a time in seconds. It should have a method called *convert_to_minutes* that returns a string of minutes and seconds formatted as in the following example: if seconds is 230, the method should return '5:50'. It should also have a method called

convert_to_hours that returns a string of hours, minutes, and seconds formatted analogously to the previous method.

28. Write a class called Converter. The user will pass a length and a unit when declaring an object from the class—for example, c = Converter(9,'inches'). The possible units are inches, feet, yards, miles, kilometers, meters, centimeters, and millimeters. For each of these units there should be a method that returns the length converted into those units. For example, using the Converter object created above, the user could call c.feet() and should get 0.75 as the result.
29. Write a Python class to implement pow(x, n).
30. Write a Python class to reverse a string word by word.
31. Write a program that opens a file dialog that allows you to select a text file. The program then displays the contents of the file in a textbox.
32. Write a program to demonstrate Try/except/else.
33. Write a program to demonstrate try/finally and with/as.

Course Outcomes: After completing this course, Students will be able to-

CO1: Comprehend how software easily to build right out of the box.
CO2: Demonstrates the use of an interpreted language for problem solving through control statements including loops and conditionals.
CO3: Practice with data structures for quick programming solutions.
CO4: Demonstrates software building for real needs by breaking out code into reusable functions and modules.
CO5: Comprehend the software reliability through exception handling.

CO – PO MAPPING:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	2	2	-	-	-	2	-	-	-
CO2	2	2	2	2	2	-	-	-	2	-	-	-
CO3	2	2	2	2	3	-	-	-	2	-	-	-
CO4	2	1	2	2	2	-	-	-	3	2	-	-
CO5	-	3	3	2	3	-	-	-	3	2	-	-

[1-Slight (low), 2-Moderate (Medium), 3-Substantial (High)]

***

I- Year II - Semester	Name of the Course	L	T	P	C
MC1201	Environmental Science	2	0	0	0

Course Objectives

- To make the students to get awareness on environment,
- to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day-to-day activities of human life
- to save earth from the inventions by the engineers.

Unit-1

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness.

Natural Resources: Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Unit-2

ECOSYSTEMS, BIODIVERSITY, AND ITS CONSERVATION

Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

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

Unit-3

ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT

Environmental Pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid Waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Unit-4

SOCIAL ISSUES AND THE ENVIRONMENT

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

Unit-5

HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations.Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

FIELD WORK: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc.

TEXT BOOKS

1. Text book of Environmental Studies for Undergraduate Courses by ErachBharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Palaniswamy – Pearson education
3. Environmental Studies by Dr.S.AzeemUnnisa, Academic Publishing Company

REFERENCES

1. Textbook of Environmental Science by Deeksha Dave and E.Sai Baba Reddy, Cengage Publications.
2. Text book of Environmental Sciences and Technology by M.Anji Reddy, BS Publication.
3. Comprehensive Environmental studies byJ.P.Sharma, Laxmi publications.
4. Environmental sciences and engineering – J. Glynn Henry and Gary W. Heinke – Prentice Hall of India Private limited.
5. A Text Book of Environmental Studies by G.R.Chatwal, Himalaya Publishing House
6. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela-Prentice Hall of India Private limited.

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

COURSE OUTCOMES

CO1	Able to U**nderstand** The concepts of the ecosystem
CO2	Able to U**nderstand** The natural resources and their importance
CO3	Able to learn the biodiversity of India and the threats to biodiversity,and **Apply** conservation practices
CO4	Able to learn Various attributes of the pollution and their impacts
CO5	Able to U**nderstand** Social issues both rural and urban environment
CO6	Able to U**nderstand** About environmental Impact assessment and **Evaluate** the stages involved in EIA

CO PO MAPPING

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												1
CO2												1
CO3												1
CO4												1
CO5												1
CO6												1

(Strong – 3; Moderate – 2; Weak – 1)

***

II- Year I - Semester	Name of the Course	L	T	P	C
BS2101	Mathematics - III	2	1	0	3

Pre-Requisites: Mathematics-I and Mathematics-II

Course Objectives:

1. To instruct the concept of Matrices in solving linear algebraic equations
2. To familiarize the techniques in partial differential equations
3. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real-world applications

UNIT-I: Solving system of linear equations, Eigen values and Eigen Vectors

Rank of a matrix by Echelon form and normal form–solving system of homogeneous and non-homogeneous linear equations–Gauss elimination, Gauss Jordan for solving system of equations-Eigen values and Eigen vectors and their properties

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 forms by orthogonal transformation.

Application: Free vibration of two mass systems.

UNIT – III: Vector Differentiation:

Scalar and Vector point functions-Vector Differential operator- Gradient – Directional derivatives–Divergence – Curl – Laplacian second order operator- Vector identities- Scalar Potential.

UNIT– IV: Vector Integration:

Line integral – Work done – Circulation- Surface integral- Volume integral Vector integral theorems (without proof): Greens theorem in a plane- Stokes theorem- Gauss Divergence theorem.

UNIT– V: Solutions of Partial differential Equations

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.

Second order PDE: Solutions of linear partial differential equations with constant coefficients RHS term of the type $e^{ax+by}, \sin(ax+by), \cos(ax+by), x^m y^n$.

Text Books:

3. **B.S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.

Reference Books:

4. **B.V. Ramana,** Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
5. **H.K.Das,** Advanced Engineering Mathematics, 22nd Edition, S. Chand & Company Ltd.
6. **Erwin Kreyszig**, Advanced Engineering Mathematics, 10th Edition, Wiley-India.

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

CO1: develop the use of matrix algebra techniques that is needed by engineers for practical applications (L6)

CO2: solve system of linear algebraic equations using Gauss elimination, Gauss Jordan (L3)

CO3: to interpret the physical meaning of different operators such as gradient, curl and divergence (L5)

CO4: estimate the work done against a field, circulation and flux using vector calculus (L5)

CO5: identify the solution methods for partial differential equation that model physical processes (L3)

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										1
CO3	3	2										1
CO4	3	2										1
CO5	3	2										1

***

II- Year I - Semester	Name of the Course	L	T	P	C
PC2101	Mathematical Foundations of Computer Science	2	1	0	3

Course Objectives:

- To introduce concepts of mathematical logic.
- To introduce concepts and perform operations with sets, relations and functions.
- To solve counting problems by applying elementary counting techniques.
- To introduce algebraic structures, generating functions and recurrence relations.
- To use graph theory for solving problems.

Unit-1: Mathematical Logic & Calculus 8hrs

Mathematical Logic: Propositional Calculus: Statements and Notations, Connectives, Well Formed Formulas, Truth Tables, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Normal Forms, Theory of Inference for Statement Calculus, Consistency of Premises, and Indirect Method of Proof.

Predicate Calculus: Predicative Logic, Statement Functions, Variables and Quantifiers, Free and Bound Variables, Inference Theory for Predicate Calculus.

Unit-2: Set theory & Relations 10hrs

***Set Theory*:** Introduction, Operations on Binary Sets, Principle of Inclusion and Exclusion.

Relations: Properties of Binary Relations, Relation Matrix and Digraph, Operations on Relations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering Relations, Hasse Diagrams, *Functions:* Bijective Functions, Composition of Functions, Inverse Functions, Permutation Functions, Recursive Functions, Lattice and its Properties.

Unit-3: Algebraic Structures and Number Theory 10hrs

Algebraic Structures: Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism.

Number Theory: Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, and Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

Unit-4: Combinatorics& Recurrence Relations 10hrs

Combinatorics: Binomial and Multinomial Coefficients, Binomial and Multinomial Theorems, Pigeonhole Principle and its Application.

Recurrence Relations: Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving non homogeneous Recurrence Relations.

Unit-5: Graph Theory **10hrs**

Graph Theory: Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multi graphs, Planar Graphs, Euler's Formula, Graph Coloring, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Text Books:

1. Discrete Mathematical Structures with Applications to Computer Science, J. P. Tremblay and P. Manohar, Tata McGraw Hill.

2. Elements of Discrete Mathematics-A Computer Oriented Approach, C. L. Liu and D. P.Mohapatra, 3rdEdition, Tata McGraw Hill.

3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K. H.Rosen, 7th Edition, Tata McGraw Hill.

Reference Books:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel,T.P. Baker, 2nd Edition, Prentice Hall of India.

2. Discrete Mathematical Structures, BernandKolman, Robert C. Busby, Sharon CutlerRoss, PHI.

3. Discrete Mathematics, S. K. Chakraborthy and B.K. Sarkar, Oxford, 2020

E-resources

1. https://nptel.ac.in/courses/106/103/106103205/
2. https://nptel.ac.in/courses/106/106/106106183/

Course Outcomes:

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

CO-1: Use mathematical logic to solve problems(L3)
CO-2: Comprehend sets, relations and discrete structures(L2)
CO-3: Use number theory to perform modulo arithmetic and computer arithmetic. (L3)
CO-4: Solve problems on recurrence relations and counting principles (L3)
CO-5: Identify and solve real world problems using graphs and trees. (L4)

CO-PO-PSO Mapping:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	-	-	-	-	-	-	-	-	-	2	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	1	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	2	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-	2	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-	2	-

II- Year I - Semester	Name of the Course	L	T	P	C
PC2102	Data Structures	3	0	0	3

Course Objectives:

1. To impart the usage of linear list to students.
2. To help students understand the difference between dynamic memory using linked list.
3. To demonstrate the students about the operations Trees.
4. To make the student to understand various algorithms in graphs.
5. To make the students to learn the importance of hashing and sorting algorithms.

Unit-1: **10 hrs**

Algorithms and Linear Lists: Algorithmic complexity, performance and Analysis, Linear lists (Arrays), Applications of Linear List: Searching and Sorting

Unit-2: **10hrs**

Stacks and Queues, Linked Lists: Single Linked List, Double Linked List, Circular Linked List, Stack and Queues using Linked list

Unit-3: **10hrs**

Trees: Binary Trees Operations, Tree traversal, Threaded Binary Trees, Binary Search Trees, Binary Heap

Unit-4: **10hrs**

Graphs- Elementary Graph Operations, Graph Traversals, Minimum cost spanning tree Algorithms, Shortest paths algorithms.

Unit-5: **8hrs**

Hashing and Pattern Matching: Concept Hashing, Hash Functions, Collision Resolution Techniques, Pattern Matching algorithms

Text Books

1. Data structures, Algorithms and Applications in Java, S. Sahni, University Press (India) Pvt. Ltd, 2nd edition, Universities Press, Pvt. Ltd.
2. Data structures and Algorithm Analysis in Java, Mark Allen Weiss, Pearson Education. Ltd, Second Edition

Reference Books

1. Data Structures and Algorithms, A. V. Aho, J. E. Hopcroft, and J. D. Ullman, Pearson, 2002.
2. Introduction to Algorithms, by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, MIT Press. 3rd Edition.
3. Classical Data Structures, 2nd Edition, Debasis Samanta, PHI

e- resources

1. Data Structures Visualizations: https://www.cs.usfca.edu/~galles/visualization/Algorithms.html
2. Code Archery Youtube Channel: https://www.youtube.com/playlist?list=PLrKBFf87Cy9CNZpzi3poq8BFWCOh4f0vL

Course Outcomes:

CO1: **Comprehend** the implementation of linear lists **(Understand – L1)**
CO2: **Examine** static and dynamic data structures with suitable applications. **(Apply – L2)**
CO3: **Determine** trees applications. **(Apply – L2)**
CO4: appreciate the importance and **significance** of graph algorithms in building and solving real world applications. **(Analyze – L3)**
CO5: **Comprehend** and implement algorithms for text processing. **(Understand – L1)**

CO-PO mapping Table

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	3	2	2	-	-	-	-	-	-	-	-	2	2
CO2	1	3	3	2	-	-	-	-	-	-	-	-	2	2
CO3	1	-	3	2	-	-	-	-	-	-	-	-	2	2
CO4	2	-	3	2	-	-	-	-	-	-	-	-	2	2
CO5	1	3	2	2	-	-	-	-	-	-	-	-	2	2

II- Year I- Semester	Name of the Course	L	T	P	C
PC2103	Java Programming	3	0	0	3

Course Objectives:

1. To understand object-oriented programming concepts, and apply them in solving problems.
2. To make the students to learn the principles of inheritance and polymorphism; and to demonstrate how they relate to the design of abstract classes; to introduce the implementation of packages and interfaces.
3. To make the students to learn the concepts of exception handling.
4. To make the students to learn the concepts of multithreading.
5. To make the students to develop GUI applications.

Unit-I: Introduction to OOPS Concepts, Classes and Strings 8Hrs

Introduction to Object Oriented Programming, Java buzzwords, Java Programming Basics, Sample programs, Data types and operators, Control statements.

Classes: Classes, Objects, Methods, Constructors, this and static keywords, Method and Constructor Overloading, Access modifiers, arrays-One Dimensional and multi-dimensional arrays, Searching, Sorting.

Strings-Exploring the String class, String buffer class, Command-line arguments.

Unit – II: Inheritance, Interfaces, Packages 10Hrs

Inheritance: Need of inheritance, types, super keyword, abstract classes, interfaces, compile time and runtime polymorphism, Packages.

Unit – III: Exception Handling and I/O Streams 10Hrs

Exception Handling: Concepts of Exception handling, Built-in exceptions, creating own exception sub classes, Assertions.

Stream based I/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, Object Serialization, exploring java.nio

Unit – IV: Multithreading 10 Hrs

Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, daemon threads, thread groups.

Unit – V: GUI Programming 10Hrs

GUI Programming with Swing: Introduction, limitations of AWT, Various swing components & hierarchy.

Event Handling- event delegation model, sources of event, Event Listeners, adapter classes, inner classes.

Text Books

Java - The Complete Reference, Herbert Schildtz, MC GRAW HILL Education, 9th Edition, 2016

Reference Books

1. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.
2. "Core Java", Nageswar Rao, Wiley Publishers.
3. "Thinking in Java", Bruce Eckel, Pearson Education
4. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.

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

CO-1: Comprehend object-oriented programming concepts for problem solving. (L1)
CO-2: Build class hierarchy and packages for real world problems. (L2)
CO-3: Develop thread safe Java programs with appropriate Exception handling. (L3)
CO-4: Demonstrate multithreaded application programs through a language (L3)
CO-5: Design GUI applications using swings and multithreading. (L4)

CO-PO MAPPING MATRIX:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	2	1	1	-	-	-	-	-	-	-	-	2	1
CO2	-	2	2	2	1	-	-	-	-	-	-	-	2	1
CO3	-	2	2	2	1	-	-	-	-	-	-	-	2	2
CO4	-	2	2	2	1	-	-	-	-	-	-	-	2	1
CO5	-	2	2	2	2	-	-	-	-	-	-	-	2	1

II- Year I- Semester	Name of the Course	L	T	P	C
PC2104	Software Engineering	3	0	0	3

COURSE OBJECTIVES: The student should be able to

1. To understand the software life cycle models.
2. To understand the software requirements and SRS document.
3. To understand the importance of modeling and modeling languages.
4. To design and develop correct and robust software products.
5. To understand the quality control and how to ensure good quality software.

Unit-1: Introduction to Software Engineering: (8 Hrs)

Software, Software Classifications and Characteristics, Emergency of Software Engineering, what is Software Engineering? Software Engineering Challenges

Software Processes Process model, Elements and Characteristics of Process model, Process Classification, Phased Development Life Cycle, Software Development

Process Models: Prescriptive Process Models, Agile process models, and RUP process model

Unit-2: Project Management & Planning: (10 Hrs)

Project management essentials, Project success and failures, Project Life Cycle, Project team structure and organization, Software Configuration Management. Project planning activities, Metrics and Measurements, Project Size Estimation, Effort Estimation Techniques, Staffing and Personnel Planning, Project Scheduling and Miscellaneous Plans.

Unit-3: Requirement Engineering: (10 Hrs.)

Software Requirements, Requirement Engineering Process, Requirement Elicitation, Requirement Analysis (Structured Analysis, Object Oriented Analysis, Data Oriented Analysis and Prototyping Analysis), Requirements Specification, Requirement Validation, and Requirement Management.

Unit-4: Software Design: (12 Hrs.)

Software Design Process, Characteristics of a Good Design**,** Design Principles, Modular Design (Coupling and Cohesion), Software Architecture, Design

Methodologies (Function Oriented Design and Object-Oriented Design), Structured Design Methodology (SDM), Transaction Analysis and Logical Design;

Coding: Coding principles, Coding process, Code verification and documentations.

Unit-5: Software Testing: (8 Hrs)

Testing Fundamentals, Test Planning, Black Box Testing, White Box Testing, Levels of Testing, Debugging Approaches

Quality of Software: Quality Concept, Quality Factors, Verification and Validation, Quality Assurance Activities, Quality Standards: Capability Maturity Model (CMM), ISO 9000, Six Sigma.

Maintenance: Software Maintenance, Maintenance Process Models and Reengineering.

Text Books

1. Software Engineering: Concepts and Practices- UgrasenSuman, Cengage Learning Publications.
2. Fundamentals of Software Engineering-Rajib Mall, PHI, New Delhi.

Reference Books

1. An Integrated Approach to S/w Engineering- PankajJalote, Narosa Publishing House.
2. Software Engineering- Ian Sommerville, Pearson Education, New Delhi.
3. Software Engineering Concepts-Richard E. Fairly, Tata McGraw Hill Inc. New York.

e- resources

https://www.javatpoint.com/software-engineering-tutorial

COURSE OUTCOMES: Upon successful completion of the course, the student will be able to

CO1: Define and develop s/w projects from requirement gathering to implementation. (L1)
CO2: Obtain knowledge about principles and practices of software engineering. (L2)
CO3: Focus on the fundamentals of modeling a software project. (L2)
CO4: Obtain knowledge about estimation and maintenance of software systems (L3)
CO5: Design test cases, schedules and perform testing for SQA (L3)

CO-PO MAPPING MATRIX:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	1	2	1	-	-	-	3	-	2	3	2	1	2	1
CO2	-	2	3	1	2	2	2	-	1	2	1	-	3	1
CO3	-	-	2	-	3	3	1	-	2	1	3	-	3	2
CO4	1	3	2	2	2	2	3	-	-	2	2	-	3	1
CO5	-	-	2	-	3	2		2	2	-	2	-	2	1

II- Year I- Semester	Name of the Course	L	T	P	C
PC2101L	Data Structures Lab	0	0	3	1.5

Course Objectives:

1. Ability to apply computational thinking to a diverse set of problems.
2. Ability to adapt to new challenges and computational environments.
3. Proficiency in the design and implementation of algorithms.

List of experiments:

Prerequisites: Solve the following problems in Hackerrank

1. Time Conversion
2. Diagonal Difference
3. Stair case
4. Birthday Cake candles

UNIT I

1. Implement Binary Search using arrays
2. Implement Insertion Sort.
3. Implement Quick Sort
4. Implement Merge Sort
5. Implement Radix Sort

String Pairs
Anagram

UNIT II

6. Implement stack using arrays
7. Implement conversion of infix to postfix expression.
8. Implement queue using arrays.
9. Implement circular queue
10. Implement Singly Linked List
11. Implement Doubly Linked List
12. Implement Binary Heap Operations.

Minimize the Sum
Implement Expression Tree.

UNIT III

13. Implement Complete Binary Tree
14. Implement Binary Trees Traversal techniques (recursive and non-recursive)
15. Implement Binary Search Tree
16. Implement Binary Heap Operations.

UNIT IV

17. Implement Graph and its operations
18. Implement Breadth First Search
19. Implement Depth First Search
20. Implement Prims' Algorithm
21. Implement Kruskal's Algorithm

Implement Island Strikes.

Implement Pawn Moves.

UNIT V

22. Implement Linear Probing on a dictionary.
23. Implement Separate Chaining.
24. Implement Brute Force Pattern Matching.
25. Implement Boyer Moore Pattern Matching.

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1	Select the most appropriate data structure and defend the selection. (L2)
CO2	Appropriately solve a variety of computational problems. (L3)
CO3	Communicate their results and describe an algorithm. (L2)

CO-PO Mapping

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSP O1**	**PSP O2**
CO-1	2	3	2										2	1
CO-2	2	3	3	1									2	1
CO-3		3	2	2									2	1

II- Year I- Semester	Name of the Course	L	T	P	C
PC2102L	Java Programming Lab	0	0	3	1.5

Course Objectives:

1. To write programs using abstract classes.
2. To write programs for solving real world problems using java collection frame work.
3. To write multithreaded programs.
4. To design GUI application using swing controls.
5. To introduce java compiler and eclipse platform
6. To impart hands on experience with java programming.

Note:

Mandatory to follow test driven development with Eclipse IDE empowered JUnit testing framework and code coverage plugin.

The list suggests the minimum program set. Hence, the concerned staff is requested to add more problems to the list asneeded.

List of Experiments

1. Create a class called Invoice that a hardware store might use to represent an invoice for an item sold at the store. An Invoice should include four pieces of information as instance variables-a part number (type String),a part description(type String),a quantity of the item being purchased (type int) and a price per item (double). Your class should have a constructor that initializes the four instance variables. Provide a set and a get method for each instance variable. In addition, provide a method named getInvoiceAmount() that calculates the invoice amount (i.e., multiplies the quantity by the price per item), then returns the amount as a double value. If the quantity is not positive, it should be set to 0. If the price per item is not positive, it should be set to 0.0. Write a test application named InvoiceTest that demonstrates class Invoice's capabilities. [CO1]

2. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, and type of EB connection (i.e., domestic or commercial). Compute the bill amount using the following tariff. [CO1]

   If the type of the EB connection is domestic, calculate the amount to be paid as follows:

   1. First 100 units - Rs. 1 per unit
   2. 101-200units - Rs. 2.50 per unit
   3. 201 -500 units - Rs. 4 per unit
   4. >501 units - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:

5. First 100 units - Rs. 2 per unit
6. 101-200units - Rs. 4.50 per unit
7. 201 -500 units - Rs. 6 per unit
8. >501 units - Rs. 7 per unit

3. Create class SavingsAccount. Use a static variable annualInterestRate to store the annual interest rate for all account holders. Each object of the class contains a private instance variable savingsBalance indicating the amount the saver currently has ondeposit. Provide method calculateMonthlyInterest to calculate the monthly interest by multiplying the savingsBalance by annualInterestRate divided by 12 this interest should be added to savingsBalance. Provide a static method modifyInterestRate that sets the annualInterestRate to a new value.Write a program to test class SavingsAccount. Instantiate two savingsAccount objects, saver1 and saver2, with balances of $2000.00 and $3000.00, respectively. Set annualInterestRate to 4%, then calculate the monthly interest and print the new balances for both savers. Then set the annualInterestRate to 5%, calculate the next month's interest and print the new balances for both savers. [CO1]
4. Create a class called Book to represent a book. A Book should include four pieces of information as instance variables-a book name, an ISBN number, an author name and a publisher. Your class should have a constructor that initializes the four instance variables. Provide a mutator method and accessor method (query method) for each instance variable. In addition, provide a method named getBookInfo that returns the description of the book as a String (the description should include all the information about the book). You should use this keyword in member methods and constructor. Write a test application named BookTest to create an array of object for 30 elements for class Book to demonstrate the class Book's capabilities. [CO1].
5. Write a JAVA program to search for an element in a given list of elements using binary search mechanism. [CO1]
6. Write a Java program that implements Merge sort algorithm for sorting and also shows the number of interchanges occurred for the given set of integers. [CO1]
7. Write a java program to make rolling a pair of dice 10,000 times and counts the number of times doubles of are rolled for each different pair of doubles. Hint: Math.random() [CO1].
8. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% ofBP for staff club fund. Generate pay slips for the employees with their gross and net salary. [CO1]
9. Write a Java Program to create an abstract class named Shape that contains twointegers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the givenshape.[CO2]

10. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa), time converter (hours to minutes, seconds and vice versa) using packages. [CO1]
11. Write a Java Program to Handle Arithmetic Exceptions and InputMisMatchExceptions. [CO1]
12. Write a multi-threaded Java program to print all numbers below 100,000 that are both prime and Fibonacci number (some examples are 2, 3, 5, 13, etc.). Design a thread that generates prime numbers below 100,000 and writes them into a pipe. Design another thread that generates Fibonacci numbers and writes them to another pipe. The main thread should read both the pipes to identify numbers common to both. [CO3].
13. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number. [CO3].

14. Write a Java program that correctly implements the producer – consumer problem using the concept of inter-thread communication. [CO3].

15. Write a Java program that reads a file name from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes. [CO1].

16. Write a Java program to build a Calculator in Swings/ [CO4]

17. Write a Java program to implement JMenu to draw all basic shapes using Graphics. [CO4]

18.Write a Java program to implement JTable and JTree. [CO4]

19. Write a Java program to implement JTabbedPane. [CO4]

20. Write a Java Program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle and the result produced by the server is the area of the circle. [CO3]

Course Outcomes: at the end of the lab, the student will be able to

CO1: Develop programs for solving real world problems using java collection frame work. (L2)
CO2: Develop and apply multithreaded programs in network applications. (L2)
CO3: Develop GUI programs using swing controls in Java. (L2)

CO-PO mapping Table

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	2	2	2		2				2				2	2
CO2	2	2	2		2				2				2	2
CO3	2	2	2		2				2				2	2

II-Year-I Semester	SOFTWARE ENGINEERING LAB	L	T	P	C
PC2104L		0	0	3	1.5

The Software Engineering lab will facilitate the students to develop a preliminary yet practical understanding of software development process and tools

Course Objectives

- To have hands on experience in developing a software project by using various software engineering principles and methods in each of the phases of software development.

Experiments

Take any real time problem and do the following experiments:

1. Do the Requirement Analysis and Prepare SRS
2. Using COCOMO model estimate effort.
3. Calculate effort using FP oriented estimation model.
4. Analyze the Risk related to the project and prepare RMMM plan.
5. Develop Time-line chart and project table using PERT or CPM project scheduling methods.
6. Draw E-R diagrams, DFD, CFD and structured charts for the project.
7. Design of Test cases based on requirements and design.
8. Prepare FTR
9. Prepare Version control and change control for software configuration items

Reference Books:

1.Roger S.Pressman, Software engineering-A practitioner's Approach, McGraw-Hill International Edition, 6th edition, 2001.
2.IanSommerville, Software engineering, Pearson education Asia, 6th edition, 2000.

Course Outcomes

1. To demonstrate requirement gathering techniques to create SRS for a defined problem.
2. To implement the cost, size, effort estimation techniques on a defined problem
3. To assess the risk for a defined problem by applying Risk Assessment strategies like RMMM.
4. To investigate a real-world problem using modern modelling tools.
5. To formulate test cases based on requirements and design
6. To conduct FTRs as a measure of communication between him and the other stakeholders of the project

CO-PO mapping:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	-	3	-	-	-	3	3	2	-
CO2	3	3	-	-	-	-	-	-	3	3	3	-
CO3	3	3	-	-	-	-	-	-	3	3	3	-
CO4	3	3	3	3	-	-	-	-	3	3	3	-
CO5	3	2	-	-	3	-	-	-	3	3	-	-
CO6	-	-	-	-	-	-	-	-	3	3	3	-

II- Year I- Semester	Advanced Python Programming (Skill Oriented Course)	L	T	P	C
SOC2101		1	0	2	2

PRE-REQUISITES:

- Fundamentals of Python
- Problem solving skills

Course objectives: The student should be able to

1. Able to learn advanced concepts in Python
2. Able to use advanced packages like numpy, scipy, opencv in Python for building data processing & visualizing applications.
3. Able to process digital imaging applications

Unit-1: Python Fundamentals: Introduction to Python, Data Structures – List, Dictionaries, Sets and Tuples. **(4 hrs)**

Modules, Python Packages, Libraries: Modules - Creating modules, import statement, from Import statement, name spacing. Math Module: Constants, Power and logarithmic functions, Trigonometric functions. Numpy Library: Numpy import, Basic functions, Matrices Addition, Subtraction Multiplication, Transpose, Inverse, Eigen values and Eigenvectors using Numpy **(8hrs)**

Unit-2: Python packages: Introduction to PIP, Installing Packages via PIP, Using Python Packages**(4hrs)**

Data Visualization – Matplotlib - Loading the library and importing the data, How Mat plot lib works? modifying the appearance of a plot, plotting multiple plots, Modifying the tick marks, Scatter plots, Bar plots. **(6hrs)**

Unit-3: File Handling – Introduction to Files, File modes, Reading, writing data from files, Copy one file to another, deletion of files. Other file programs in Python. **(4hrs)**

Text Processing: Word, character and line counting, Frequency count. Usage of with () and split (). Reading and writing into CSV formats**. (6hrs)**

Unit-4: Image Processing - Installing Jupiter notebook. Image & Its properties. Image processing applications. Image I/O and display with Python, Reading, saving and displaying an image using Open CV - PyPI, matplotlib

Sample programs – Image statistics Cropping, converting images from RGB to Gray and resizing the image. **(8 hrs)**

Unit-5: Using Databases and SQL – Introduction to Database Concepts, usage of SQLite, Create, Insert & Retrieve data, Spidering twitter using a database. Sample Python codes **(8 hrs)**

Text books:

1. Python for Everybody: Exploring Data Using Python 3, Charles Severance
2. The Hitchiker's Guide to Python, O'Reilly publication

Reference books:

1. Hands-On Image Processing with Python, O'Reilly Publications
2. *Think Python,* Allen Downey, Green Tea Press

e- Resources & other digital material

1. https://nptel.ac.in/courses/117/105/117105079/
2. https://nptel.ac.in/courses/106/106/106106145/#
3. https://realpython.com/python-mysql/

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1: Recall the usage of Python Concepts. (L1)

CO2: Use different Python packages for Data Visualization (L2)

CO3: Demonstrate File handling & text processing (L3)

CO4: Demonstrate applications that performs Image processing (L3)

CO5: Connect database with Python. (L4)

CO-PO mapping Table

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	1	1	1	2									2	
CO2	1	2	2	2									2	
CO3	1	2	2	2									2	
CO4	2	2	2	2									2	
CO5	1	2	2	1									2	

II- Year I- Semester	Name of the Course	L	T	P	C
MC2101	Essence of Indian Traditional Knowledge	2	0	0	0

Objectives:

To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

- The course aim of the importing basic principle of third process reasoning and inference sustainability is at the course of Indian traditional knowledge system
- To understand the legal framework and traditional knowledge and biological diversity act 2002 and geographical indication act 2003.
- The courses focus on traditional knowledge and intellectual property mechanism of traditional knowledge and protection.
- To know the student traditional knowledge in different sector.

Unit-I: 10Hrs

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Learning Outcomes:

At the end of the unit the student will able to:

- Understand the traditional knowledge.
- Contrast and compare characteristics importance kinds of traditional knowledge.
- Analyze physical and social contexts of traditional knowledge.
- Evaluate social change on traditional knowledge.

Unit-II: **10Hrs**

Protection of traditional knowledge: the need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Learning Outcomes:

At the end of the unit the student will able to:

- Know the need of protecting traditional knowledge.
- Apply significance of TK protection.
- Analyze the value of TK in global economy.
- evaluate role of government

Unit-III: 10Hrs

Legal framework and TK: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act);B:The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indications act 2003.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand legal framework of TK.
- Contrast and compare the ST and other traditional forest dwellers
- Analyze plant variant protections
- Evaluate farmers right act

Unit-IV: 7Hrs

Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FOR A for increasing protection of Indian Traditional Knowledge.

Learning Outcomes:

At the end of the unit the student will able to:

- Understand TK and IPR
- Apply systems of TK protection.
- Analyze legal concepts for the protection of TK.
- Evaluate strategies to increase the protection of TK.

Unit-V: 9Hrs

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

Learning Outcomes:

At the end of the unit the student will able to:

- know TK in different sectors.
- apply TK in engineering.
- analyze TK in various sectors.
- evaluate food security and protection of TK in the country.

Reference Books:

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by AmitJha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" KapilKapoor, Michel Danino

E-Resources:

1. https://www.youtube.com/watch?v=LZP1StpYEPM
2. 2.http://nptel.ac.in/courses/121106003/

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

1. understand the concept of Traditional knowledge and its importance
2. know the need and importance of protecting traditional knowledge
3. know the various enactments related to the protection of traditional knowledge.
4. understand the concepts of Intellectual property to protect the traditional knowledge

***

II- Year II- Semester	Name of the Course	L	T	P	C
BS2201	Probability and Statistics	2	1	0	3

Course objectives:

1. To **Classify** the concepts of data science and its importance (L4) or (L2)
2. To **Interpret** the association of characteristics and through correlation and regression tools (L4)
3. To **Understand** the concepts of probability and their applications, **apply** discrete and continuous probability distributions (L3)
4. To **Design** the components of a classical hypothesis test (L6)
5. To **Infer** the statistical inferential methods based on small and large sampling tests (L4)

UNIT-I

Descriptive statistics and methods for data science: Data Science-Statistics Introduction-Population vs Sample-Collection of data-primary and secondary data-Types of variable: dependent and independent Categorical and Continuous Variables-Data Visualization-Measures of Central Tendency-Measures of Variability (spread or variance)-Skewness Kurtosis.

UNIT-II

Correlation and Curve fitting: Correlation- correlation coefficient-Rank Correlation-Regression coefficient and properties-regression lines-Multiple Regression-Method of least squares-Straight line-parabola-Exponential-Power curves.

UNIT-III

Probability and Distributions: Probability- Conditional probability and Baye's Theorem-Random Variables-Discrete and Continuous random variables-Distribution Function-Mathematical Expectation and Variance-Binomial, Poisson, Uniform and Normal distributions.

UNIT-IV

Sampling Theory: Introduction–Population and samples-Sampling distribution of Means and Variance (definition only)-Central limit theorem (without proof)-Point and Interval estimations, good estimator, Unbiased estimator, Efficiency Estimator-Maximum error of estimate.

UNIT-V

Test of Hypothesis: Introduction–Hypothesis-Null and Alternative Hypothesis-Type I and Type II Errors-Level of significance-One tail and two-tail tests-Tests concerning one mean, two means, and proportions using Z test, Tests concerning one mean, two means using t test, also chi-square and F tests use for small samples.

Text books:

1. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. **S. C. Gupta and V. K. Kapoor,** Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012

Reference books

1. **Shron L. Myers, Keying Ye, Ronald E Walpole,** Probability and Statistics Engineers and the Scientists, 8th Edition, Pearson 2007.

2. **Jay I. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Sheldon M. Ross,** Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.
4. **Johannes Ledolter and Robert V. Hogg,** Applied statistics for Engineers and Physical Scientists, 3rd Edition, Pearson, 2010.
5. **T. K. V. Iyenger**, Probability and Statistics, S. Chand & Company Ltd, 2015.

e- Resources & other digital material

1. https://www.youtube.com/watch?v=COI0BUmNHT8&list=PLyqSpQzTE6M_JcleDbrVyPnE0PixKs2JE(For Probability and Statistics)
2. https://www.youtube.com/watch?v=VVYLpmKRfQ8&list=PL6C92B335BD4238AB(For Probability and Statistics)
3. https://www.mathsisfun.com/data/standard-normal-distribution-table.html(Information about Normal distribution)
4. https://www.statisticshowto.com/tables/t-distribution-table/(Information about T- distribution)

Statistical Tables to be allowed in examinations:

1. Normal distribution table
2. T- distribution table

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1: **Classify** the concepts of data science and its importance (L4) or (L2) (**Understand, Analyze)**
CO2: **Interpret** the association of characteristics and through correlation and regression tools (L4) **Analyze**
CO3: **Understand** the concepts of probability and their applications, **apply** discrete and continuous probability distributions (L3) **Understand, Apply**
CO4: **Design** the components of a classical hypothesis test (L6) **Understand, Design, create**
CO5: **Infer** the statistical inferential methods based on small and large sampling tests (L4) **Understand, Analyze**

CO-PO mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO-1	PSO-2
CO1	2	2												
CO2	2	3												
CO3	2	2												
CO4	2	2												
CO5	2	3												

***

II- Year II- Semester	Name of the Course	L	T	P	C
ES2201	Computer Organization	3	0	0	3

Course Objectives:

1. To understand basic structures of computers and to understand various machine instructions.
2. To understand basic structures of computers and to understand various machine instructions.
3. To analyse ALU & I/O organization of a computer.
4. To understand various memory systems.
5. To analyse functionalities done by processing unit and also learn micro programmed control.

Unit – I: Basic Structure of a Computer and Machine Instructions. 8 hrs

Introduction, History of Computer Generations, Functional unit, Basic Operational concepts, Bus structures, System Software, Performance. Number representation: Fixed Point and Floating-Point representation. Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types

Unit – II: Addressing modes and types of Instructions 10 hrs

Addressing Modes, Basic Input/output Operations, and role of Stacks and Queues in computer programming equation.

Component of Instructions: Logical Instructions, shift and Rotate Instructions. Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

Unit – III: **Basic building blocks for the ALU: 10 hrs**

Adder, Subtractor, Shifter, Multiplication and division circuits. Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

Unit – IV: The Memory Systems 8 hrs

Basic memory circuits, Memory System Consideration, Read- Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Associative Memory, Cache Memories: Mapping Functions, INTERLEAVING, Secondary Storage: Magnetic Hard Disks, Optical Disks.

Unit – V: Processing unit **12 hrs**

Fundamental Concepts: Register Transfers, Performing an Arithmetic or Logic Operation, fetching a Word from Memory, Execution of Complete Instruction, Hardwired Control, MICRO PROGRAMMED CONTROL: Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field.

Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization by William Stallings, PHI Pvt. Ltd., Eastern Economy Edition, Sixth Edition, 2003

Reference Books:

1. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.
2. Computer System Architecture by M Morris Mano, Prentice Hall of India, 2001

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

CO-1: Comprehend basic structures of computers and various machine Instructions.(L1)
CO-2: Learn and use the addressing modes and types of instructions. (L2)
CO-3: Analyze I/O organization of a computer. (L3)
CO-4: Comprehend various memory systems. (L2)
CO-5: Analyze functionalities done by processing unit and also learn micro programmed control. (L3)

CO-PO Mapping Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	2	-	-	-	-	-	-	-	-	-	-	-	-	2
CO2	2	-	2	-	-	-	-	-	-	-	-	-	-	2
CO3	-	2	2	-	-	-	-	-	-	-	-	-	2	-
CO4	-	2	2	-	-	-	-	-	-	-	-	-	2	-
CO5	2	2	2	1	-	-	-	-	-	-	2	2	2	2

****

II- Year II- Semester	Name of the Course	L	T	P	C
PC2203	Operating Systems	3	0	0	3

Course Objectives:

1. Study the basic concepts and functions of operating system
2. Learn about Processes, Threads and Scheduling algorithms
3. Understand the principles of concurrency and Deadlocks
4. Learn various memory management schemes
5. Study I/O management and File systems

UNIT-I **8 Hours**

Introduction to Operating System Concepts: What Operating Systems do, Computer System Organization, Functions of Operating systems, Types of Operating Systems, Operating Systems Services, System calls, Types of System calls, Operating System Structures, Distributed Systems, Special purpose systems.

UNIT-II **10 Hours**

Process Management: Process concept, Process State Diagram, Process control block, Process Scheduling- Scheduling Queues, Schedulers, Scheduling Criteria, Scheduling algorithms and their evaluation, Operations on Processes, Inter-process Communication.

Threads: Overview, User and Kernel threads, Multi-threading Models.

UNIT-III **10 Hours**

Concurrency: Process Synchronization, The Critical- Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Monitors, and Classic Problems of Synchronization.

Principles of deadlock: System Model, Deadlock Characterization, Methods for Handling Deadlocks: Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock.

UNIT- IV **10 Hours**

Memory Management: Logical vs physical address space, Swapping, Contiguous Memory Allocation, Paging, Structures of the Page Table, Segmentation.

Virtual Memory Management: Virtual memory overview, Demand Paging, Page-Replacement & its algorithms, Allocation of Frames, Thrashing.

UNIT-V **10 Hours**

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

File System implementation: File system structure, Allocation methods, and Free-space management.
Mass-storage structure: overview of Mass-storage structure, Disk scheduling, Swap space management.

Text Books:

1. Operating System Concepts, Abraham Silberschatz, Peter Baer Galvin and Greg Gagne 9th Edition, John Wiley and Sons Inc., 2012

2. Operating Systems – Internals and Design Principles, William Stallings, 7th Edition, Prentice Hall, 2011

Reference Books:

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

2. Operating Systems: A Design-Oriented Approach, Charles Crowley, Tata McGraw Hill Education.

3. Operating Systems: A Concept-Based Approach, D M Dhamdhere, Second Edition, Tata McGraw-Hill Education

e-Resources

1. https://en.wikipedia.org/wiki/Operating_system
2. https://www.tutorialspoint.com/operating_system/

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

CO-1: Understand the structure and functionalities of Operating System (L1)
CO-2: Demonstrate the concept of Process, Threads and CPU Scheduling Algorithms (L2)
CO-3: Use the principles of Concurrency to solve Synchronization problems various methods for handling Deadlocks (L3)
CO-4: Infer various Memory Management Techniques (L1)
CO-5: Illustrate File System Implementation (L2)

CO-PO Mapping Matrix:

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	1	2	-	-	-	-	-	-	-
CO3	2	2	3	-	2	-	-	-	-	-	-	-
CO4	3	3	3	-	2		-	-	-	-	-	-
CO5	1	1	1	-	-	-	-	-	-	-	-	-

CO-PSO Mapping Matrix:

	PSO-1	PSO-2
CO1	3	2
CO2	3	--
CO3	2	--
CO4	2	2
CO5	3	2
CO6	1	--

***

II- Year II- Semester	Name of the Course	L	T	P	C
PC2202	Database Management System	3	0	0	3

Course Objectives:

1. Study the basic concepts and importance of Database Management Systems
2. Learn and understand the conceptual design of database and information retrieval
3. Learn various commands and writing of queries for information retrieval
4. Understand the concepts of Database design
5. Study of internal storage and its access

Unit-I: Introduction (10hrs)

Introduction to Database, Applications of Database, Purpose of Database, View of Data, Data Independence, Data Models, Users of Database, DBA, Query Processor, Storage Manager, Database Architecture

Unit-II: Conceptual Design & Relational Query Languages (10hrs)

Conceptual Design of Database using ER Model, Notations, Types of attributes, Relation, Mapping Constraints, Features of ER Diagram, Weak Entity Set, Examples of Conceptual Design

Relational Algebra: Selection, Projection, Set Operations, Rename, Cartesian-Product, Join, Outer Join, Examples

Relational Calculus: Tuple Relational Calculus and Domain Relational Calculus, Safety Expressions

Unit-III: SQL & PL/SQL (10hrs)

SQL Commands: DDL, DML, TCL, DCL

Types of Constraints (Primary, Alternate, Not Null, Check, Foreign), Basic form of SQL query, joins, outer joins, set operations, group operations, various types of queries, PL/SQL (Cursor, Procedures, Functions, Packages, Triggers…)

Unit-IV: Database Design (10 hrs)

Database Design: Normalization, Purpose of Normalization, Functional Dependency, Closure, 1NF, 2NF, 3NF, BCNF, MVFD, 4NF, Join Dependency, 5NF

Why NoSQL? Importance of NoSQL

Unit-V: Transaction, Data Recovery & Storage Management (8hrs)

Transaction Management: ACID Properties of Transactions, Conflict & View serializability, Lock based protocols, Time Stamp based protocol, Thomas Write Rule, Validation Based Protocol, Deadlock detection, Deadlock avoidance, Deadlock prevention: wait-die and wound-wait

Recovery Management: Types of failures, ideal storage, Log, Log records, log-based recovery techniques, Shadow Paging, ARIES

File Organization & Indexing: Types of File Organizations, Primary Indexing, Secondary Indexing, Multi-level Indexing, Hash Indexing, Tree Indexing

Text Books:

1. Data base System Concepts,5/e, Silberschatz, Korth, TMH
2. Introduction to Database Systems, CJ Date, Pearson

Reference Books:

1. Data base Management Systems, Raghu Rama Krishnan, Johannes Gehrke, and TATA McGraw Hill 3rd Edition
2. Fundamentals of Database Systems, ElmasriNavate Pearson Education

Course Outcomes:

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

CO1: To **comprehend** the basics of database systems and applications (L1)

CO2: To **construct** logical design of database and information retrieval (L2)

CO3: To **demonstrate** relational model practically (Structured Query Language) (L2)

CO4: To **demonstrate** and relate normalization for database design (L3)

CO5: To **outline** the necessity of transaction management, recovery management, file organization & indexing (L1)

CO-PO Mapping Matrix:

Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	--	--	--	--	--	3	--	--	--	--	--	1	--
CO2	3	2	2	--	--	--	--	--	--	--	--	--	--	2
CO3	3	2	1	--	3	--	--	--	--	--	--	--	2	3
CO4	3	2	1	--	--	--	--	--	--	--	--	--	1	3
CO5	2	--	--	--	--	--	--	--	--	--	--	--	1	--

II- Year II- Semester	Name of the Course	L	T	P	C
PC2201	Advanced Java Programming	3	0	0	3

Course Objectives:

1. To impart the knowledge on collection framework.
2. To make the students to develop network-based applications.
3. To introduce XML and processing of XML Data with Java.
4. To introduce Server-side programming with Java Servlets and JSP

UNIT-I **10 Hours**

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, Hash table, Properties, Stack, Vector.

UNIT-II **10 Hours**

Introduction to Networking: Basics of Networking, Networking classes and Interfaces, Networking with URLs, exploring java.net package.

JDBC Connectivity: JDBC connectivity, types of Jdbc Drivers, connecting to the database, JDBC Statements, JDBC Exceptions, Manipulations on the database

UNIT-III **10 Hours**

HTML Common tags- List, Tables, images, forms, Frames; Cascading Style sheets;

XML: Introduction to XML, Defining XML tags, their attributes and values, Document Type Definition, XML Schemas, Document Object Model, and Extensible Style sheet Language and XSL Transformations, Parsing XML Data – DOM and SAX Parsers in java.

UNIT- IV **10 Hours**

Introduction to Servlets: Life cycle of a Servlet, deploying a servlet, The Servlet API, Reading Servlet parameters, Reading Initialization parameters, Handling Http Request & Responses, Using Cookies and Sessions.

UNIT-V **8 Hours**

Introduction to JSP: The Anatomy of a JSP Page, JSP Processing, Declarations, Directives, Expressions, Code Snippets, implicit objects, Using Beans in JSP Pages, Using Cookies and session for session tracking.

Text Books:

1. Java The Complete Reference, Herbert Schildtz, MC GRAW HILL Education, 9th Edition, 2016
2. Internet and World Wide Web – How to program, Dietel and Nieto, Pearson.
3. Java Server Pages –Hans Bergsten, SPD O'Reilly.

Reference Books:

1. Chris Bates, "Web Programming, building internet applications", 2nd Edition, WILEY, Dreamtech, 2008.
2. Thomas A Powel, "The Complete Reference: AJAX", 1st Edition, Tata McGraw Hill, 2008.
3. Web Technologies, Uttam K Roy, Oxford University Press

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

CO1: Use various data structures using java collections. **(Implement – L2)**
CO2: Comprehend the trade-offs of implementation of priority queues. **(Understand – L1)**
CO3: Implement web-based applications using features of HTML and XML. **(Implement – L2)**
CO4: Appreciate the importance and significance of graph algorithms in building and solving real world applications. **(Analyze – L3)**
CO5: Comprehend and implement algorithms for pattern matching in a text. **(Understand – L1)**

CO-PO Mapping Matrix:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	1	1	2	-	-	-	-	-	-	-	-	2	1
CO2	-	1	2	2	-	-	-	-	-	-	-	-	2	1
CO3	-	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	-	2	2	2	-	-	-	-	-	-	-	-	2	1
CO5	-	2	2	2	-	-	-	-	-	-	-	-	2	1

II- Year II - Semester	OPERATING SYSTEMS LAB	L	T	P	C
PC2203L		0	0	3	1.5

Course Objectives:

1. Ability to apply computational thinking to a diverse set of problems.
2. Ability to analyze the working of an OS as a resource manager, file system manager, process manager, memory manager and I/O manager and methods used to implement the different parts of OS.
3. Proficiency in the design and implementation of algorithms.

LIST OF EXPERIMENTS

1. Simulate the following CPU scheduling algorithms [CO1]
a) FCFS
b) SJF (Premptive, Non Premptive)
c) Priority (Premptive, Non Premptive)
d) Round Robin

2. Simulate the following Process Synchronization techniques [CO1]
a) Bounded-Buffer problem
b) Readers-Writer's problem
c) Dining philosophers' problem using semaphores
d) Dining-Philosophers Solution using Monitors

4. Simulate Bankers Algorithm for [CO1]
a) Dead Lock Avoidance
b) Dead Lock Prevention

4. Simulate the following page replacement algorithms. [CO2]
a) FIFO
b) LRU
c) LFU
d) MFU

5. Simulate the following [CO2]
a) Multiprogramming with a fixed number of tasks (MFT)
b) Multiprogramming with a variable number of tasks (MVT)

6. Simulate the following File allocation strategies [CO3]

a) Contiguous
b) Linked
c) Indexed

7. Simulate the following disk-scheduling algorithms [CO3]
a) FCFS
b) SSTF
c) SCAN
d) C-SCAN
e) LOOK
f) C-LOOK

Course Outcomes:

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

CO1: Examine various process management techniques like CPU scheduling, process synchronization and deadlocks. [K4, Analyze]
CO2: Prioritize various memory management techniques like page replacement algorithms. [K4, Analyze]
CO3: Analyze various storage management techniques like file allocation and disk scheduling. [K4, Analyze]

CO-PO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
CO 1	2	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 2	2	2	2	-	-	-	-	-	-	-	-	1	2	1
CO 3	2	2	2	-	-	-	-	-	-	-	-	1	2	1

II- Year II - Semester	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
PC2202L	**Prerequisites:** Basic Data Handling	0	0	3	1.5

Course Objectives:

1. To familiarize the participant with the distinctions of database environments towards an information-oriented framework
2. To give a good formal foundation on the relational model of data
3. To present SQL and procedural interfaces to SQL comprehensively

List of experiments:

SQL

1. Queries for Creating, Dropping, and Altering Tables, Views, and Constraints **[CO1]**
2. Queries to facilitate acquaintance of Built-In Functions, String Functions, Numeric Functions, Date Functions and Conversion Functions. **[CO1]**
3. Queries using operators in SQL **[CO2]**
4. Queries to Retrieve and Change Data: Select, Insert, Delete, and Update **[CO2]**
5. Queries using Group By, Order By, and Having Clauses **[CO2]**
6. Queries on Controlling Data: Commit, Rollback, and Save point **[CO2]**
7. Queries to Build Report in SQL *PLUS **[CO2]**
8. Queries on Joins and Correlated Sub-Queries **[CO2]**
9. Queries on Working with Index, Sequence, Synonym, Controlling Access, and Locking Rows for Update, Creating Password and Security features **[CO2]**

PL/SQL

1. Write a PL/SQL Code using Basic Variable, Anchored Declarations, and Usage of Assignment Operation **[CO3]**
2. Write a PL/SQL Code Bind and Substitution Variables. Printing in PL/SQL **[CO3]**
3. Write a PL/SQL block using SQL and Control Structures in PL/SQL **[CO3]**
4. Write a PL/SQL Code using Cursors, Exceptions and Composite Data Types **[CO3]**
5. Write a PL/SQL Code using Procedures, Functions, and Packages FORMS **[CO4]**
6. Write a PL/SQL Code Creation of forms for any Information System such as Student Information System, Employee Information System etc. **[CO4]**
7. Demonstration of database connectivity **[CO4]**

Course Outcomes:

CO1: To create database for user (Creation of Database)
CO2: To solve various SQL queries for user defined schemas
CO3: To generalize PL/ SQL blocks
CO4: To illustrate the usage of user defined packages

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	--	3	--	--	--	--	--	--	--	--	--	3	2
CO2	3	2	1	1	--	--	--	--	--	--	--	--	1	3
CO3	2	1	1	--	--	--	--	--	--	--	--	--	1	--
CO4	2	--	--	--	--	--	--	--	--	--	--	--	1	--

***

II- Year II- Semester	Name of the Course	L	T	P	C
PC2201L	Advanced Java Programming Lab	0	0	3	1.5

Course Objectives

At the end of the course the students will understand

1. Implementing data structures using collection Framework
2. Basic technologies to develop web documents.
3. Developing Client-Server applications.
4. XML and Web Servers.
5. Java Servlet technologies.

LIST OF EXPERIMENTS

1. To write a Java Program to design an interface for Stack ADT and implement Stack ADT using both Array and Linked List.
2. Write a Java program that loads names and phone numbers from a text file where the data is organized as one line per record and each field in a record are separated by a tab (\t). It takes a name or phone number as input and prints the corresponding other value from the hash table (hint: use hash tables).
3. Write a Java program that connects to a database using JDBC and does add, delete, modify and retrieve operations.
4. Write a java program that prints the meta-data of a given table
5. Write a java program to implement client-server application
6. Develop and demonstrate a HTML5 document that illustrates the use of ordered list, unordered list, table, borders, padding, color, and the & tag.
7. Write HTML5 code to provide intra and inter document linking.
8. Create a web page with the following using HTML5:
   i. To embed an image map in a web page
   ii. To fix the hot spots
   iii. Show all the related information when the hot spots are clicked
   iv. Create a web page with all types of Cascading style sheets.
9. Create a web page with the following using CSS:
   v. Text shadows, rounded corners and box shadows.
   vi. Linear and Radial gradients.
   vii. Animation
   viii. Transitions and Transformations.

11.Create a home page for "Cyber book stores" that will display the various books available, the authors and prices of the books. Include a listbox that contains various subjects and a "submit" button, which displays information about the books on the subject required by the user.

12.Write an XML file which displays the book details that includes the following:

1) Title of book

2) Author name

3) Edition

4) Price

Write a DTD to validate the above XML file and display the details in at able (to do this use XSL).

13. Design an XML document to store information about a student in an engineering college. The information must include: college id, Name of the College, Brach, Year of Joining, and e-mail id. Makeup sample data for 3 students. Create a CSS style sheet and use it to display the document.
14. Write a program to demonstrate XML SAX Parser.
15. Write a program to demonstrate XML DOM Parser.
16. Create tables in the database which contain the details of items (books in our case Like Book name, Price, Quantity, Amount) of each category.

    Modify your catalogue page in such a way that you should connect to the database and extract data from the tables and display them in the catalogue page using JDBC.
17. Using java servlets and JDBC store and retrieve the following information from a database:
    a. Name
    b. Password
    c. Email id
    d. Phone number
18. Demonstrate Cookie and Session Management in Servlets.
19. Write a program to demonstrate Java Bean using JSP Implicit objects.
20. Write a JSP program to conduct online examination and to display student mark list available in a database.
21. Write a program to demonstrate cookie & Sessions using JSP.

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

CO-1: Create static web pages using HTML, CSS. (L2)

CO-2: Develop Client-Server Applications. (L3)

CO-3: Create XML documents and work with web servers to create web applications (L3)

CO-4: Build server-side programs using Java Servlets and JSP. (L3)

CO-PO Mapping:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	1	1	2	-	-	-	-	-	-	-	-	2	1
CO2	-	1	2	2	-	-	-	-	-	-	-	-	2	1
CO3	-	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	-	2	2	2	-	-	-	-	-	-	-	-	2	1

II- Year II- Semester	Name of the Course	L	T	P	C
SOC2201	Mobile Application Development	1	0	2	2

Course Objectives:

1. Understand Mobile application basics.
2. Understand components in SDK
3. Use different application tools
4. Build several applications

UNIT-I

Introduction: What is Android, Android versions and its feature set,the various Android devices on the market, The Android Market application store, Android Development Environment - System Requirements, Android SDK, Installing Java, and ADT bundle - Eclipse Integrated Development Environment (IDE), Creating Android Virtual Devices (AVDs)

Android Architecture Overview and Creating an Example Android Application: The Android Software Stack, the Linux Kernel, Android Runtime, Java Interoperability Libraries, Android Libraries, Application Framework, creating a New Android Project, Defining the Project Name and SDK Settings, Project Configuration Settings.

UNIT-II

Android Software Development Platform: Understanding Java SE, The Directory Structure of an Android Project, Common Default Resources Folders, The Values Folder, Leveraging Android XML, Screen Sizes, Launching Your Application: The AndroidManifest.xml File,Creating Your First Android Application

Android Framework Overview: Android Application Components, Android Activities: Defining the UI, Android Services: Processing in the Background, Broadcast Receivers: Announcements and Notifications Content Providers: Data Management, Android Intent Objects: Messaging for Components, Android Manifest XML: Declaring Your Components

UNIT-III

Understanding Android Views : View Groups and Layouts, Designing for Different Android Devices, Views and View Groups, Android Layout Managers, The View Hierarchy, Designing an Android User Interface using the Graphical Layout Tool, Displaying Text with TextView, Retrieving Data from Users, Using Buttons, Check Boxes and Radio Groups, Getting Dates and Times from Users, Using Indicators to Display Data to Users, Adjusting Progress with SeekBar, Working with Menus using views, Displaying Pictures, Gallery, ImageSwitcher, GridView, and ImageView views to display images, Creating Animation

UNIT- IV

Content Providers, and Databases

Saving and Loading Files, SQLite Databases, Android Database Design, Exposing Access to a Data Source through a Content Provider, Content Provider Registration, Native Content Providers.

Intents and Intent Filters: Intent Overview, Implicit Intents, Creating the Implicit Intent Example Project, Explicit Intents, Creating the Explicit Intent Example Application, Intents with Activities, Intents with Broadcast Receivers

A Basic Overview of Android Threads and Thread handlers

An Overview of Threads, The Application Main Thread, Thread Handlers, A Basic Threading Example, creating a New Thread, implementing a Thread Handler, Passing a Message to the Handler

UNIT-V

Messaging and Location-Based Services

Sending SMS Messages Programmatically, Getting Feedback after Sending the Message Sending SMS Messages Using Intent Receiving, sending email, Introduction to location-based service, configuring the Android Emulator for Location-Based Services, Geocoding and Map-Based Activities

Multimedia: Audio, Video, Camera

Playing Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures

Text Books:

1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

Reference Books:

1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

e-digital resources:

1. https://developer.android.com/courses/fundamentals-training/toc-v2
2. https://google-developer-training.github.io/android-developer-fundamentals-course-concepts-v2/

List of Experiments

1. Develop an application that uses GUI components, Font and Colors.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Develop a native application that uses GPS location information.
7. Implement an application that writes data to the SD card.
8. Implement an application that creates an alert upon receiving a message.
9. Develop a mobile application that creates alarm clock.
10. User interface design layouts

Course Outcomes:

CO-1: Implement Basic Mobile applications (L2)
CO-2: Design GUI Applications (L3)
CO-3: Implement GPS tracking Applications (L2)
CO-4: Deploy web applications (L4)

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	1	1	2	-	-	-	-	-	-	-	-	2	1
CO2	-	1	2	2	-	-	-	-	-	-	-	-	2	1
CO3	-	2	2	2	-	-	-	-	-	-	-	-	2	1
CO4	-	2	2	2	-	-	-	-	-	-	-	-	2	1

***

Computer Networks					
Course Code:	Year and Semester: III - I	L	T	P	C
Prerequisites: Fundamentals of Computers		3	0	0	3

Course Objectives:

1. To summarize OSI and TCP/IP reference models and Example networks, characteristics of transmission media and classify multiplexing techniques
2. To explain the Error Control, Flow Control and Medium Access Control Protocols
3. To compute optimal path using Routing Algorithms.
4. To summarize the concepts of reliable unreliable transmission
5. To explain the knowledge on various application layer protocols

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

CO1: To explain OSI and TCP/IP reference models and Example networks, characteristics of transmission media and classify multiplexing techniques (L2)
CO2: To summarize various Error Control, Flow Control techniques and Medium Access Control Protocols (L2)
CO3: To compute optimal path using Routing Algorithms. (L3)
CO4: To explain the concepts of reliable unreliable transmission (L2)
CO5: To illustrate the working of various application layer protocols (L3)

UNIT-I: Introduction to Computer Networks and Physical Layer 10 Hrs

Introduction: Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, Example Networks, Physical Layer – Fourier analysis – Bandwidth Limited Signals – The Maximum Data Rate of a Channel Guided Transmission Media, Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing, and Code Division Multiplexing

UNIT-II: Data Link Layer 12 Hrs

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Control Protocols, Sliding Window Protocols, HDLC, PPP, Channel Allocation problem, Multiple Access Protocols, IEEE standards for Local Area Networks, WLAN, Bluetooth

UNIT– III: Network Layer 10 Hrs

Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Internet Protocol Header, IP Addresses, subnetting and super netting.

UNIT-IV: Transport Layer **8 Hrs**

Transport Layer Design Issues, Connection Establishment, Connection Termination, Transport and User Datagram Protocols

UNIT – V: Application Layer **8 Hrs**

Design Issues, DNS, WWW, HTTP/HTTPS, E-mail, FTP

Text Books:

1. Computer Networks, Andrew S Tanenbaum, Pearson, 5th Edition
2. Data Communications and Networking, Behrouz A Forouzan, Tata McGraw Hill, 4th Edition

Reference Book:

1. TCP/IP Protocol Suite, Behrouz A Forouzan**,** Tata McGraw Hill Edition, 3rd Edition

Web Resources:

1.https://youtube.com/playlist?list=PLbRMhDVUMngfpeFloB7kyiA40EptH1up
2.https://www.geeksforgeeks.org/computer-network-tutorials/
3.https://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2									1	
CO2		2	2	2									1	
CO3		2	2	2	1								1	
CO4		2	2	2	1								1	
CO5		2	2	2	1								1	

Artificial Intelligence					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Basics of Programming and Mathematics		3	0	0	3

Course Objectives:

1. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
2. To improve analytical and problem-solving skills based on the characteristics of the problem using various heuristic search techniques and to improve designing and playing a game
3. To have knowledge on propositional calculus, proportional and predicate logic to understand few systems such as natural deduction, axiomatic system, etc.
4. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as min-max, resolution, etc. that play an important role in AI programs.
5. To have a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, agents and robotics, expert systems, and planning
6. To have basic knowledge on probabilistic analysis and networks as well as fuzzy systems and fuzzy logics.

Course Outcomes:

CO1: Summarize fundamental understanding of the history of artificial intelligence (AI) and its foundations. (L1)
CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception and learning. (L2)
CO3: Infer the Knowledge representation in problem solving (L1)
CO4: Demonstrate proficiency developing applications in an 'AI language', expert system shell. (L2)
CO5: Demonstrate proficiency in applying fuzzy sets and logic. (L2)

UNIT-I: Introduction to artificial intelligence: Introduction, history, intelligent systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages, current trends in AI

Problem solving: state-space search and control strategies: Introduction, general problem solving, characteristics of problem, exhaustive searches, heuristic search techniques, iterative deepening a*, constraint satisfaction **(10 hrs)**

UNIT-II: Problem reduction and game playing: Introduction, problem reduction, game playing, alpha-beta pruning, two-player perfect information games

Logic concepts: Introduction, propositional calculus, proportional logic, natural deduction system, axiomatic system, semantic tableau system in proportional logic, resolution refutation in proportional logic, predicate logic **(10 hrs)**

UNIT-III: Knowledge representation: Introduction, approaches to knowledge representation, knowledge representation using semantic network, extended semantic networks for KR, knowledge representation using frames **advanced knowledge representation techniques:** Introduction, conceptual dependency theory, script structure, cyc theory, case grammars, semantic web **(10 hrs)**

UNIT-IV: Expert system and applications: Introduction, phases in building expert systems, expert system versus traditional systems, rule-based expert systems, blackboard systems truth maintenance systems, application of expert systems, list of shells and tools

Uncertainty measure: probability theory: Introduction, probability theory, Bayesian belief networks, certainty factor theory, Dempster-Shafer theory **(10 hrs)**

UNIT-V: Fuzzy sets and fuzzy logic: Introduction, fuzzy sets, fuzzy set operations, types of membership functions, multi valued logic, fuzzy logic, linguistic variables and hedges, fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems. **(8 hrs)**

TEXT BOOKS:

1. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning,
2. Artificial intelligence, A modern Approach, 2nded, Stuart Russel, Peter Norvig, PEA

REFERNCE BOOKS:

1. Artificial intelligence, structures and Strategies for Complex problem solving, -George F Lugar, 5thed, PEA
2. Introduction to Artificial Intelligence, Ertel, Wolf Gang, Springer
3. Artificial Intelligence, A new Synthesis, Nils J Nilsson, Elsevier

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2									2	1
CO2	1	2	2	2									2	1
CO3	1	2	2	2									2	1
CO4	1	2	2	2									2	1
CO5	1	2	2	2									2	1

Formal Languages and Automata Theory					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Set Theory, Relations and Functions, Mathematical Induction		3	0	0	3

Course Objectives:

1. Illustrating finite state machines to solve problems in computing.
2. Understanding deterministic and non-deterministic machines.
3. To familiarize regular grammars, context frees grammar.
4. To understand the differences between decidability and undecidability.
5. To explain the hierarchy of problems arising in the computer sciences.

Course Outcomes:

CO-1: **Summarize** basic concepts in formal language theory, grammars, automata theory, computability theory, and complexity theory. (L1)
CO-2: Demonstrate abstract models of computing, including deterministic (DFA), non-deterministic (NFA) models and their power to recognize the regular languages. (L2)
CO-3: Relate practical problems to Context Free Languages and constructs automata, PDA for it. (L2)
CO-4: apply mathematical and formal techniques for solving problems with Turing machines in computer science. (L3)
CO-5: Summarize the relationship among language classes and grammars with the help of Chomsky Hierarchy. (L1)

Unit – I: Fundamentals & Finite Automata (10 hrs)

Alphabet, Strings, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, transition diagrams and Language recognizers.

NFA with null transitions - Significance, acceptance of languages. Conversions and Equivalence: Equivalence between NFA with and without null transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

Unit – II: Regular Languages &Grammar Formalism (12 hrs)

Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets.

Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Rightmost and leftmost derivation of strings.

Unit – III: Context Free Grammars &Push Down Automata (10 hrs)

Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL.

Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, inter conversion. Introduction to DCFL and DPDA.

Unit – IV: Turing Machine (8 hrs)

Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, counter machine, types of Turing machines. , linear bounded automata and context sensitive language.

Unit – V: Computability Theory (8 hrs)

Chomsky hierarchy of languages, decidability of problems, Universal Turing machine, undecidability of posts correspondence problem, Turing reducibility, Definition of P and NP Problems, NP complete and NP hard problems.

Text Books:

1."Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education.
2. "Theory of Computer Science – Automata languages and computation". Mishra and Chandra shekaran, 2nd edition, PHI.

Reference Books

1.Introduction to Formal Languages, Automata Theory and Computation – Kamala Krithivasan, RamaR
2.Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
3.Theory of Computation: A Problem – Solving Approach- Kavi Mahesh, Wiley India Pvt. Ltd.
4.Elements of Theory of Computation, Lewis H.P. &Papadimition C.H. Pearson /PHI.

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2										
CO2	2	2	2	2										
CO3	2	2	2	2										
CO4	2	2	2	2										
CO5	2	2	2	2										

Data Warehousing & Data Mining (Professional Elective-1.1)					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Data Base Concepts		3	0	0	3

Course Objectives:

1. Distinguishes the certainty of various classical approaches for mining data in warehouse.
2. Prepares students in identifying various problems and its corresponding approaches for mining data.
3. Outlines a student about merits and demerits of mining approaches contextually.

Course Outcomes:

CO1: Summarize about Data Warehousing & Data Mining. (Understand – L1)
CO2: Demonstrates Pre-processing Techniques before Data Mining. (Applying – L3)
CO3: Infer Classification & recite different approaches. (Analyzing – L4)
CO4: Infer Association Analysis & recite different approaches. (Analyzing – L4)
CO5: Perform Cluster Analysis & recite different approaches. (Analyzing – L4)

UNIT - I

Introduction: Data Warehousing: Architecture, OLAP vs OLTP, Data Cube and their operations. **Data Mining**: Patterns of data mining, issues in data mining, Statistical descriptions, data visualizations, similarity and dissimilarity measures of data. **(10 hrs)**

UNIT - II

Data Pre-processing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization. **(10 hrs)**

UNIT - III

Classification: Basic concepts, General approach for solving a classification problem, Decision tree algorithm working and attribute selection measures, **Alternative techniques**: Bayes' Theorem, Naïve Bayesian classification Algorithm, Bayesian Belief networks. **(10 hrs)**

UNIT - IV

Association Analysis: Basic Concepts, Frequent item set generation, compact representation of frequent item sets and FP-Growth Algorithm. **(8 hrs)**

UNIT - V

Cluster Analysis: Basic Concepts, Different types of Clustering and cluster, **Algorithms:** K-means algorithm and their additional issues, Bisecting K-means, Agglomerative Hierarchical Clustering Algorithm, DBSCAN Algorithm strengths and their weaknesses. **(10 hrs)**

TEXT BOOKS:

1. Introduction to Data Mining: Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Pearson.
2. Data Mining concepts and Techniques, 3/e, Jiawei Han, Michel Kamber, Elsevier.

REFERENCE BOOKS:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning.
2. Data Mining :VikramPudi and P. Radha Krishna, Oxford.
3. Data Mining and Analysis - Fundamental Concepts and Algorithms; Mohammed J. Zaki, Wagner Meira, Jr, Oxford
4. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH.

e-Resources:

1. https://www.saedsayad.com/data_mining_map.htm
2. https://nptel.ac.in/courses/106/105/106105174/
3. (NPTEL course by Prof.PabitraMitra) http://onlinecourses.nptel.ac.in/noc17_mg24/preview
4. (NPTEL course by Dr. NandanSudarshanam& Dr. BalaramanRavindran) http://www.saedsayad.com/data_mining_map.htm

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2	1								2	
CO2	2	2	2	2	1								2	
CO3	2	2	2	2	1								2	
CO4	2	2	2	2	1								2	
CO5	1	2	2	2	1								2	

Software Testing Methodologies (Professional Elective-1.2)					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Basics of Programming Languages.		3	0	0	3

Course Objectives:

1) To study fundamental concepts in software testing and discuss Various Software testing issues and solutions
2) To learn how to plan a test project, design test cases and data, Conduct Testing, manage Software problems and defects, and generate a test report
3) To expose the advanced software testing concepts such as object-oriented Software testing methods, web-based and component-based software testing
4) To understand software test automation problems and solutions
5) To learn how to write software test documents and communicate with Engineers in various forms

Course Outcomes: After completing this course, Students will be able to-

CO1: Identify and understand various software testing problems, apply software testing knowledge and engineering methods and solve these problems by designing and selecting software test models, criteria, strategies, and methods (L1)
CO2: Design and conduct a software test process for a software project (L3)
CO3: Analyze the needs of software test automation (L4)
CO4: Use various communication methods and skills to communicate with their teammates to conduct their practice-oriented software testing projects (L2)
CO5: Design test cases for given software to test it before delivery to the customer and write test scripts for both desktop and web-based applications (L3)

UNIT – I: Software Testing (8 hrs)

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 (10 hrs)

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 (10 hrs)

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 (8 hrs)
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 (10 hrs)
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. Software Testing, Principles and Practices, NareshChauhan, Oxford
2. Software Testing, Yogesh Singh, CAMBRIDGE

Reference Books:

1. Foundations of Software testing, Aditya P Mathur, 2ed, Pearson
2. Software testing techniques – BarisBeizer, Dreamtech, second edition.
3. Software Testing, Principles, techniques and Tools, M G Limaye, TMH
4. Effective Methods for Software testing, Willian E Perry, 3ed, Wiley

e-resources:

https://archive.nptel.ac.in/courses/106/105/106105150/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	1	1	2								1	1
CO2		2	1	1	2								1	1
CO3		2	1	1	2								1	1
CO4		2	1	1	2								1	1
CO5		2	1	1	2								1	1

Social Networks (Professional Elective-1.3)					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Basics of Networks and Python Programming		3	0	0	3

Course Objectives:

1. To train on the concepts and techniques in social networking
2. To emphasize include social networking for business and professional use
3. To comprehend social networking analysis and social network developer tools
4. To apply social network concepts for solving real-world issues

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

CO1. Summarize proficiency and understanding of social networks for business and professional use (L1)
CO2. Use of social network analysis and social network developer tools (L2)
CO3. Demonstrate proficiency and understanding of public sector media and privacy (L2)
CO4. Demonstrate proficiency in understanding concepts in social networking and utilizing these concepts or solving real-world social network issues. (L2)
CO5: Summarize Small world Networks (L1)

Unit-1: Introduction to Python, Introduction to Networks, Social Networks: The Challenge, Google Page Rank, Searching in a Network, Link Prediction, The Contagions, Importance of Acquaintances, Marketing on Social Networks
Handling Real-world Network Datasets: Introduction to Datasets, Ingredients Network, Synonymy Network, Web Graph, Social Network Datasets, Datasets: Different Formats, How to Download, Analysing using Networks and Analyzing using Gephi, Emergence of Connectedness: Introduction, Advanced Material, and Programming Illustration, Summary to Datasets
Strength of Weak Ties: Introduction, Granovetter's Strength of weak ties, Triads, clustering coefficient and neighborhood overlap, Structure of weak ties, bridges and local bridges, Validation of Granovetter's experiment using cell phone data, Embededness, Structural Holesm Social Capital, Finding Communities in a graph (Brute Force Method), Community Detection using Girvan Newman Algorithm, Visualizing Communities using Gephi, The Strength, Social Media and Passive Engagement, Between Measures and Graph Partitioning, Strong and Weak Relationship – Summary **(10 hrs)**

Unit-2: Homophily: Should you watch your company? Selection and Social Influence, Interplay between Selection and Social Influence, Homophily - Definition and measurement, Foci Closure and Membership Closure, Introduction to Fatman Evolutionary model, Fatman Evolutionary Model- The Base Code (Adding people), The Base Code (Adding Social Foci), Implementing Homophily, Quantifying the Effect of Triadic Closure, Fatman Evolutionary Model-Implementing Closures, Implementing Social Influence, Storing and analyzing longitudinal data
Spatial Segregation: Introduction, Simulation of the Schelling Model – Introduction, Base Code, Visualization and Getting a list of boundary and internal nodes, Getting a list of unsatisfied nodes, Shifting the unsatisfied nodes and visualizing the final graph **(10 hrs)**

Unit-3: Hubs and Authorities: PageRank Revisited – An example, convergence in the example, conservation and convergence, Matrix Multiplication (Pre-requisite 1), Convergence in Repeated Matrix Multiplication (Pre-requisite 1), Addition of Two Vectors (Pre-requisite 2), Convergence in Repeated Matrix Multiplication- The Details, PageRank as a Matrix Operation, PageRank Explained **Powerlaw:** Introduction, Power Law emerges in WWW graphs, Detecting the Presence of Powerlaw, Rich Get Richer Phenomenon, Implementing Rich-getting-richer Phenomenon, Implementing a Random Graph,Forced Versus Random Removal of Nodes **(10 hrs)**

Unit-4: Epidemics: Introduction, Simple Branching Process for Modeling Epidemics, Modeling epidemics on complex networks, SIR and SIS spreading models, Comparison between SIR and SIS spreading models, Basic Reproductive Number Revisited for Complex Networks, Percolation model, Analysis of basic reproductive number in branching model, The Generative Model, Decentralized Search **(8 hrs)**

Unit-5: Small world networks: Introduction, Base code, Making homophily based edges, Adding weak ties, Plotting change in diameter, Myopic Search, Myopic Search comparision to optimal search, Time Taken by Myopic Search, PseudoCores : Introduction, How to be Viral, finding the right key nodes, Coding K-Shell Decomposition, Coding cascading Model **(10 hrs)**

Text Books:

1. Social Networks, Prof. Sudharshan Iyengar, Computer Science and Engineering, IIT Ropar
2. Perspectives on Social Media: A Yearbook. Piet A.M. Kommers, Pedro Isaias, and TomayessIssa

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2	1									
CO2	1	2	2	2	1									
CO3	1	2	2	2	1									
CO4	1	2	2	2	1									
CO5	1	2	2	2	1									

Unix and Shell Programming (Professional Elective-1.4)					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Fundamentals of Operating System		3	0	0	3

Course Objectives:

1. Introduce Unix Operating System and its features while exploring file system and security
2. Learn UNIX Filters related to text processing, communication and search utilities
3. Learn programming filters and interactive shell scripting
4. Learn shell programming constructs writing advanced scripts
5. Learn kernel programming on file operations and managing processes

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

CO1: Infer the importance of UNIX operating system by lear.4ning salient features and using basic utilities **(Understand – L1)**
CO2: Develop apt programming and non-programming filters **(Apply – L3)**
CO3: Devise shell scripts using the syntactic constructs of shell for producing the desired effects. **(Create – L4)**
CO4: Compose advanced shell scripts for string and array processing (**Create – L4**)
CO5: Construct functions using system calls related to file and process control (**Create – L4)**

UNIT-I **10 Hours**
Introduction to Unix OS, File Systems, Security and File Permissions, Introduction to Shells.

UNIT-II **10 Hours**
Filters, Communications, Regular Expressions, global regular expression and print (grep)

UNIT-III **10 Hours**
Stream editor (sed), Programming filter (awk), Interactive shell programming

UNIT- IV **10 Hours**
Shell Programming concepts, Advanced Shell Programming

UNIT-V **08 Hours**
Introduction System calls and Signals, File I/O, Files & Directories, Process control

Text Books:

1. UNIX and Shell Programming, Behrouz A, Forouzan and Richard F.Gilberg, Cengage Learning, 2003.
2. Advanced Programming in UNIX Environment, W.Richard Stevens, Stephen A Rago, 3rd Edition, Addison-Wesley Professional, 2013.

Reference Books:

1. UNIX and shell programming by B.M. Harwani, OXFORD university press.
2. Unix essentials by Sumitabha Das
3. Unix Shell Programming, Stephen G.Kochan, Patrick Wood, 3/e, Pearson

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2								1	2	
CO2		2	2	2								1	2	
CO3		2	2	2								1	2	
CO4		2	2	2								1	2	
CO5		2	2	2									2	

Computer Graphics (Professional Elective-1.5)					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Basics of Mathematics		2	0	2	3

Course Objectives:

1. To develop, design and implement two- and three-dimensional graphical structures
2. To enable students to acquire knowledge Multimedia compression and animations.
3. To learn Creation, Management and Transmission of Multimedia objects.

Course Outcomes:

CO1: Identify Applications, video devices and **analyse** 2D Objects by learning output primitives (L1)
CO2: Analyze various 2D Object representation models by **learning** various visualization techniques (L3)
CO3: Analyze various 3D Object representation models by **learning** various visualization techniques (L3)
CO4: Develop programs in OPENGL by using apt functions for efficacy in Computer Graphics 2D/3D and Animation **Perform Rendering** of 2D/3D Objects by **learning** about shading, texture mapping techniques and drawing shadows (L3)
CO5: Design complicated Real-world Scenes by **learning** Iterated Function Systems for implementing Fractals **Apply** 3D Solid Geometric Techniques for representing 3D objects (L4)

UNIT - I **10 Hours**
Introduction to Computer Graphics: Applications of Computer Graphics,
2D Primitives: -Output Primitives: Points, Lines, Planes, Frame- Buffers, Video-display devices, Line Drawing Algorithms: DDA Line drawing, Bresenham's Line Drawing, Parallel Line Drawing, Circle and Ellipse Generation, Polygon Generation, Polygon Filling Algorithms, Attributes of Output Primitives.

UNIT - II **10 Hours**
2D Transformations & Viewing: Basic Transformations: Translation, Rotation, Scaling, and Other Transformations: Reflection, Shear, Composite Transformations, Coordinate Transformation, and Viewing Pipeline: Viewing Reference Frame, window, view-port, window-to-view-port Transformation, Multiple window transformation, Clipping: Line Clipping: cohen-sutherland line clipping algorithm, Polygon Clipping: Sutherland-Hodgeman polygon clipping algorithm, Text Clipping.

UNIT - III **10 Hours**
3D Concepts: 3D Object Representation: Polygons, Curved Lines, Splines, Quadric Surfaces, **3D Transformations: Basic: Translation**, Coordinate-axis-Rotation, Arbitrary-axis Rotation, Scaling, Other: Reflection, Shear, Composition of 3D transformations, Projections: Parallel, Perspective, 3D Viewing, Visible-Surface Detection Algorithms: Back face removal, Z-Buffer, A-Buffer, Area-sub-division, Depth-Sorting (painter's), BSP-Tree, Octree,3D Clipping

UNIT - IV **10 Hours**

Graphics Programming Color Models – RGB, YIQ, CMY, HSV – Animations – General Computer Animation, Raster, Key frame Graphics programming using OPENGL – Basic graphics primitives – Drawing three dimensional objects - Drawing three dimensional scenes

Rendering Introduction to Shading models – Flat and Smooth shading – Adding texture to faces – Adding shadows of objects – Building a camera in a program – Creating shaded objects– Rendering texture – Drawing Shadows

UNIT - V **8 Hours**

Fractals Fractals and Self similarity – Peano curves – Creating image by iterated functions – Mandelbrot sets – Julia Sets – Random Fractals.

Overview of Ray Tracing Intersecting rays with other primitives – Adding Surface texture – Reflections and Transparency – Boolean operations on Objects.

Text Books:

1. Donald Hearn, Pauline Baker, Computer Graphics – C Version, second edition Pearson Education,2004.
2. F.S. Hill, Computer Graphics using OPENGL, Second edition, Pearson Education, 2003.

Reference Books:

1. James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics-Principles and practice, Second Edition in C, Pearson Education, 2007.

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2	1									
CO2		2	2	2	1									
CO3		2	2	2	1									
CO4		2	2	2	1									
CO5		2	2	2	1									

Front End Development (Open Elective-1) / Job Oriented Course					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Fundamentals of HTML, CSS and Java Script		3	0	0	3

Course Objectives:

1. To learn Client-side application development using HTML and CSS
2. To understand Java script ES6 features
3. To focus on contemporary front-end technologies like React
4. To understand data access through NodeJS

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

CO1: Summarize Client-side design of the web. (L1)
CO2: Explore different ES6 features in Java script. (L2)
CO3: Implement components and props through React. (L3)
CO4: Comprehend React Hooks (L2)
CO5: Use NodeJS for data availability (L2)

Unit-1: Introduction to HTML 5, syntax, attributes, events, SVG, Web storage, Introduction to Canvas, Audio & Video, Geolocations, Drag & Drop, Web workers, working with Fonts, working with other graphics.
Style sheets: Introduction CSS, Applying CSS to HTML, Selectors, Properties and Values, CSS Colors and Backgrounds, CSS Box Model, CSS Margins, Padding, and Borders, CSS Text and Font Properties

Unit-2: Introduction to ES6 features, Arrow functions, default parameters, destructuring elements, Higher order functions, defining classes, accessing data members, constructors, inheritance, super.

Unit-3: ReactJS: Introduction, Installing Node JS server, creating a simple react project, Templating using JSX, Components, Rendering, State and Props, Types of Components – Component Lifecycle, Forms and User Input, Event Handling.

Unit-4: React JS: React Routing, Introduction to Hooks, State management, Types of Hooks - useState, useEffect, useContext, useReducer, useRef, useMemo, useCallback, Usage of Web API calls- fetch and axios, Error Handling.

Unit-5: React Date picker, Communicate Between Components, CORS policies
Introduction to MongoDB, creating databases, Operations – insert, update, delete and Querying.

Text Books:

1. HTML5, Black book, Dreamtech Publications
2. Beginning React, Greg Lim
3. Learning AngularJS: A Guide to AngularJS Development, O' Reilly Publication

References:

1. React Cook Book, Carlos Santana Roldan
2. Learning React, 2nd Edition, O' Reilly publications.
3. React in Action by Mark Tielens Thomas

Web Resources:

https://developer.mozilla.org/en-US/docs/Web/JavaScript
https://reactjs.org/docs/getting-started.html
https://nodejs.org/en/docs/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2	2				2				2	1
CO2		2	2	2	2				2				2	1
CO3		2	2	2	2				2				2	1
CO4		2	2	2	2				2				2	1
CO5		2	2	2	2				2				2	1

Front End Development Lab					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Fundamentals of HTML, CSS and Java Script		0	0	3	1.5

Course Objectives

At the end of the course the students will understand

- ✓ Higher order functions
- ✓ Class Components.
- ✓ Functional Components.
- ✓ Different types of Hooks.
- ✓ React application with data base connectivity.

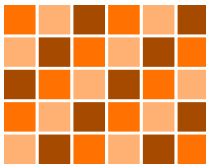
Course Outcomes:

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

1. Use Higher Order functions like filter(), reduce(), map() .
2. Develop a react application using class components.
3. Develop a react application using functional components.
4. Develop a complete react application with data base connectivity.

List of experiments:

1. Try to recreate the following patterns using HTML and CSS only.



2. Implement Drag n Drop feature in HTML 5
3. Demonstrate Event bubbling with necessary examples.
4. Design a Calculator using Java script and relevant CSS.

(	CE	)	C
1	2	3	+
4	5	6	-
7	8	9	x
.	0	=	÷

5. Demonstrate Higher order functions with necessary examples – filter(), reduce() and map()
6. Create a Class Component for Counter in React JS
7. Create a Class component for Changing the color of the text given in React JS
8. Class a Class Component for viewing an array of objects in a tabular form.
9. Display a digital clock in React JS.
10. Demonstrate useState Hook with the help sample text.
11. Demonstrate useContext Hook with necessary example.
12. Demonstrate useEffect Hook with necessary example.

13. Demonstrate consuming web API using fetch &axios (AXIOS API). Demonstrate with the help of fake URL.
14. Design a BMI calculator using React JS based on the description given below:

BMI is a measurement of a person's leanness or corpulence based on their height and weight, and is intended to quantify tissue mass. It is widely used as a general indicator of whether a person has a healthy body weight for their height.

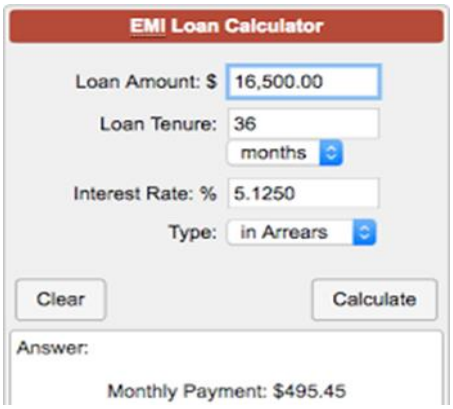
Formula:

weight (kg) / [height (m)]2 (or) [weight (kg) / height (cm) / height (cm)] x 10,000

BMI table for adults: This is the World Health Organization's (WHO) recommended body weight based on BMI values for adults. It is used for both men and women, age 18 or older.

Category	BMI range - kg/m^2
Severe Thinness	< 16
Moderate Thinness	16 – 17
Mild Thinness	17 - 18.5
Normal	18.5 – 25
Overweight	25 – 30
Obese Class I	30 – 35
Obese Class II	35 – 40
Obese Class III	> 40

15. Display a selected set of images in tabular format using React JS.
16. Implement Upload & down load options on a given file.
17. Create a React application to view EMI calculator. A specific view is given below:



$$E = P \times r \times \frac{(1+r)^n}{(1+r)^n - 1}$$

Where,

E is the EMI

P is the principal amount

r is the monthly rate of interest

n is the number of months

18. Design the following Hotel bill screen. User can select as many items as possible from the dropdown box and is allowed to enter in the text field provided. Each transaction must be added in the table given below along with the bill amount.

GREEN STAR HOTEL

Customer Bill

Date:

Items: Biryani No of Items:

1.	Biryani	2	Rs. 140 Each	Rs.280
2.	Fried Rice	1	Rs. 110 Each	Rs.110
3.	Chicken Curry	2	Rs. 230 Each	Rs.460

Total	Rs. 850
GST @5%	Rs. 42.50
Bill to be paid	Rs. 892.50

19. Demonstrate the procedure to create a schema in MongoDB.
20. Demonstrate CRUD operations using MongoDB.

CO-PO mapping:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		3	3	3	3				2				2	
CO2		3	3	3	3				2				2	
CO3		3	3	3	3				2				2	
CO4		3	3	3	3				2				2	

Artificial Intelligence Tools and Techniques Lab					
Course Code:	Year and Semester: III – I	L	T	P	C
Prerequisites: Basics of Programming and Mathematics		0	0	3	1.5

Course Objectives:

1. Study the concepts of Artificial Intelligence.
2. Learn the methods of solving problems using Artificial Intelligence.
3. Introduce the concepts of machine learning.

Course Outcomes:

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

CO1: Identify problems that are amenable to solution by AI methods. (L2)
CO2: Recognize appropriate AI methods to solve a given problem. (L2)
CO3: Discuss a given problem in the language /framework of different AI methods. (L2)
CO4: Develop basic AI algorithms (L2)

Experiments

1. Write a Program to Implement Tic-Tac-Toe game using Python.
2. Write a program to solve water jug problem
3. Write a Program to Implement Breadth First Search using Python.
4. Write a Program to Implement Depth First Search using Python.
5. Write a Program to Implement 8-Puzzle problem using Python
6. Implementation of Towers of Hanoi Problem
7. Write a Program to Implement Missionaries-Cannibals Problems using Python
8. Write a Program to Implement Travelling Salesman Problem using Python
9. Write a Program to Implement Monkey Banana Problem using Python
10. Write a Program to Implement N-Queens Problem using Python

CO-PO Mapping:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		3	3	3	3								2	
CO2		3	3	3	3								2	
CO3		3	3	3	3								2	
CO4		3	3	3	3								2	

Indian Constitution					
Course Code:	Year and Semester: III - I	L	T	P	C
Prerequisites: Basics of Sciences		2	0	0	0

Course Objectives:

1. To Enable the student to understand the importance of constitution
2. To understand the structure of executive, legislature and judiciary
3. To understand philosophy of fundamental rights and duties
4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India.
5. To understand the central and state relation financial and administrative.

Course Outcomes:

CO-1 Know the sources, features and principles of Indian Constitution. (L1)
CO-2 Learn about Union Government, State government and its administration. (L1)
CO-3 Get acquainted with Local administration and Pachayati Raj. (L2)
CO-4 Be aware of basic concepts and developments of Human Rights. (L1)
CO-5 Gain knowledge on roles and functioning of Election Commission (L2)

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

LEARNING OUTCOMES:

After completion of this unit student will

- Understand the concept of Indian constitution
- Apply the knowledge on directive principle of state policy
- Analyze the History, features of Indian constitution
- Evaluate Preamble Fundamental Rights and Duties

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions;

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the structure of Indian government
- Differentiate between the state and central government
- Explain the role of President and Prime Minister
- Know the Structure of supreme court and High court

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the structure of state government

- Analyze the role Governor and Chief Minister
- Explain the role of state Secretariat
- Differentiate between structure and functions of state secretariat

UNIT-IV

Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Panchayats: Functions PRI: Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

LEARNING OUTCOMES: - After completion of this unit student will

- Understand the local Administration
- Compare and contrast district administration role and importance
- Analyze the role of Myer and elected representatives of Municipalities
- Evaluate Zilla panchayat block level organization

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissioner ate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women

LEARNING OUTCOMES: - After completion of this unit student will

- Know the role of Election Commission apply knowledge
- Contrast and compare the role of Chief Election commissioner and Commissioner ate
- Analyze role of state election commission
- Evaluate various commissions of viz SC/ST/OBC and women

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-RESOURCES:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

Cryptography and Network Security					
Course Code:	Year and Semester: III - II	L	T	P	C
Prerequisites: Fundamentals of Algorithms and Networking		3	0	0	3

Course Objectives:

1. To understand and classify various security attacks, services mechanisms and classical cryptographic techniques
2. To analyse the design principles of block ciphers and their implementation.
3. To compute and analyse asymmetric key cryptographic algorithms
4. To evaluate Authentication, Hash Codes and verify the digital signatures
5. To impart the knowledge on Network security concepts.

Course Outcomes:

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

CO1: Classify various security attacks, services mechanisms and classical cryptographic techniques (L1)

CO2: Analyse the design principles of block ciphers and their implementation. (L3)

CO3: Computes and Analyse various Asymmetric Key Cryptographic techniques (L2)

CO4: Evaluates Authentication, Hash Codes and verify the digital signatures (L4)

CO5: Impart the knowledge on Network security concepts. (L1)

UNIT-I: Introduction to Cryptography and Network Security 10 Hrs

Introduction: Security attacks, services & mechanisms, Network Security Model, Symmetric Cipher Model, Mathematics of Cryptography, Substitution Ciphers, Transposition Ciphers Techniques, Steganography.

UNIT-II: Symmetric Key Cryptography 10 Hrs

Mathematics of Symmetric Key Cryptography, Modern Block Ciphers, Modes of Block Ciphers, Design Principles of Block Ciphers, Feistel Cipher, Data Encryption Standard, Double DES, Triple DES, International Data Encryption Algorithm, CAST-128, Blowfish, Advanced Encryption Standard

UNIT–III: Asymmetric (Public) Key Cryptography 10 Hrs

Mathematics of Asymmetric Key Cryptography: Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorem, Chinese Remainder Theorem, Primitive Roots, Discrete Logarithms, Principles of Public Key Cryptosystems, Applications, RSA, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Cryptography, El-Gammal Key Exchange.

UNIT-IV: Data Integrity, Digital Signatures, Authentication Protocols 10 Hrs

Requirements of Hash Functions and Message Authentication Codes, Hash Algorithms: MD5, SHA-160,256,512, RIPEMD, Properties of Digital Signatures, DSS, Authentication Applications: Kerberos Version4 and Version 5.

UNIT – V: Network Security **10 Hrs**

IP Security: IP Security Overview, Architecture, Authentication Header, Encapsulating Security Payload,
Web Security: Overview, Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction,
Email Security: Pretty Good Privacy, S/MIME,
System Security: Intruders, Password Management, Viruses and Worms.

Text Books:

1. Cryptography and Network Security Principles and Practices: William Stallings, Pearson Education, 5th Edition
2. Cryptography and Network Security, Behrouz A Forouzan, Tata McGraw Hill, 3rd Edition

Reference Book:

1. Practical Cryptography, Bruce Schneier, Wiley, Deamtech India Pvt Ltd.

Web Resources:

1. https://crypto.stanford.edu/~dabo/courses/OnlineCrypto/

https://nptel.ac.in/courses/106105162

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2	1	1		1					1	
CO2	2	2	2	2	1	1		1					1	
CO3	2	2	2	2	1	1		1					1	
CO4	2	2	2	2	1	1		1					1	
CO5	1	2	2	2	1	1		1					1	

Design and Analysis of Algorithms					
Course Code:	Year and Semester: III – II	L	T	P	C
Prerequisites: Prior knowledge of programming language(s) and basic Data Structures and Algorithms		3	0	0	3

Course Objectives:

1. To provide an introduction to formalisms to understand, analyse and denote time complexities of algorithms
2. To introduce the different algorithmic approaches for problem solving through numerous example problems
3. To provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness

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

1. **Infer** the divide-and-conquer paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems. Derive and solve recurrences describing the performance of divide-and-conquer algorithms. (L1)
2. **Examine** the greedy paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems. (L2)
3. **Demonstrate** the dynamic-programming paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems. (L3)
4. **Demonstrate** the backtracking paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems. (L3)
5. **Explore** the branch and bound paradigm and its context. Recite algorithms that employ this paradigm. Apply this paradigm to design algorithms for apt problems. (L3)

.

Unit-1: Introduction: Algorithm Definition, Algorithm Specification, Performance Analysis, Performance Measurement, Asymptotic notations.
Divide and Conquer: General Method, Binary Search, Finding the Maximum and Minimum, Quick Sort. **(10 hrs)**

Unit-2: The Greedy Method: The General Method, Knapsack Problem, Job Sequencing with Deadlines Problem, Single Source Shortest Path Problem, Optimal Merge Patterns Problem. **(10 hrs)**

Unit-3: Dynamic Programming: The General Method, 0/1 Knapsack Problem, Single Source Shortest Path – General Weights, All Pairs-Shortest Paths Problem, Traveling Salesperson Problem, String Editing Problem. **(10 hrs)**

Unit-4: Backtracking: The General Method, N-Queens Problem, Sum of Subsets Problem, Graph Coloring Problem, and Hamiltonian Cycles Problem. **(8 hrs)**

Unit-5: Branch and Bound: The General Method, FIFO Branch-and-Bound, LC Branch-and-Bound, 0/1 Knapsack Problem, Traveling Salesperson Problem.
NP-Hard and NP-Complete problems: Basic concepts, Cook's Theorem. **(10 hrs)**

Text Books:

1. Ellis Horowitz, SartajSahni, SanguthevarRajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.

References:

1. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press.
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press.

e-Resources:

https://nptel.ac.in/courses/106101060

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2									2	1
CO2	1	2	2	2									2	1
CO3	1	3	3	2									2	1
CO4	1	3	3	2									2	1
CO5	1	3	3	2									2	1

Compiler Design					
Course Code:	Year and Semester: III - II	L	T	P	C
Prerequisites: Set Theory, Relations and Automata Theory		3	0	0	3

Course Objectives

1. To impart the knowledge of compilers and their structure
2. To help students to design parsers - Language generators &recognizers.
3. To demonstrate the students' parsers can be equipped with translation Schemes
4. To make the student to understand storage allocations, Machine independent IR, Machine Dependent / independent - Code Generation
5. To make the students to understand different techniques in optimization of code

CO1. Annotate Compilers, Grammars, Scanners, Types & structures of Compilers (Understand – L1)
CO2. Infer and Articulate different Parsers - can generate language & recognize it (Understand & apply – L3)
CO3. Exemplify semantic analyzer without the aid of automatic generators translation schemes (Understand – L1)
CO4. Outline storage allocation strategies, IR forms & Code generation form (Understand – L1)
CO5. Implement source code for a novel language converted into machine code for a novel computer (L2)

UNIT - I **8 Hrs**
Introduction to Compilers: Introduction to Translators, Lexical Analysis (Scanner), Grammars

UNIT - II **10 Hrs**
Top-Down Parsers: Introduction to Syntax Analyzer or Parser, Top-Down Parsing

UNIT - III **10 Hrs**
Bottom-Up Parsing, Semantic Analysis

UNIT - IV **10 Hrs**
Intermediate-Code Generation, Run-Time Environments, Code Generation

UNIT - V **10 Hrs**
Optimization Techniques

Text Books:
1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, MonicaS. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson.

Reference Books:
1. Compiler Construction-Principles and Practice, Kenneth C Louden, CengageLearning.

2. Modern compiler implementation in C, Andrew W Appel, Revised edition,Cambridge University Press.
3. The Theory and Practice of Compiler writing, J. P. Tremblay and P. G. Sorenson,TMH
4. Writing compilers and interpreters, R. Mak, 3rd edition, Wiley student edition.
5. Lex&yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly

e-resources:

https://archive.nptel.ac.in/courses/106/105/106105190/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2										2	
CO2	1	2	2										2	
CO3	1	2	2										2	
CO4	1	2	2										2	
CO5	1	2	2										2	

R Programming (Professional Elective – 2.1)					
Course Code:	Year and Semester: III – II	L	T	P	C
Prerequisites: Fundamentals of Statistics		3	0	0	3

Course Objectives: the student will be aimed

- To understand IDE and usage of R language primitives
- To work with lists, frames, vectors and sets
- To analyse various plotting methods

Course Outcomes:

CO-1: Summarize basics of R Components (L1)
CO-2: Use various operators and functions and methods in R (L2)
CO-3: Explore various statistical methods (L2)
CO-4: Demonstrate various graphical representations that can be designed in R (L3)
CO-5: Analyse linear and multiple regression models (L3)

Unit – I **10 Hrs**

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

Unit – II **10 Hrs**

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

Unit – III **10 Hrs**

Doing Math and Simulation in R, Math Function, Extended Example Calculating Probability- Cumulative Sums and Products-Minima and Maxima- Calculus, Functions Fir Statistical Distribution, Sorting,

Linear Algebra Operation on Vectors and Matrices, Extended Example: Vector cross Product- Extended Example: Finding Stationary Distribution of Markov Chains, Set Operation, Input /output, Accessing the Keyboard and Monitor, Reading and writer Files,

Unit – IV **8 Hrs**

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

Unit – V **10 Hrs**

Probability Distributions, Normal Distribution- Binomial Distribution- Poisson Distributions Other Distribution, Basic Statistics, Correlation and Covariance, T-Tests, -ANOVA.

Linear Models, Simple Linear Regression, -Multiple Regression Generalized Linear Models, Logistic Regression.

Text Books

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

Reference Books

1. R Cookbook, Paul Teetor, O'Reilly.
2. R in Action, Rob Kabacoff, Manning

e-resources:
https://archive.nptel.ac.in/courses/111/104/111104100/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2	2								1	1
CO2	1	2	2	2	2								1	1
CO3	1	2	2	2	2								1	1
CO4	1	2	2	2	2								1	1
CO5	1	2	2	2	2								1	1

Object Oriented Analysis and Design using UML (Professional Elective – 2.2)					
Course Code:	Year and Semester: III – II	L	T	P	C
Prerequisites: Object Oriented Programming		3	0	0	3

Course Objectives:

- To understand how to solve complex problems
- Analyze and design solutions to problems using object-oriented approach
- Study the notations of Unified Modeling Language

Course Outcomes:

CO-1: Explore solutions to the complex problems using object-oriented approach (L1)
CO-2: Build classes, responsibilities and states using UML notation (L3)
CO-3: Identify basic Interactions, Use cases of the problem domain (L1)
CO-4: Summarize advanced behavioral modeling using UML notation (L1)
CO-5: Summarize components of the problem domain (L1)

UNIT-1: **10 Hrs**

Introduction to OOAD, The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Introduction- Why we model, Conceptual model of UML Architecture

UNIT-2: **10 Hrs**

Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams

Unit-3: **10 Hrs**

Introduction- Interactions, Interaction diagrams, use cases, Use case Diagrams, Activity Diagrams

Unit-4: **8 Hrs**

Events and signals, State machines, Processes and Threads, Time and space, State chart diagrams

Unit-5: **10 Hrs**

Introduction- Component, Deployment, Component diagrams, Deployment diagrams

Case Study: The Unified Library application

TEXT BOOKS:

1. "Object- Oriented Analysis and Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia, Houston, 3rd edition, 2013, PEARSON.

2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, 12th Impression, 2012, PEARSON.

REFERENCE BOOKS:

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI

2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O' Reilly

3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning

Online References

https://archive.nptel.ac.in/courses/106/105/106105224/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2	2					1			1	
CO2		2	2	2	2					1			1	
CO3		2	2	2	2					1			1	
CO4		2	2	2	2					1			1	
CO5		2	2	2	2					1			1	

Professional Elective – 2.3 **Information Retrieval systems**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Basics of File processing and Pattern matching		3	0	0	3

Course Objective:

- To learn the important concepts and algorithms in IRS
- To understand the data/file structures that are necessary to design, and implement information retrieval (IR) systems.

Course Outcomes:

CO-1: Identify relevant data structures for IRS (L1)
CO-2: Use various files and models (L3)
CO-3: Illustrate lexical analysis on various tree models (L2)
CO-4: Summarize various Stemming algorithms (L1)
CO-5: Implement various string searching algorithms. (L3)

UNIT - I: **8 hrs**

Introduction to Information storage and retrieval systems: Domain Analysis of IR systems, IR and other types of Information Systems, IR System Evaluation

Introduction to Data structures and algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT - II: **10 hrs**

Inverted Files and Signature Files: Introduction, Structures used in Inverted Files, Building an Inverted file using a sorted array, Modifications to the Basic Techniques.

Signature Files: Concepts of Signature files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT - III: **10 hrs**

New Indices for Text, Lexical Analysis and Stop lists: PAT Trees and PAT Arrays: Introduction, PAT Tree structure, Algorithms on the PAT Trees, Building PAT Trees as PATRICA Trees, PAT representation as Arrays. Stop lists.

UNIT - IV: **10 hrs**

Stemming Algorithms and Thesaurus Construction: Types of Stemming algorithms, Experimental Evaluations of Stemming, stemming to Compress Inverted Files.

Thesaurus Construction: Features of Thesauri, Thesaurus Construction, Thesaurus construction from Texts, Merging existing Thesauri.

UNIT - V: String Searching Algorithms: **10 hrs**

Introduction, Preliminaries, The Naive Algorithm, The Knutt-Morris-Pratt Algorithm, The Boyer-Moore Algorithm, The Shift-Or Algorithm, The Karp-Rabin Algorithm.

Text Books:

1. Modern Information Retrieval, Ricardo Baeza-Yates, Neto, PEA, 2007.
2. Information Storage and Retrieval Systems: Theory and Implementation, Kowalski, Gerald, Mark Academic Press, 2000.

e-resources:

https://www.youtube.com/watch?v=kXpHcEoZWPM

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		1	2	1									1	1
CO2		1	2	1									1	1
CO3		1	2	1									1	1
CO4		1	2	1									1	1
CO5		1	2	1									1	1

Professional Elective – 2.4 **Cyber Security**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Basics of Internet and Networks		3	0	0	3

Course Objectives:

- To learn threats and risks within context of the cyber security architecture.
- Student should learn and Identify security tools and hardening techniques.
- To learn types of incidents including categories, responses and timelines for response.

Course Outcomes: At the end of the course, student will be able to
CO-1: Summarize Cyber security architecture principles. (L1)
CO-2: Illustrate risk management processes and practices. (L2)
CO-3: Appraise cyber security incidents to apply appropriate response (L2)
CO-4: Distinguish system and application security threats and vulnerabilities. (L3)
CO-5: Identify security tools and hardening techniques (L2)

UNIT–I: 8 hrs
Introduction to Cyber security- Cyber security objectives, Cyber security roles, Differences between Information Security & Cyber security, Cyber security Principles Confidentiality, integrity, &availability Authentication & non- repudiation.

UNIT–II: 10 hrs
Information Security (IS) within Lifecycle Management-Lifecycle management landscape, Security architecture processes, Security architecture tools, Intermediate lifecycle management concepts, Risks & Vulnerabilities-Basics of risk management, Operational threat environments, Classes of attacks.

UNIT–III: 10 hrs
Incident Response- Incident categories, Incident response Incident recovery, and Operational security protection: Digital and data assets, ports and protocols, Protection technologies, Identity and access Management, configuration management.

UNIT–IV: 10 hrs
Threat Detection and Evaluation (DE): Monitoring- Vulnerability Management, Security Logs and Alerts, Monitoring Tools and Appliances. Analysis- Network traffic Analysis, packet capture and analysis

UNIT–V: **10 hrs**
Introduction to backdoor System and security-Introduction to metasploit, Backdoor, demilitarized zone (DMZ), Digital Signature, Brief study on Harding of operating system.

Text Books:

1. NASSCOM: Security Analyst Student Hand Book Dec 2015.
2. Information Security Management Principles Updated Edition by David Alexander, Amanda Finch, David Sutton, Published by BCS.

Reference Books:

1. CSX- cyber security fundamentals 2 nd edition, Published by ISACA, Cyber security, Network Security, Data Governance Security.

e-resources:

https://archive.nptel.ac.in/courses/106/106/106106129/

https://www.youtube.com/watch?v=nzZkKoREEGo

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2			2	2		2					2	2
CO2		2			2	2		2					2	2
CO3		2			2	2		2					2	2
CO4		2			2	2		2					2	2
CO5		2			2	2		2					2	2

MOOCS course (Professional Elective – 2.5					
Course Code:	Year and Semester: III – II	L	T	P	C
Prerequisites: Prior Knowledge of Computer Fundamentals		3	0	0	3

Course Objectives:

- To make the student familiar with online learning
- To make the student familiar with self-learning
- To let the student understand competence at NPTEL level courses

Guidelines:

- A candidate shall complete a course of 12 weeks duration only, if MOOCs course is opted as Professional Elective course – 2.
- Enrolment of MOOC course will be initiated from the date of commencement of classwork for III Year – 2nd Semester.
- MOOC course completion certificate must be submitted on or before the completion of Fourth Year – 1st Semester to consider it for Regular evaluation. Otherwise, it will be considered as Supplementary.
- Student has to pursue and acquire a certificate for a MOOC course only from the SWAYAM/NPTEL through online with the approval of Head of the Department concerned.
- List of courses will be announced by the respective Board of Studies at the time of commencement of class work for Second Year – 2nd Semester.
- A Faculty Coordinator at Department level will be associated with the courses enrolled.

Cloud Computing (Open Elective – 2)					
Course Code:	Year and Semester: III – II	L	T	P	C
Prerequisites: Prior Knowledge of Data Bases, Programming and Basics of Networking.		3	0	0	3

Course Objectives:

1. Students will be able to learn about cloud environment.
2. Students will be able to learn about the key dimensions of the challenges of cloud computing.
3. Student encounters with building software systems and components which scale millions of users in modern internet.
4. students will be able to deal with various cloud service models such as Iaas, Paas, Saas
5. Students will be able to learn about the storage and management of resources concepts in the cloud.
6. Students will learn about the components that scale to millions of users in modern internet, cloud concepts capabilities across the various cloud service models including Iaas, Paas, Saas, and developing cloud-based software applications on top of cloud platforms.

Course Outcomes:

CO1. Summarize the key dimensions of the challenge of Cloud Computing (**Understanding – L1**)
CO2. Assessment of the economics, financial, and technological implications for selecting cloud computing for own organization (**Evaluating – L3**)
CO3. Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications. (**Evaluating – L2**)
CO4. Assessment of own organizations' needs for capacity building and training in cloud computing-related IT areas. (**Evaluating – L3**)

UNIT – I **10Hrs**

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT-II **10 Hrs**

Virtual Machines and Virtualization of Clusters and Data Centers Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation.

UNIT-III **10 Hrs**

Cloud Platform Architecture Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

UNIT-IV **10 Hrs**

Cloud Resource Management and Scheduling Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two-Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

UNIT – V **8 Hrs**

Cloud Programming and Software Environments Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

Storage Systems Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system. Apache Hadoop, Big Table, Megastore, Amazon Simple Storage Service (S3)

TEXT BOOKS:

1. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 2014
2. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
3. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
4. Cloud Computing, A Hands-on approach, ArshadeepBahga, Vijay Madisetti, University Press

REFERNCE BOOK:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

ONLINE RESOURCE:

1. **https://nptel.ac.in/courses/106/105/106105167/**
2. **https://cloudacademy.com/courses/**
3. **www.slideshare.net**

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2		2					1	2	1	1	2
CO2		2	2		2					1	2	1	1	2
CO3		2	2		2					1	2	1	1	2
CO4		2	2		2					1	2	1	1	2
CO5		2	2		2					1	2	1	1	2

Design and Analysis of Algorithms Lab					
Course Code:	Year and Semester: III - II	L	T	P	C
Prerequisites: Prior knowledge of programming language(s) and basic Data Structures and Algorithms		0	0	3	1.5

Course Objectives:

1. To learn fundamental algorithmic problems.
2. To understand methods of designing and analysing algorithms.
3. To know various designing paradigms of algorithms for solving real world problems.

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

1. Identify and apply the suitable algorithm for the given problem. (L2)
2. Design and implement efficient algorithms for a specified application. (L3)

List of experiments:

1. Write a program to find the maximum and minimum element from the collection of elements using divide and conquer technique.
2. Write a program to find the optimal profit of a Knapsack using Greedy method.
3. Write a program for Optimal Merge Patterns problem using Greedy Method.
4. Write a program for Single Source Shortest Path for General Weights using Dynamic Programming.
5. Write a program to find all pair shortest path from any node to any other node within a graph.
6. Write a program to find the non-attacking positions of Queens in a given chess board using backtracking.
7. Find a subset of a given set S = {S_l, S_2, ...,S_n} of n positive integers, whose sum is equal to a given positive integer d. For example, if S= {1, 2, 5, 6, 8} and d = 9 there are two solutions {1, 2, 6} and {1, 8}. A suitable message is to be displayed if the given problem instance doesn't have a solution.
8. Write a program to color the nodes in a given graph such that no two adjacent can have the same color using backtracking.
9. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using Backtracking principle.

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	2	3	3	3									2	2
CO2	2	3	3	3									2	2

UML Lab					
Course Code:	Year and Semester: III - II	L	T	P	C
Prerequisites: prior knowledge of Object-Oriented Programming Concepts.		0	0	3	1.5

Course Objectives:

- To know the practical issues of the different object-oriented analysis and design concepts
- Inculcate the art of object-oriented software analysis and design
- Apply forward and reverse engineering of a software system
- Carry out the analysis and design of a system in an object-oriented way

Course Outcomes:

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

- utilize UML Tools effectively for modeling
- develop structural model of a given system
- develop behavioral model of a given system

Note: For performing the experiments consider any case study (ATM/ Banking / Library / Hospital management systems)

Experiment 1:

Familiarization with Rational Rose or Umbrella environment

Experiment 2:

a) Identify and analyze events
b) Identify Use cases
c) Develop event table

Experiment 3:

a) Identify & analyze domain classes
b) Represent use cases and a domain class diagram using Rational Rose
c) Develop CRUD matrix to represent relationships between use cases and problem domain classes

Experiment 4:

a) Develop Use case diagrams
b) Develop elaborate Use case descriptions & scenarios
c) Develop prototypes (without functionality)

Experiment 5:

a) Develop system sequence diagrams and high-level sequence diagrams for each use case
b) Identify MVC classes / objects for each use case
c) Develop Detailed Sequence Diagrams / Communication diagrams for each use case showing interactions among all the three-layer objects

Experiment 6:

a) Develop detailed design class model (use GRASP patterns for responsibility assignment)
b) Develop three-layer package diagrams for each case study

Experiment 7:
a) Develop Use case Packages
b) Develop component diagrams
c) Identify relationships between use cases and represent them
d) Refine domain class model by showing all the associations among classes

Experiment 8:
Develop sample diagrams for other UML diagrams - state chart diagrams, activity diagrams and deployment diagrams

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		3	3	3	1									
CO2		3	3	3	1									
CO3		3	3	3	1									

Secure Coding Lab					
Course Code:	Year and Semester: III - II	L	T	P	C
Prerequisites: Data Privacy, Data & Network Security		0	0	3	1.5

Course Objectives:

- To experience cryptographic algorithmic implementation
- To use Java security tools

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

CO-1: To Build Codes for Symmetric Key encryption
CO-2: To Address popular public key encryption techniques
CO-3: To Use Java security tools

List of Experiments

1) Simple Caesar cipher & Substitution cipher techniques
2) One-Time Pad and Perfect Secrecy
3) Message Authentication Codes
4) Cryptographic Hash Functions and Applications
5) Symmetric Key Encryption Standards (DES)
6) Symmetric Key Encryption Standards (AES)
7) Diffie-Hellman Key Establishment
8) Public-Key Cryptosystems (PKCSv1.5)
9) Digital Signatures
10) Java Security Tools – Java Authentication & Authorization Services (JAAS)

Ref: Java Authentication and Authorization Service (JAAS) Reference Guide (oracle.com)

*****

.Net Programming Lab (Skill Advanced Course)					
Course Code:	Year and Semester: III-II	L	T	P	C
Prerequisites: OOP's Concept and Programming Skills		0	0	3	1.5

Course Objectives: This Lab course will help students to achieve the following objectives:
1. Introduce to .Net IDE Component Framework.
2. Programming concepts in .Net Framework.
3. Creating website using ASP.Net Controls.

Course Outcomes: At the end of this Lab course students will be able to:
CO1. Create user interactive web pages using ASP.Net. (L3)
CO2. Create simple data binding applications using ADO.Net connectivity. (L3)
CO3. Performing Database operations for Windows Form and web applications. (L3)

List of Experiments:

1. Program to display the addition, subtraction, multiplication and division of two number using console applications.
2. Program to display the first 10 natural numbers and their sum using console application.
3. Program to display the addition using the windows application.
4. Write a program to convert input string from lower to upper and upper to lower case.
5. Write a program ta o simple calculator using a windows application.
6. Write a program working with Page using ASP.Net.
7. Write a program working with forms using ASP.NET.
8. Write a program to connect with the Oracle database.
9. Write a program to access data sources through ADO.NET.
10. Write a program to manage the session.

e-resources:
https://dotnettutorials.net/course/csharp-dot-net-tutorials/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		3	3	3	2							2	1	1
CO2		3	3	3	2							2	1	1
CO3		3	3	3	2							2	1	1

Soft Skills (Skill Advanced Course – 2)					
Course Code:	Year and Semester: III - II	L	T	P	C
Prerequisites: -		1	0	2	2

Soft Skills amount to talents for adaptive and optimistic behavior that alter humans to deal effectively with the stress and challenges of life. This notion is additionally termed as psychosocial proficiency. The subject varies greatly reckoning on social norms and community expectations however skills that operate for well-being and aid people to change into active and productive members of their communities' square measure thought-about as Soft Skills.

They exemplify innovativeness, significant thinking, problem-solving, decision-making, the supremacy to speak-up and team-up, in aggregation with personal and social responsibility that contribute to sensible citizenship – all essential skills for achievement within the twenty first century, each for healthy societies and for employable people.

The course of soft skills is introduced to boost the standard of learning and living by complementing scholastic records with skill-based coaching. Realizing that the dual purpose of education i.e., is to foster educational excellence among students and additionally guide them to transform themselves into responsible people and professionals.

Soft Skills are a unit, a crucial facet of having the ability to fulfil the strain of daily & professional lives in a very unendingly dynamical world. The big changes in international economies over the last 5 years have coincided with technological transformations, all of that area unit leaving an impression on education, the geographic point, and our personal lives. Students need dynamically guided soft skills and hands on exposure, like the power to face / tackle stress and frustration, to address the growing pace and alter recent life. Over the course of their careers, today's engineering aspirants can have various new professions, each one with its own set of constraints and necessities, with flexibility & adaptability in demand of learn ability.

Objectives:

By the end of the program students will be able to:

1. communicate clearly, confidently, concisely, and persuasively both written as well as orally.
2. rediscover and boost self-confidence, to the zenith, and solve issues with ease.
3. recognize the results (change) of their behavior / conduct and teach them to take ownership of
4. their acts rather than blaming others.
5. build confidence in their speaking / presentation skills and become industry-ready.
6. develop a stronger sense of consciousness and appreciation for others by analyzing prospects, and
7. creating choices.
8. manage self-competence and self-confidence.

Preamble: Soft skills are character traits and interpersonal skills that portray a person's relationships with other people. In the workplace, soft skills are considered to be a balance to hard skills, which refers to a person's knowledge and professional skills.

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

CO1: master advanced nuances of both written and oral communication skills that are imperative for any professional to succeed coupled with being emphatic.

CO2: confidently ace different competitive exams and develop writing skills.
CO3: gain awareness of the industry expectations and craft CV / Résumé in lieu with desired job profiles.
CO4: crack behavioral (HR) interview confidently and exhibit professional persona.
CO5: make presentations effective and develop interview strategies while get rid of interview phobia.

Syllabus:

Module 1 Effective communication skills

- Start with self and connect with others.
- The art of narrating and storytelling.
- Enhance teamwork and influence change.

Module 2 Advanced verbal ability concepts – practice and Professional writing skills

- Nurture and enhance the verbal ability strength through practice.
- Conducting mock verbal (ability) tests and their timely review.
- List the steps of writing an email effectively & comprehend the importance of structuring an email.
- Overview of various elements related to accuracy, brevity and correctness in our everyday writing at the workplace (Project proposals / covering letters / blogs / short essays).

Module 3 Industry sneak and résumé / CV building strategies

- Industry & aspirant career expectations and tailoring action learning plan aptly.
- Crafting winning résumé(s) suiting to different profiles.
- Framing responses to résumé-based interview questions.

Module 4 Behavioral competency building – Part II and psychometric test (HR Round Preparation)

- Listing personal characteristics and preparing blueprint to inculcate them.
- Assess the students' ability to fit into a specific work environment or with specific personality types.
- Determine basic characteristics of an individual.

Module 5 Presentation skills & Mock interviews

- Illustration of presentation structure via impromptu / free speech – and essential criteria for an
- effective presentation
- Importance of non-verbal communication (signposting)
- Inciting the interview process by practicing a gamut of behavioral mock interviews.

Module 1 –Tasks

- Listening & comprehension skills – lessons from the corporate training videos / scenes in films.
- Role play – story telling & anchoring
- Extempore – students' experience with college/program.
- Listening & comprehension skills – lessons from the corporate training videos / scenes in films

Module 2 -Tasks

- Story paraphrasing, peer introduction and monologue.
- Assignment on short essay and blog building/digital profile creation.

Module 3 -Tasks

- Overview & analysis of a Job Description (JD) and its reflection in resume / self-introduction
- Crafting of resumes by mapping skills & competences to different profiles offered for engineering graduates.
- An act on – one day in the life of an HR manager/ Project leader etc.

Module 4 -Tasks

- Case scenarios – to identify behavioral competencies and personality traits
- increase self-awareness and improve interactions with others

Module 5 -Tasks

- Pair & Group work – debating / demonstration of product promotion, etc.
- Peer mock interview practice on selected profiles.

Reference Books

1. The Ace of Soft Skills: Attitude, Communication and Etiquette for Success, Pearson Education; 1edition, 2013.
2. Barun K. Mitra, “Personality Development & Soft Skills”, Oxford Publishers, Third impression,2017.
3. ICT Academy of Kerala, "Life Skills for Engineers", McGraw Hill Education (India) Private Ltd.,2016.
4. Caruso, D. R. and Salovey P, “The Emotionally Intelligent Manager: How to Develop and Use the FourKey Emotional Skills of Leadership”, John Wiley & Sons, 2004.
5. Kalyana, “Soft Skill for Managers”; First Edition; Wiley Publishing Ltd, 2015.
6. Larry James, “The First Book of Life Skills”; First Edition, Embassy Books, 2016.
7. ShaliniVerma, “Development of Life Skills and Professional Practice”; First Edition; Sultan Chand(G/L) & Company, 2014.
8. Daniel Goleman, "Emotional Intelligence"; Bantam, 2006.
9. Remesh S., Vishnu R.G., "Life Skills for Engineers", Ridhima Publications, First Edition, 2016.
10. Butterfield Jeff, “Soft Skills for Everyone”, Cengage Learning India Pvt. Ltd; 1 edition, 2011.
11. Training in Interpersonal Skills: Tips for Managing People at Work, Pearson Education, India; 6th Edition, 2015.

Digital References

1.InfosysSpringboard(https://infyspringboard.uk.onwingspan.com/web/en/login)
2. AICTE Digital Learning Portal (https://free.aicte-india.org/)
3. APSCHE LMS – Bringing Learning to People (https://apschelms.e-pragati.in/#/)
4. Dale Carnegie Academy (https://www.dalecarnegie.com/en)
5.TedX Program (https://www.ted.com/about/programs-initiatives/tedx-program)
6. Toast Masters International (https://www.toastmasters.org/)
7. NPTEL (https://nptel.ac.in/)
8.Coursera / Udemy / Unacademy / Wikipedia (https://en.wikipedia.org/wiki/Main_Page)

Entrepreneurial Skill Development					
Course Code:	Year and Semester: III - II	L	T	P	C
Prerequisites: Basic Sciences and Humanities		2	0	0	0

Course Objective:

1. To impart the basics of entrepreneurship skills for better understanding of entrepreneurial scenario.
2. To familiarize the various components from I to E and promoting adaptability nature.
3. To aware of small-scale ventures and registrations and patents related for entrepreneurship and startups management.
4. To familiarize with significance of institutional support at various levels for determining the marketing strategies.
5. To familiarize the strategic perspectives in entrepreneurship.

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

CO 1: Outline basics of entrepreneurship skills for better understanding of entrepreneurial scenario are understood.

CO 2: Explore various components from I to E and promoting adaptability nature were made familiar.

CO 3: Outline small scale ventures and registrations and patents related for entrepreneurship and startups was explained.

CO 4: Examine of institutional support at various levels for determining the marketing strategies was explained.

CO 5: Explore Strategic perspectives in entrepreneurship are made familiar.

SYLLABUS

UNIT I **8 hrs**

Entrepreneurial Perspectives

Introduction to Entrepreneurship – Evolution - Concept of Entrepreneurship - Types of Entrepreneurs - Entrepreneurial Competencies, Capacity Building for Entrepreneurs. Entrepreneurial Training Methods - Entrepreneurial Motivations - Models for Entrepreneurial Development - The process of Entrepreneurial Development.

UNIT - II **10hrs**

New Venture Creation

Introduction, Mobility of Entrepreneurs, Models for Opportunity Evaluation; Types of loans for entrepreneurship and startups. Business plans – Purpose, Contents, Presenting Business Plan, Procedure for setting up Enterprises, Central level - Startup and State level - T Hub, Other Institutions initiatives.

UNIT – III **10hrs**

Small Scale Ventures, MSME in India and their challenges

Concept of micro, small and medium enterprises and startups. Scope and trends of small entrepreneurship and startup in India. Role of government in promoting small scale industries. Management of MSMEs and Sick Enterprises Challenges of MSMEs, Preventing Sickness in Enterprises – Specific Management Problems; Industrial Sickness; Industrial Sickness in India – Symptoms, process and Rehabilitation of Sick Units.

UNIT – IV **10hrs**

Market growth for generating entrepreneurship opportunities

Entrepreneur's legal and regulatory systems, Intellectual property rights, patents, Copy rights and trademark and their protection. Managing Marketing and Growth of Enterprises Essential Marketing Mix of Services, Key Success Factors in Service Marketing, Cost and Pricing, Branding, New Techniques in Marketing, International Trade.

UNIT – V **10hrs**

Institutional Support to Entrepreneurship and Woman Entrepreneurship

Strategic perspectives in Entrepreneurship, Technology and Entrepreneurship, Training institutions "District Industry Centre (DIC), Entrepreneurship Development Institute of India (EDII)" Innovation council – Ministry of Human Resource Development (MHRD), Small Industries Development Bank of India (SIDBI), Industrial Development Bank of India (IDBI).

Women Entrepreneurs – Strategies to develop Women Entrepreneurs, Institutions supporting Women Entrepreneurship in India, Association of Lady Entrepreneurs of India (ALEAP)

TEXT BOOKS:

1. Entrepreneurship Development and Small Business Enterprises, Poornima M. Charantimath, 2e, Pearson, 2014.
2. P.Narayana Reddy, Entrepreneurship, Cengage Learning, New Delhi,2010.
3. Steven Fisher, Ja-nae Duane, the startup equation – A visual guide book for building your startup, Indian edition, McGraw Hill Education India Pvt. Ltd. 2016

REFERENCE BOOKS:

1. Entrepreneurship, Arya Kumar, 4 e, Pearson 2015.
2. Entrepreneurship, a South – Asian Perspective, D.F. Kuratko and T. V. Rao, 3e, Cengage, 2012.
3. The Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, 2015.
4. Anjan Rai Chaudhuri, Managing new ventures, concepts and cases, Prentice Hall International, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New Delhi, 2010.

Universal Human Values – 2: Understanding Harmony					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Basic knowledge of Professional ethics		3	0	0	3

COURSE OBJECTIVE: The objective of the course is

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Module 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education
1. Purpose and motivation for the course, recapitulation from Universal Human Values-I
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and experiential Validation- as the process for self-exploration
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority
4. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
5. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

Module 2: Understanding Harmony in the Human Being - Harmony in Myself!
1. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
2. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
3. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
4. Understanding the characteristics and activities of 'I' and harmony in 'I'
5. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail
6. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

Module 3: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship 14. Understanding the meaning of Trust; Difference between intention and competence
2. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
3. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
4. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Module 4: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

1. Understanding the harmony in the Nature
2. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature
3. Understanding Existence as Co-existence of mutually interacting units in all pervasive space
4. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Module 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:
    a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    b. At the level of society: as mutually enriching institutions and organizations
7. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Book

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5. Small is Beautiful - E. F Schumacher.
6. Slow is Beautiful - Cecile Andrews
7. Economy of Permanence - J C Kumarappa
8. Bharat Mein Angreji Raj - PanditSunderlal
9. Rediscovering India - by Dharampal
10. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland (English)
13. Gandhi - Romain Rolland (English)

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1								3	2	2		2		
CO2								3	2	2		2		
CO3								3	2	2		2		
CO4								3	2	2		2		
CO5								3	2	2		2		

Professional Elective – 3.1 **No SQL Databases**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Fundamentals of Databases		3	0	0	3

Course Objectives:

1. To make student understand about NoSQL, its characteristics and history, and the primary benefits for using NoSQL data
2. To explore students about various types of NO-SQL databases (wide-column, document, key-value, graph and object-oriented) in adding content and running queries
3. To make students in understanding the NoSQL data architecture patterns

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

CO1: Outlines the importance of NoSQL and types of NoSQL Databases. (L1)
CO2: Demonstrates the working environment of Column-oriented databases. (L3)
CO3: Demonstrates the working environment of Key Value Databases. (L3)
CO4: Demonstrates the working environment of Document based Databases. (L3)
CO5: Demonstrates the working environment of Graph Databases. (L3)

UNIT-I: Introduction to No-SQL **8 hrs**
What is No-SQL? NoSQL Overview, NoSQL Database Environment, NoSQL Options, When to use No-SQL?, Introduction to No-SQL development

UNIT-II: Column-Oriented Databases **10 hrs**
Column family, key and key space, Apache HBASE

Unit – III: Key Value Databases **10 hrs**
What is key value store? Key value databases, DynamoDB

UNIT-IV: Document based Databases **10 hrs**
What is document? Document Databases, MangoDB

UNIT-V: Graph Databases **10 hrs**
What is Graph Database? Graph Databases, Neo4J

Text Books:
1. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Author: Sadalage, P. & Fowler, Publication: Pearson Education

2. NoSQL Databases A Complete Guide - 2020 Edition, Author: Gerardus Blo dyk, Publisher: 5starcooks

Reference Books
1. Name: Redmond, E. &Wilson, Author: Seven Databases in Seven Weeks: A Guide to Modern Databases and the NoSQL Movement Edition: 1st Edition.

2. NoSQL For Dummies, Author: Adam Fowler, Publisher: A wiley Brand

e- Resources & other digital material:

1. https://www.guru99.com/hbase-tutorials.html
2. https://docs.mongodb.com/manual/tutorial/
3. https://dynobase.dev/dynamodb/
4.https://neo4j.com/developer/graph-db-vs-nosql/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2	2								1	
CO2		2	2	2	2								1	
CO3		2	2	2	2								1	
CO4		2	2	2	2								1	
CO5		2	2	2	2								1	

Professional Elective – 3.2 **Design Patterns**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: OOPS and Java		3	0	0	3

Course Objectives

- Demonstration of patterns related to object-oriented design.
- Describe the design patterns that are common in software applications
- Analyze a software development problem and express it
- Design a module structure to solve a problem, and evaluate alternatives
- Implement a module so that it executes efficiently and correctly

Course Outcomes

CO-1 Summarize various categories of design patterns. (L1)
CO-2 Illustrate common design patterns to incremental/iterative development via case study. (L2)
CO-3 Exploit well-known creational and structural design patterns (such as Iterator, Observer, Factory and Visitor). (L3)
CO-4 Choose appropriate behavioral patterns for design of given problem (L2)
CO-5 Construct a design consisting of a collection of modules (L4)

UNIT – I: 8 hrs

What is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalogue of Design Patterns, Organizing The Catalog, How Design Patterns solve Design Problems, How to Select a Design pattern, How to Use a Design Pattern.

UNIT – II 10 hrs

A Case Study: Designing a Document Editor, Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary, Creational Patterns, Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT – III: 10 hrs

Structural Pattern Part-I, Adapter, Bridge, Composite. Structural

Pattern Part-II, Decorator, Facade, Flyweight, Proxy

UNIT--IV: 10 hrs

Behavioral Patterns Part: I, Chain of Responsibility, Command, Interpreter, Iterator.
Behavioral Patterns Part: II, Mediator, Memento, Observer, Discussion of Behavioral

Patterns.

UNIT V: **10 hrs**

Behavioral Patterns Part: III, State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns. What to Expect from Design Patterns, A Brief History, The Pattern Community, An Invitation, A Parting Thought.

TEXT BOOKS:

1. Design Patterns by Erich Gamma, Pearson Education

REFERENCE BOOKS:

1. Patterns in JAVA Vol-I (or) Vol-II By Mark Grand, Wiley Dream Tech.
2. Java Enterprise Design Patterns Vol-III By Mark Grand Wiley Dream Tech

e-resources:

https://archive.nptel.ac.in/courses/106/105/106105224/

https://refactoring.guru/design-patterns

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		--	2	3	1								1	
CO2		2	3	3	--								1	
CO3		2	3	2	--								1	
CO4		2	3	2	--								1	
CO5		2	3	2	--								1	

Micro Processors & Micro Controllers (Professional Elective– 3.3)					
Course Code:	Year and Semester: III – II	L	T	P	C
Prerequisites: Prior Knowledge of Digital Logic Design		3	0	0	3

Course Objectives:

- To understand the organization and architecture of Microprocessor
- To understand addressing modes to access memory
- To understand 8051 micro controller architecture
- To understand the programming principles for 8086 and 8051
- To understand the interfacing of MP with IO as well as other devices
- To understand how to develop cyber physical systems

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

CO-1: Summarize the Microprocessor capability in general and explore the evaluation of microprocessors. (L1)
CO-2: Summarize the addressing modes of Microprocessors (L1)
CO-3: Program Microprocessors and Microcontrollers. (L3)
CO-4: Interface Microprocessors and Microcontrollers with other electronic devices (L2)
CO-5: Develop cyber physical systems(L3)

Unit-1: Introduction to Microprocessor Architecture (10 hrs)
Introduction and evolution of Microprocessors – Architecture of 8086 – Memory Organization of 8086 – Register Organization of 8086 – Instruction sets of 8086 – Addressing modes – Assembler directives – Introduction to 80286, 80386, 80486 and Pentium (brief description about architectural advancements only).

Unit-2: Minimum and Maximum Mode Operations (10 hrs)
Minimum and Maximum Mode Operations; General bus operation of 8086 – Minimum and Maximum mode operations of 8086 – 8086 Control signal interfacing – Read and write cycle timing diagrams.
Microprocessors I/O interfacing – I; 8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086.

Unit-3: Microprocessors I/O interfacing – II (10 hrs)
Architecture and interfacing of 8251 USART – Architecture and interfacing of 8254 Timer/counter – Architecture and interfacing of DMA controller (8257) – Architecture 8259 Programmable Interrupt Controller (8259) – Command words and operating modes of 8259 –Interfacing of 8259 – Architecture of Keyboard/display controller (8279) – Modes of operation – Command words of 8279 – Interfacing of 8279.

Unit-4: 8051 Microcontroller: (10 hrs)

Overview of 8051 Microcontroller – Architecture– Memory Organization – Register set – I/O ports and Interrupts – Timers and Counters – Serial Communication – Interfacing of peripherals-Instruction set.

Unit-5: PIC Architecture (8 hrs)

Block diagram of basic PIC 18 micro controller – registers I/O ports – Programming in C for PIC: Data types, I/O programming, logical operations, data conversion.

Text Books:

1. Ray and Burchandi, "Advanced Microprocessors and Interfacing", Tata McGraw–Hill.
2. Kenneth J Ayala, "The 8051 Microcontroller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.
3. PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18, -Muhammad Ali Mazidi, RolindD.Mckinay, Danny causey -Pearson Publisher 21st Impression.

Reference Books:

1. Microprocessors and Interfacing, Douglas V Hall, Mc–Graw Hill, 2nd Edition.
2. R.S. Kaler, "A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
3. Ajay V. Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw–Hill Companies – 2005.
4. Ajit Pal, "Microcontrollers – Principles and Applications", PHI Learning Pvt Ltd, 2011.

e-resources:

https://archive.nptel.ac.in/courses/106/108/106108100/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	1	2	2									1	
CO2	1	1	2	2									1	
CO3	1	1	2	2	1								1	
CO4	1	1	2	2	1								1	
CO5	1	1	2	2	1								1	

Professional Elective – 3.4 **Cyber Forensics**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Basics of Internet and networks		3	0	0	3

Course Objectives:

- To understand the cyberspace.
- To understand the forensics fundamentals.
- To understand the evidence capturing process.
- To understand the preservation of digital evidence.

Course Outcomes:

CO-1: summarize the forensic fundamentals (L1)
CO-2: Explore Forensic Evidences (L2)
CO-3: Summarize methods to preserve the digital evidences (L1)
CO-4: Analyze digital forensics (L3)
CO-5: Summarize various contemporary Forensic tools (L1)

UNIT - I: **10 hrs**

Computer Forensics Fundamentals: Introduction to Computer Forensics, Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Resources / Employment Proceedings, Computer Forensics Services, Benefits of Professional Forensics Methodology, Steps Taken by Computer Forensics Specialists, Who Can Use Computer Forensic Evidence? Types of Computer Forensics Technology: Types of Military Computer Forensic Technology, Types of Law Enforcement Computer Forensic Technology, Types of Business Computer Forensics Technology.

UNIT-II: 10 hrs

Computer Forensics Evidence and Capture: Data Recovery: Data Recovery Defined, Data Backup and Recovery, The Role of Backup in Data Recovery, The Data-Recovery Solution, Case Histories. Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options, Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collecting and Archiving, Methods of Collection, Artifacts, Collection Steps, Controlling Contamination: The Chain of Custody.

UNIT III: 10 hrs

Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene,
Computer Evidence Processing Steps, Legal Aspects of Collecting and Preserving Computer Forensic Evidence. Computer Image Verification and Authentication: Special Needs of Evidential Authentication, Practical Considerations, Practical Implementation.

UNIT IV: 10 hrs

Computer Forensics Analysis: Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool, Identification of Data: Timekeeping, Time Matters, Forensic Identification and Analysis of Technical Surveillance Devices. Reconstructing Past Events: How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, A Technical Approach, Destruction of Email, Damaging Computer Evidence, International Principles Against Damaging of Computer Evidence, Tools Needed for Intrusion Response to the Destruction of Data, Incident Reporting and Contact Forms.

UNIT V: 8 hrs

Current Computer Forensics Tools: Evaluating Computer Forensics Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software.

TEXT BOOKS:

1. "Computer Forensics: Computer Crime Scene Investigation", JOHN R. VACCA, Firewall Media.
2. "Guide to Computer Forensics and Investigations" 4e, Nelson, Phillips Enfinger, Steuart, Cengage Learning.

REFERENCES:

1. "Computer Forensics and Cyber Crime", Marjie T Britz, Pearson Education.
2. "Computer Forensics", David Cowen, Mc Graw Hill.
3. Brian Carrier, "File System Forensic Analysis", Addison Wesley, 2005

e-resources:

https://archive.nptel.ac.in/courses/106/105/106105217/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1				2	2	2							1	
CO2				2	2	2							1	
CO3				2	2	2							1	
CO4				2	2	2							1	
CO5				2	2	2							1	

Professional Elective – 3.5 **Digital Image Processing**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Computer Graphics, Matrices		3	0	0	3

Course Objectives: Students undergoing this course are expected to:

1. Familiarize with basic concepts of digital image processing
2. Learn various image processing techniques like image enhancement
3. Understand Color fundamentals and different Color models
4. Understand Image Compression & Morphological Image Processing

Course Outcomes: After completing this course, Students will be able to-

CO1: Summarize Digital Image Fundamentals (L1)
CO2: Perform various Image enhancement techniques (L2)
CO3: Analyze pseudo and full color image processing methods (L3)
CO4: Use various compression techniques and morphological operations. (L2)
CO5: Use various Image segmentation methods (L2)

UNIT – I: Introduction 10 hrs

Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels- Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robot vision, Character recognition, Remote Sensing.

UNIT – II: Image Enhancement in The Spatial Domain: 8 hrs

Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods

UNIT – III: Color Image Processing 8 hrs

Color Fundamentals, Color Models, Pseudo color image processing, Color transformation, Smoothing and sharpening, Image segmentation based on Color, Noise in Color images

UNIT – IV: Image Compression & Morphological Image Processing 10 hrs

Image Compression - Fundamentals, some basic compression methods, Digital Image water marking.
Morphological Image Processing - Erosion and Dilation, Opening and Closing, Hit-or-Miss Transformation, Some basic morphological algorithms, Gray-scale morphology.

UNIT – V: Image Segmentation: 12 hrs

Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.

TEXT BOOKS

1. Digital Image Processing, Third Edition, Rafael C Gonzalez, Richard E Wood

Reference Books:

1. Milan Sonka "Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition.
2. Fundamentals of Digital Image Processing- Anil K. Jain, 2nd Edition, Prentice Hall of India.
3. S. Sridhar, Digital Image Processing, Oxford University Press, 2nd Ed, 2016.

Online Resources:

https://web.stanford.edu/class/ee368/
https://inst.eecs.berkeley.edu/~ee225b/sp20/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	2	2	2	2	2									
CO2	2	2	2	2	2									
CO3	2	2	2	2	2									
CO4	2	2	2	2	2									
CO5	2	2	2	2	2									

Professional Elective – 4.1 **Big Data Analytics**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Java, DBMS and Data Mining		3	0	0	3

Course Objectives: The student should be able to

1. Summarize the Big Data Concepts and Big Data Technologies (L1)
2. Provide an overview of Apache Hadoop (L2)
3. Provide HDFS Concepts and Interfacing with HDFS (L2)
4. Summarize Map Reduce Jobs (L1)
5. Provide hands on Hadoop Eco System (HDFS, MapReduce, Pig & Hive) (L2)

UNIT-I: Introduction to Big Data and Hadoop **10 hrs**

Introduction to Big Data:
Big Data-definition, Characteristics of Big Data (Volume, Variety, Velocity), Data in the Warehouse and Data in Hadoop, Why is Big Data Important? Patterns for Big Data Development, Examples of Big Data Analytics.
Introduction to Hadoop:
Working with Big Data: Google File System, A Brief History of Hadoop, Apache Hadoop and the Hadoop Ecosystem, Hadoop Releases, Hadoop Installation Modes.
Hadoop Distributed File System:
HDFS, Building Blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo distributed mode, Fully Distributed mode), Configuring XML files.

UNIT-II : Map Reduce **10 hrs**

Introduction, How MapReduce works? MR Execution Flow with an Example, Understanding Hadoop API for MapReduce Framework (Old and New), Components of MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner; MapReduce Programs for Word Count, Weather Dataset.

UNIT– III: Hadoop IO **10 hrs**

The Writable Interface, WritableComparable and Comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections, Implementing a Custom Writable: Implementing a RawComparator for speed, Custom Comparators.

UNIT-IV: PIG **10 Hrs**

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Installation and Running of Pig, Execution Types, Evaluating Local and Distributed Modes, Pig Latin Editors, Comparison with databases, Pig Latin, Functions, Data Processing Operators, Checking out the Pig Script Interfaces, Scripting with Pig Latin, Running Pig Programs.

UNIT – V: Hive **8 hrs**

Installing Hive, Comparison with Traditional Databases, Running Hive, Applying Structure to Hadoop Data with Hive: Saying Hello to Hive, Seeing How the Hive is Put Together, Getting Started with Apache Hive, Examining the Hive Clients, Working with Hive Data Types, Creating and Managing Databases and Tables, Seeing How the Hive Data Manipulation Language Works, Querying and Analyzing Data.

Text Books:

1. Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC.
2. Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly.
3. Hadoop in Action by Chuck Lam, MANNING Publ.
4. Hadoop for Dummies by Dirk deRoos, Paul C. Zikopoulos, Roman B. Melnyk, Bruce Brown, Rafael Coss.

References:

1. Hadoop in Practice by Alex Holmes, MANNING Publ.
2. Hadoop MapReduce Cookbook, Srinath Perera, Thilina Gunarathne

Software Links:

1. Hadoop: http://hadoop.apache.org/
2. Hive: https://cwiki.apache.org/confluence/display/Hive/Home
Pig Latin: http://pig.apache.org/docs/r0.7.0/tutorial.html

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	2	2										--	2	2
CO2	2	2	2									--	2	2
CO3	2	2	2									2	2	2
CO4	1	2	2									2	2	2
CO5	2	2	2									2	2	2

Professional Elective – 4.2 **Software Project Management**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Software Engineering		3	0	0	3

Course Objectives: At the end of the course, the student shall be able to:

- To describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project
- To compare and differentiate organization structures and project structures
- To implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

Course Outcomes: Upon the completion of the course students will be able to:

CO-1: Summarize the process to be followed in the software development life-cycle models. (L1)
CO-2: Summarize the concepts of project management & planning (L1)
CO-3: Implement the project plans through managing people, communications and change (L3)
CO-4: Conduct activities necessary to successfully complete and close the Software projects (L3)
CO-5: Implement communication, modeling, and construction & deployment practices in software development. (L3)

Unit-1: Conventional Software Management **8 hrs**

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-2: The Old Way and The New **10 hrs**

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-3: Model Based Software Architectures **10 hrs**

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-4: Iterative Process Planning **10 hrs**

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-5: Process Automation **10 hrs**

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) Software Project Management, Walker Royce, Pearson Education, 2005.

2) Software Project Management, Bob Hughes, 4th edition, Mike Cotterell, TMH.

Reference Books:

1) Software Project Management, Joel Henry, Pearson Education.

2) Software Project Management in practice, Pankaj Jalote, Pearson Education, 2005.

3) Effective Software Project Management, Robert K.Wysocki, Wiley,2006.

e-resources:

https://archive.nptel.ac.in/courses/110/104/110104073/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2						2	3		1	
CO2		2	2	2						2	3		1	
CO3		2	2	2						2	3		1	
CO4		2	2	2						2	3		1	
CO5		2	2	2						2	3		1	

Advanced Computer Architecture (Professional Elective – 4.3)					
Course Code:	Year and Semester: III – II	L	T	P	C
Prerequisites: Prior Knowledge of Computer Organization		3	0	0	3

Course Objectives:

- Understand the Concept of Parallel Processing and its applications
- Implement the Hardware for Arithmetic Operations
- Analyze the performance of different scalar Computers
- Develop the Pipelining Concept for a given set of Instructions
- Distinguish the performance of pipelining and non-pipelining environment in a processor

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

CO-1: Illustrate the types of computers, and new trends and developments in computer architecture (L1)
CO-2: Outline pipelining, instruction set architectures, memory addressing (L2)
CO-3: Apply ILP using dynamic scheduling, multiple issue, and speculation (L3)
CO-4: Illustrate the various techniques to enhance a processors ability to exploit Instruction-level parallelism (ILP), and its challenges (L2)
CO-5: Apply multithreading by using ILP and supporting thread-level parallelism (TLP) (L3)

Unit-1: Computer Abstraction and Technology **10 hrs**

Introduction, Eight Great Ideas in Computer Architecture, Below Your Program, Under the Covers, Technologies for Building Processors and Memory, Performance, The Power Wall, The Sea Change: The Switch from Uni-processors to Multiprocessors, Benchmarking the Intel Core i7, Fallacies and Pitfalls.

Unit-2: Instructions **10 hrs**

Language of the Computer: Operations of the Computer Hardware, Operands of the Computer Hardware, Signed and Unsigned Numbers, Representing Instructions in the Computer, Logical Operations, Instructions for Making Decisions, Supporting Procedures in Computer Hardware, Communicating with People, MIPS Addressing for 32-Bit Immediate and Addresses, Parallelism and Instructions: Synchronization, Translating and Starting a Program, A C Sort Example to Put It All Together, Arrays versus Pointers, ARMv7 (32-bit) Instructions, x86 Instructions, ARMv8 (64-bit) Instructions.

Unit-3: Arithmetic for Computers **10 hrs**

Introduction, Addition and Subtraction, Multiplication, Division, Floating Point, Parallelism and Computer Arithmetic: Subword Parallelism, Streaming SIMD Extensions and Advanced Vector Extensions in x86, Subword Parallelism and Matrix Multiply.

Unit-4: The Processor **10 hrs**

Introduction, Logic Design Conventions, building a Datapath, A Simple Implementation Scheme, An Overview of Pipelining, Pipelined Datapath and Control, Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions, The ARM Cortex-A8 and Intel Core i7 Pipelines.

Unit-5: Large and Fast **8 hrs**

Exploiting Memory Hierarchy: Introduction, Memory Technologies, The Basics of Caches, Measuring and Improving Cache Performance, Dependable Memory Hierarchy, Virtual Machines, Virtual Memory, A Common Framework for Memory Hierarchy, Using a Finite-State Machine to Control a Simple Cache, Parallelism and Memory Hierarchies: Cache Coherence, Parallelism and Memory Hierarchy: Redundant Arrays of Inexpensive Disks, Advanced Material: Implementing Cache Controllers, The ARM Cortex-A8 and Intel Core i7 Memory Hierarchies.

Text Books:

1)Computer Organization and Design: The hardware and Software Interface, David A Patterson, John L Hennessy, 5thedition, MK.
2)Computer Architecture and Parallel Processing –Kai Hwang, Faye A.Brigs, Mc Graw Hill.

Reference Books:

1)Modern Processor Design: Fundamentals of Super Scalar Processors, John P. Shen and Miikko H. Lipasti, Mc Graw Hill.
2)Advanced Computer Architecture –A Design Space Approach –Dezso Sima, Terence Fountain, Peter Kacsuk, Pearson.

e-resources:

https://archive.nptel.ac.in/courses/106/103/106103206/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	2	2	2											
CO2	2	2	2											
CO3	2	2	2		1									
CO4	2	2	2		1									
CO5	2	2	2		1									

Professional Elective – 4.4 **Wireless Sensor Networks**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Computer Networks & Data Communication		2	0	2	3

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

- Acquire the knowledge of various techniques in mobile networks/ ad-hoc networks and sensor-based networks.
- The objective of this course is to facilitate the understanding of Infrastructure less networks and their importance in the future directions for wireless communications

Course Outcomes:

CO-1: Summarize the Fundamental Concepts and applications of ad hoc and wireless sensor networks
CO-2: Analyze the MAC protocol issues of ad hoc networks
CO-3: Summarize routing protocols for ad hoc wireless networks with respect to TCP design issues
CO-4: Analyze the concepts of network architecture and MAC layer protocol for WSN
CO-5: Summarize the WSN routing issues by considering QoS measurements

UNIT I: **8 hrs**

Introduction to Ad Hoc Wireless Networks- Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks- Issues, Design Goals and Classifications of the MAC Protocols

UNIT II: **12 hrs**

Routing Protocols for Ad Hoc Wireless Networks- Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

UNIT III: **10 hrs**

Security protocols for Ad hoc Wireless Networks- Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

UNIT IV: 10 hrs

Basics of Wireless Sensors and Applications- The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks- Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

UNIT V: **8 hrs**

Security in WSNs- Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems–TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow style language: TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Text Books:

1) Ad Hoc Wireless Networks – Architectures and Protocols, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004.
2) Ad Hoc and Sensor Networks – Theory and Applications, Carlos Corderio Dharma P.Aggarwal, World Scientific Publications / Cambridge University Press, March 2006.
3) Wireless Sensor Networks – Principles and Practice, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010.

Reference Books:

1) Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009.
2) Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008.
3) Ad hoc Networking, Charles E.Perkins, Pearson Education, 2001.
4) Wireless Ad hoc Networking, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007.

e-resources:

https://archive.nptel.ac.in/courses/106/105/106105160/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2										
CO2		2	2	2										
CO3		2	2	2										
CO4		2	2	2										
CO5		2	2	2										

Professional Elective – 4.5 **Computer Vision**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Computer Graphics & Image Processing		3	0	0	3

Course Objectives:

- Upon Completion of the course, the students will be able to
- Recall image processing techniques for computer vision
- Do shape and region analysis
- Elucidate Hough Transform and its applications to detect lines, circles, ellipses
- Apply three-dimensional image analysis techniques
- Exploit motion analysis
- Study real world applications of computer vision algorithms

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

CO-1: Explain the basic image processing techniques (L2)
CO-2: Interpret in-shape, boundary tracking and apply chain codes in region detection (L2)
CO-3: Apply Hough transform for detection of geometric shapes like line, ellipse and objects. (L3)
CO-4: Illustrate 3D vision process and motion estimation techniques (L2)
CO-5: Apply computer vision in real time scenario. (L3)

UNIT I - IMAGE PROCESSING FOUNDATIONS **8 hrs**

Fundamentals Of Image Processing Techniques – Classical Filtering Operations Thresholding Techniques – Edge Detection Techniques – Corner and Interest Point Detection –Mathematical Morphology –Texture

UNIT II - SHAPES AND REGIONS **12 hrs**

Binary Shape Analysis – Connectedness – Object Labeling and Counting – Size Filtering – Distance Functions – Skeletons and Thinning – Deformable Shape Analysis – Boundary Tracking Procedures – Active Contours – Shape Models and Shape Recognition – Centroidal Profiles – Handling Occlusion – Boundary Length Measures – Boundary Descriptors – Chain Codes – Fourier Descriptors – Region Descriptors – Moments

UNIT III - HOUGH TRANSFORM **10 hrs**

Line Detection – Hough Transform (HT) For Line Detection – Foot-of-Normal Method – Line Localization – Line Fitting – RANSAC For Straight Line Detection – HT Based Circular Object Detection – Accurate Center Location – Speed Problem – Ellipse Detection – Case Study: Human Iris Location – Hole Detection – Generalized Hough Transform – Spatial Matched Filtering – GHT For Ellipse Detection – Object Location – GHT For Feature Collation

UNIT IV - 3D VISION AND MOTION **10hrs**

Methods For 3D Vision – Projection Schemes – Shape from Shading – Photometric Stereo – Shape from Texture – Shape from Focus – Active Range Finding – Surface Representations – Point-Based Representation – Volumetric Representations – 3D Object Recognition – 3D

Reconstruction – Introduction to Motion – Triangulation – Bundle Adjustment – Translational Alignment – Parametric Motion – Spline-Based Motion – Optical Flow – Layered Motion

UNIT V - APPLICATIONS **8 hrs**
Application: Content Based Image Retrieval, Content Based Video Retrieval.
Case Study: Face Recognition, Gait Recognition.

Learning Resources

Text Books:

1. E. R. Davies, (2012), ‚Computer & Machine Vision', Fourth Edition, Academic Press.
2. R. Szeliski, (2011) ‚Computer Vision: Algorithms and Applications', Springer 2011.
3. Simon J. D. Prince, (2012) ‚Computer Vision: Models, Learning, and Inference', Cambridge University Press, 2012.
4. Mark Nixon and Alberto S. Aquado, (2012) ‚Feature Extraction & Image Processing for Computer Vision', Third Edition, Academic Press.

Reference Books:

1. D. L. Baggio et al., (2012) ‚Mastering Open CV with Practical Computer Vision Projects', Packet Publishing,
2. Jan Erik Solem, (2012) ‚Programming Computer Vision with Python: Tools and algorithms for analyzing images', O'Reilly Media.

Online Resources:

1. http://kercd.free.fr/linksKCD.html
2. http://www.cs.ubc.ca/spider/lowe/vision.html
3. https://archive.nptel.ac.in/courses/106/106/106106224/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2	1	1						1	2	1
CO2		2	2	2	1	1						1	2	1
CO3		2	2	2	1	1						1	2	1
CO4		2	2	2	1	1						1	2	1
CO5		2	2	2	1	1						1	2	1

Professional Elective – 5.1 **Machine Learning**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Statistics and Data Mining		3	0	0	3

Course Objectives: The student should be able to:

1. Recognize the importance and characteristics of machine learning.
2. Apply supervised machine learning techniques for data handling and to gain knowledge from it.
3. Apply advanced supervised machine learning and probabilistic models for classification problems.
4. Apply unsupervised machine learning models to real world problems.
5. Evaluate the performance of algorithms and to provide solution for various real-world applications using ensemble models.

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1: Recognize the characteristics of machine learning.
{Understand level, KL2} {Analyze level, KL4}

CO2: Apply various supervised learning methods to appropriate problems.
{Understand level, KL2} {Apply level, KL3}

CO3: Identify and integrate more than one technique to enhance the performance of learning and create probabilistic models for handling unknown pattern.
{Understand level, KL2} {Apply level, KL3} {Evaluate level, KL5}

CO4: Apply unsupervised learning models e.g. clustering algorithms to handle the unknown data.
{Apply level, KL3} {Analyze level, KL4}

CO5: Apply Ensemble models to any real-world problem to Analyze its performance effectively.
{Apply level, KL3} {Analyze level, KL4} {Evaluate level, KL5}

UNIT-I **10 Hrs**

Introduction to Machine Learning

Introduction, Components of Learning, Learning Models, Geometric Models, Probabilistic Models, Logic Models, Grouping and Grading, Designing a Learning System, Types of Learning, Supervised, Unsupervised, Reinforcement, Perspectives and Issues, Version Spaces, PAC Learning, VC Dimension.

UNIT-II **10 Hrs**

Supervised Learning

Learning a Class from Examples, Linear, Non-linear, Multi-class and Multi-label classification, Decision Trees: ID3, Classification and Regression Trees (CART), Regression: Linear Regression, Multiple Linear Regression, Logistic Regression.

UNIT-III **10 Hrs**

Advanced Supervised Learning

Neural Networks: Introduction, Perceptron, Multilayer Perceptron, Support vector machines: Linear and Non-Linear, Kernel Functions, K-Nearest Neighbors.

Probabilistic Models

Bayesian Learning, Bayes Optimal Classifier, Naïve Bayes Classifier, Bayesian Belief Networks.

UNIT– IV: 10 Hrs

Unsupervised Learning

Introduction to clustering, K-means clustering, K-Mode Clustering, Distance based clustering, Clustering around mediods, Silhouettes, Hierarchical Clustering.

UNIT-V: 8 Hrs

Ensemble Learning

Ensemble Learning Model Combination Schemes, Voting, Error-Correcting Output Codes, Bagging: RandomForest Trees, Boosting: Adaboost, Stacking.

Text Books:

1. EthemAlpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
2. MehryarMohri, AfshinRostamizadeh, AmeetTalwalkar "Foundations of Machine Learning", MIT Press, 2012
3. Machine Learning: The art and Science of algorithms that make sense of data, Peter Flach, Cambridge University Press, 2012

Reference Books:

1. Chris Albon: Machine Learning with Python Cookbook, O'Reilly Media, Inc.2018.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Charu C. Aggarwal, "Data Classification Algorithms and Applications", CRC Press, 2014. Stephen Marsland, "Machine Learning – An Algorithmic Perspective", 2nd Edition, CRC Press, 2015.
4. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012 Jiawei Han and Micheline Kambers and Jian Pei, "Data Mining –Concepts and Techniques", 3rd Edition, Morgan Kaufman Publications, 2012.
5. Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, "Mathematics for Machine Learning", Cambridge University Press, 2019.

E- Resources & Other Digital Material:

1. Kevin Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012, https://www.cs.ubc.ca/~murphyk/MLbook/pml-intro-5nov11.pdf.
2. Professor S. Sarkar, IIT Kharagpur "Introduction to machine learning", https://www.youtube.com/playlist?list=PLYihddLFCgYuWNL55Wg8ALkm6u8U7gps.
3. Professor Carl Gustaf Jansson, KTH, Video Course on Machine Learning https://nptel.ac.in/noc/individual_course.php?id=noc19-cs35.
4. Tom Mitchell, "Machine Learning", http://www.cs.cmu.edu/~tom/10701_sp11/lectures.shtml

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	2	2	2	2	2								2	
CO2	2	2	2	2	2								2	
CO3	2	2	2	2	2								2	
CO4	2	2	2	2	2								2	
CO5	2	2	2	2	2								2	

Professional Elective – 5.2 **Mean Stack Technologies**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Basic Web programming tools		3	0	0	3

Course Objectives:

- To explore all the full stack development tools with respect to MEAN.
- To be able to build applications with contemporary technologies

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

CO-1: Build client-side web pages (L2)

CO-2: Summarize Java script ES6 features and Node JS components (L1)

CO-3: Use Express.js for server-side Node JS components & type script. (L3)

CO-4: Use document database using MongoDB. (L3)

CO-5: Utilize Angular JS to design dynamic and responsive web pages. (L3)

UNIT-I: 8 hrs

HTML 5: Introduction to Web, Overview of Web Technologies, HTML - Introduction, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element, Division and Span Elements, List Element, Link Element, Character Entities, HTML5 Global Attributes, Creating Tables with all attributes, Creating Form Elements, Input Elements - Attributes, Color and Date Pickers.

JavaScript: Java script elements, let, statements, control statements, functions, Arrays and methods, Strings.

UNIT-II: 10 hrs

Java script ES features – let, var and const, destructuring, spread and rest operators, higher order functions, modules, classes and objects. Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API, Creating and consuming Modules.

Node.js: Why and What is Node.js, How to use Node.js, Create a web server in Node.js, Node Package Manager, Modular programming in Node.js, Restarting Node Application, File Operations.

UNIT-III 12 hrs

Express.js: Express Development Environment, defining a route, Handling Routes, Route and Query Parameters, How Middleware works, Chaining of Middleware, Types of Middleware, connecting to MongoDB with Mongoose, Validation Types and Defaults, Models, CRUD Operations, API

Development, Why Session management, Cookies, Sessions, Why and What Security, Helmet Middleware, Using a Template Engine Middleware, Stylus CSS Preprocessor.

Typescript: Installing TypeScript, Basics of TypeScript, Function, Parameter Types and Return Types, Arrow Function, Function Types, Optional and Default Parameters, Rest Parameter, Creating an Interface, Duck Typing, Function Types, Extending Interfaces, Classes, Constructor, Access Modifiers, Properties and Methods, Creating and using Namespaces, Creating and using Modules, Module Formats and Loaders, Module Vs Namespace, What is Generics, What are Type Parameters, Generic Functions, Generic Constraints.

UNIT-IV: 8 hrs

MongoDB: Introduction Module Overview, Document Database Overview, Understanding JSON, MongoDB Structure and Architecture, MongoDB Remote Management, Installing MongoDB on the local computer (Mac or Windows), Introduction to MongoDB Cloud, Create MongoDB Atlas Cluster, GUI tools Overview, Install and Configure MongoDB Compass, Introduction to the MongoDB Shell, MongoDB Shell JavaScript Engine, MongoDB Shell JavaScript Syntax, Introduction to the MongoDB Data Types, Introduction to the CRUD Operations on documents, Create and Delete Databases and Collections, Introduction to MongoDB Queries.

UNIT-V: 10 hrs

Angular JS: What is Angular, Features of Angular, Angular Application Setup, Components and Modules, Executing Angular Application, Elements of Template, Structural Directives, Custom Structural Directive, Attribute Directives, Custom Attribute Directive, Property Binding, Attribute Binding, Style and Event Binding, Built in Pipes, Passing Parameters to Pipes, Nested Components Basics, Passing data from Container Component to Child Component, Passing data from Child to Container Component, Shadow DOM, Component Life Cycle, Template Driven Forms, Reactive Forms, Custom Validators in Reactive Forms, Custom Validators in Template Driven forms, Dependency Injection, Services Basics, RxJS Observables, Server Communication using HttpClient, Communicating with different backend services using Angular HttpClient, Routing Basics, Router Links, Route Guards, Asynchronous Routing, Nested Routes.

Text Books:

1. Programming the World Wide Web, 7th Edition, Robet W Sebesta, Pearson.
2. Full Stack JavaScript Development with MEAN, Colin J Ihrig, Adam Bretz, 1st edition, SitePoint, SitePoint Pty. Ltd., O'Reilly Media.
3. MongoDB – The Definitive Guide, 2nd Edition, Kristina Chodorow,O’Reilly.

Reference Books:

1. Web Technologies, HTML, JavaScript, PHP, Java, JSP, XML and AJAX, Black book,1st Edition, Dream Tech

2. An Introduction to Web Design, Programming, 1st Edition, Paul S Wang, Sanda SKatila, Cengage Learning.

Online Resources:

Infosys: Infosys Springboard: https://infyspringboard.onwingspan.com/web/en/

https://www.youtube.com/watch?v=_v7bFuECyM4

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2	2							2	1	1
CO2		2	2	2	2							2	1	1
CO3		2	2	2	2							2	1	1
CO4		2	2	2	2							2	1	1
CO5		2	2	2	2							2	1	1

Professional Elective – 5.3 **Embedded Systems**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Operating systems, Computer Organization, DLD		3	0	0	3

Course Objectives:

1. Attain the knowledge of embedded system and its development environment.
2. Gain the knowledge of RTOS based embedded system design and its applications.

COURSE OUTCOME: After completion of the course student will be able to:

CO-1: Summarize the basics of embedded system and its structural units.

CO-2: Analyze the embedded system specification and develop software programs.

CO3: Evaluate the requirements of the programming embedded systems, related software architecture.

CO-4: Summarize the RTOS based embedded system design.

CO-5: Summarize all the applications of the embedded system and designing issues.

Unit-1: **10 hrs**

Introduction to Embedded Systems: Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor, selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

Unit-2: **10 hrs**

Embedded Networking: Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols – RS232 standard – RS422 – RS485 – CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.

Unit-3: **10 hrs**

Embedded Firmware Development Environment: Embedded Product Development Life Cycle objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

Unit-4: **8 hrs**

RTOS Based Embedded System Design: Introduction to basic concepts of RTOSTask, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.

Unit-5: **10 hrs**

Embedded System Application Development: Design issues and techniques Case Study of Washing Machine- Automotive Application- Smart card System Application

Text Books:

1. Wayne Wolf, “Computers as Components: Principles of Embedded Computer System Design”, Elsevier, 2006.
2. Michael J. Pont, “Embedded C”, Pearson Education, 2007.
3. Steve Heath, “Embedded System Design”, Elsevier, 2005.

Reference Books:

1. Steve Heath, “Embedded System Design”, Elsevier, 2005.
2. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, “The 8051
3. Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2007.

e-resources:

https://www.youtube.com/watch?v=uFhDGagZzjs

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2	1									
CO2	1	2	2	2	1									
CO3	1	2	2	2	2									
CO4	1	2	2	2	2									
CO5	1	2	2	2	2									

Professional Elective – 5.4 **Blockchain Design and their Use cases**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: fundamentals of Network security		3	0	0	3

COURSE OBJECTIVES: the main objective of this course is to explore various Blockchain applications.

COURSE OUTCOMES: after completion of the course, the student will be able to

CO1: Summarize emerging abstract models for Blockchain Technology. (L1)
CO2: Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain (L2)
CO3: Summarize conceptual understanding of the function of Blockchain as a method of securing distributed ledgers,
CO4: Infer how consensus is achieved (L2)
CO5: Use Hyperledger Fabric and Ethereum platform to implement the Block chain Application. (L3)

UNIT -1 INTRODUCTION TO BLOCKCHAIN 8 hrs

Blockchain- Public Ledgers, Blockchain as Public Ledgers -Bitcoin, Blockchain 2.0, Smart Contracts, Block in a Blockchain, Transactions-Distributed Consensus, The Chain and the Longest Chain -Cryptocurrency to Blockchain 2.0 - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree.

UNIT -2 BITCOIN AND CRYPTOCURRENCY 12 hrs

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay, Consensus introduction, Distributed consensus in open environments-Consensus in a Bitcoin network.

UNIT -3 BITCOIN CONSENSUS 10 hrs

Bitcoin Consensus, Proof of Work (PoW)- Hash cash PoW, Bitcoin PoW, Attacks on PoW, monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases, Design issues for Permissioned Blockchains, Execute contracts- Consensus models for permissioned blockchain-Distributed consensus in closed environment Paxos

UNIT -4 DISTRIBUTED CONSENSUS **10 hrs**

RAFT Consensus-Byzantine general problem, Byzantine fault tolerant system-Agreement Protocol, Lamport-Shostak-Pease BFT Algorithm-BFT over Asynchronous systems, Practical Byzantine Fault Tolerance

UNIT -5 HYPER LEDGER FABRIC & ETHERUM **8 hrs**

Architecture of Hyperledger fabric v1.1-Introduction to hyper ledger fabric v1.1, chain code-Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, Smart contracts, Truffle Design and issue Crypto currency, Mining, DApps, DAO.

BLOCKCHAIN APPLICATIONS: Internet of Things-Medical Record Management System-Blockchain in Government and Blockchain Security-Blockchain Use Cases –Finance

TEXT BOOKS:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Bashir, Imran,2017.

2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.

3. Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.

e-resources:

https://archive.nptel.ac.in/courses/106/105/106105235/

-Publisher: https://www.packtpub.com/big-data-and-business-intelligence/hands-blockchain-hyperledger

- Amazon (Kindle and Paperback): https://www.amazon.com/Hands-Blockchain-Hyperledger-decentralized-applications/dp/1788994523

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2	2	2								2	2
CO2		2	2	2	2								2	2
CO3		2	2	2	2								2	2
CO4		2	2	2	2								2	2
CO5		2	2	2	2								2	2

Professional Elective – 5.5 **Deep Learning**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Data Mining, Machine Learning & Neural Networks		3	0	0	3

Course Objectives:

1. To understand basic concepts of neural networks.
2. To emphasize on learning, optimization techniques.
3. To learn CNN, RNN, Auto encoder models.
4. To learn deep learning algorithms to solve real world problems.

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

1. Summarize basic neural network models (L1)
2. Perform optimization and evaluate performance of the neural network Model. (L2)
3. Implement mathematical model of neural network. (L3)
4. Design convolutional neural network for solving problems. (L4)
5. Design RNN's, Auto encoders. (L4)

UNIT-I: **8 hrs**

Deep learning basics Introduction, the perceptron, Practical network Overfitting training, Back-Propagation, why does it work? and generalization, Shallow Neural Network, Dep Neural Networks.

UNIT-II: **8 hrs**

Optimization Challenges in neural network Checking, RMSProp, Gradient Adam, Batch Descent, Stochastic Gradient Descent, Momentum Optimizer, AdaGrad, normalization. optimization, Initialization, - Regularization, Gradient

UNIT-III: **12 hrs**

Deep Learning for Computer Vision Building blocks of CNN, Local receptive fields, Shared weights and bias, Pooling layers, Max- pooling, Average pooling, CNN for image classification, CNN for segmentation, an example of DCNN- LeNet, LeNet code in Keras, Understanding the power of deep learning, Recognizing CIFAR-10 images with deep learning, recognizing cats with a VGG-16 net.

UNIT -IV: **10 hrs**

Effective training of Deep Neural Networks and Recent trends in Deep Learning Architecture Early stopping, Dropout, Instance Normalization, Group Normalization, Transfer Learning, Improving the CIFAR-10 performance with deeper a network, Improving the CIFAR-10 performance with data augmentation, Predicting with ClFAR-10, Very deep convolutional networks for large-scale image recognition.

UNIT- V: **10 hrs**

Deep Learning for Natural Language Processing Computational representation of language, one-hot representation of words, word vectors, The skip-gram word2vec model, The CBOW word2vee model, word vector arithmetic, RNN, LSTM.

Text books:

1. Deep Learning- lan Goodfellow, YoshuaBenjio, Aaron Courville, The MIT Press
2. Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Reference books:

1. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.
2. Russell1, S. and Norvig, N. Artificial Intelligence: A Modern Approach. Prentice Hall Series in Artificial Intelligence. 2003.
3. Bishop, C. M. Neural Networks for Pattern Recognition. Oxford University Press.1995. Hastie. T., Tibshirani, R. and Friedman, J. The Elements of Statistical Learning. Springer.2001
4. Kolle, D. and Friedman, N. Probabilistic Graphical Models. MIT Press. 2009.

Web Resources & other digital material:

NPTEL Lecture material 1. Lecture Series on Deep Learning by Prof. P. K. Biswas, Department of Electrical & Electronic Communication Engineering, IIT Kharagpur.
https://onlinecourses.nptel.ac.in/noc22_cs22/preview#:~text=Week%201%3A%20Introdhio ion%20to%20Deep, Multilayer%20Perceptron%2C%20Back%20Propagation%20Learning Course

Note: (This is the Updated Syllabus for this Deep Learning Course, From the Original Syllabus the Syllabus is Re-organized the Units –III, IV, V as newly as Units-V, III, IV respectively)

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2	2								1	1
CO2	1	2	2	2	2								1	1
CO3	1	2	2	2	2								1	1
CO4	1	2	2	2	2								1	1
CO5	1	2	2	2	2								1	1

Open Elective – 3 / Job Oriented Course **Data Science**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Statistics and Mathematics		3	0	0	3

Course Objectives:

1. To gain knowledge in the basic concepts of Data Analysis
2. To acquire skills in data preparatory and preprocessing steps
3. To learn the tools and packages in Python for data science
4. To gain understanding in classification and Regression Model
5. To acquire knowledge in data interpretation and visualization techniques

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

CO1: Summarize knowledge in the basic concepts of Data Analysis (L1)

CO2: Acquire skills in data preparatory and preprocessing steps (L2)

CO3: Use the tools and packages in Python for data science (L3)

CO4: Analyse in classification and Regression Model (L4)

CO5: Infer knowledge in data interpretation and visualization techniques (L1)

UNIT I **8hrs**

Introduction: Need for data science – benefits and uses – facets of data – data science process – setting their search goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT II **10 hrs**

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 – inter quartilerange –variability for qualitative and ranked data.

UNIT III **10 hrs**

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 **10hrs**

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 **10 hrs**

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 state models 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", 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. (Chapters 2– 4 for Units IV and V)

Reference Books:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

Online Resources:

https://archive.nptel.ac.in/courses/106/106/106106212/

https://www.kaggle.com/learn

https://www.youtube.com/watch?v=ua-CiDNNj30

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1	1	2	2	2	1								2	1
CO2	1	2	2	2	1								2	1
CO3	1				2								2	1
CO4	1	2	2	2									2	1
CO5	1	1	1	2	2								2	1

Open Elective – 4 / Job Oriented Course **Devops**					
Course Code:	Year and Semester: IV - I	L	T	P	C
Prerequisites: Software Engineering		3	0	0	3

Course Objectives:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

Course Outcomes:

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

CO-1: Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT service agility (L1)
CO-2: Illustrate DevOps & DevSec Ops methodologies and their key concepts (L3)
CO-3: Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models (L3)
CO-4: Set up complete private infrastructure using version control systems and CI/CD tools (L3)
CO-5: Infer Devops Maturity model (L2)

UNIT I **10 hrs**

Phases of Software Development life cycle, Values and principles of agile software development,

UNIT II **10 hrs**

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system.

UNIT III **10 hrs**

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT IV **10 hrs**

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits of CI/CD, Metrics to track CI/CD practices

UNIT V **8 hrs**

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity model, DevOps maturity Assessment

Text Books:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Gene Kim , John Willis , Patrick Debois , Jez Humb,1st Edition, O'Reilly publications, 2016.
2. What is Devops? Infrastructure as code, 1st Edition, Mike Loukides ,O'Reilly publications, 2012.

Reference Books:

1. Building a DevOps Culture, 1st Edition, Mandi Walls, O'Reilly publications, 2013.
2. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Microservices, 1st Edition, Viktor Farcic, CreateSpace Independent Publishing Platform publications, 2016
3. Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation, 1st Edition, Jez Humble and David Farley, 2010.
4. Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and microservices, 1st Edition, Dave Harrison, Knox Lively, Apress publications, 2019

e-Resources:

1. https://www.javatpoint.com/devops
2. https://github.com/nkatre/Free-DevOps-Books-1/blob

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		1	2	2	2					2	1	2	2	1
CO2		1	2	2	2					2	1	2	2	1
CO3		1	2	2	2					2	1	2	2	1
CO4		1	2	2	2					2	1	2	2	1
CO5		1	2	2	2					2	1	2	3	1

Skill Advanced Course (Option-1) Power BI Lab					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Basics of Data & its interpretation		1	0	2	2

Course Objectives:

- To Learn to design robust data models and amazing reports to improve business intelligence

Course Outcomes:

CO-1: Analyze power BI workflow (L3)

CO-2: Summarize Power BI data visualization techniques (L2)

CO-3: Summarize Power BI reporting approaches (L2)

List of Experiments

1. Installation and overview in power BI Desktop.
2. Import the data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system and build Relationship between Tables.
3. Perform the Extraction Transformation and Loading (ETL) on Data.
4. Create different visualization in a report.
5. Create Reports Using set Interactions between Visuals, Hierarchies and Drilldown, Drill through into Power BI.
6. Create Reports Using Aggregation functions calculate a (scalar) value such as count, sum, average, minimum, or maximum for all rows in a column or table as defined by the expression.
7. Create Reports Using calculations based on dates and time.
8. Create Reports Using MTD QTD YTD in Power BI
9. Create Reports Using filter functions in DAX.
10. Publish the Power BI project report and create a dashboard.

e-resources:

https://powerbi.microsoft.com/en-us/learning/

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		2	2		3							3		
CO2		2	2		3							3		
CO3		2	2		3							3		

*****

Skill Advanced Course (Option-2) **Competitive Coding Lab**					
Course Code:	Year and Semester: IV – I	L	T	P	C
Prerequisites: Any Programming language, Data Structures & Algorithms		1	0	2	2

Course Objective: the main objective of this course is to make the student familiar with competitive coding by addressing different algorithm-based problems.

Course Outcomes:

CO-1: Implement various algorithms (L3)

CO-2: Analyze solutions of different problems using Backtracking and dynamic programming (L4)

CO-3: Develop codes for implementation of recursion and other techniques(L4)

List of Experiments:

1. Finding out Twin primes in the given range.
2. Validate a given PAN card number through a set of rules
3. Implementing problems using regular expressions on checking password validity.
4. Implementing towers of Hanoi problem with and without recursion
5. Display the spiral matrix of size nxn.
6. Finding whether a given expression is balanced or not.
7. Finding the addition of two longest integers.
8. Implement 2 stacks using one array.
9. Finding out longest common prefix in the given string.
10. Sum of longest subsequences
11. Find out longest palindrome subsequence.
12. Finding number of distinct subsequences.
13. Construct a random Binary tree.
14. Euclidean based algorithms
15. Non-recursive tree traversals – inorder, preorder, postorder, level order.
16. Construct an expression tree.

17. Displaying the binary tree in the form of bird's eye view.
18. Create a graph with all basic operations (add vertex, add edge, remove vertex, remove edge, view graph)
19. Check whether a given graph holds a cycle or not
20. Find the number of islands in the given specific area.

CO-PO mapping Matrix:

Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PS01	PSO2
CO1		3	3	3	2								2	2
CO2		3	3	3	2								2	2
CO3		3	3	3	2								2	2

****