B. TECH FOUR YEAR DEGREE COURSE

SR-21 ACADEMIC REGULATIONS

COURSE STRUCTURE & SYLLABUS

(*Applicable for the batches admitted from 2021-22*)

DEPARTMENT

OF

ARTIFICIAL INTELLIGENCE

& MACHINE LEARNING

SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY

(UGC – Autonomous Institution)

(Approved by AICTE, Permanently affiliated to JNTUK, Kakinada, ISO 9001: 2015 certified Institution)

(Accredited by NAAC with 'A' Grade; Recognised by UGC under sections 2(f) & 12(B))

NH-216, Amalapuram-Kakinada Highway, Cheyyeru (V), AMALAPURAM -533216.

Institute Vision

To develop the institution into a world class destination for technological education and research

Institute Mission

- To impart high quality, industry relevant, career oriented , engineering education to rural students , to translate our vision into a reality
- To provide the best of instructional and institutional infrastructure facilities
- To have strategic linkages with industry and other institutions
- To mould students to meet the challenges of life with ethics , courage and conviction

Department of Artificial Intelligence and Machine Learning

Department Vision

To be a centre of excellence in Artificial Intelligence and Machine Learning and take up challenge for the benefit of society.

Department Mission

- Impart professional education through best curriculum in harmony with the industry needs.
- Inculcate ethics, research capabilities and team work in the young minds so as to put efforts to the advancement of the nation.
- Strive for student achievement and success with leadership qualities and preparing them for continuous learning in the global environment.

1. PRELIMINARY DEFINITIONS AND NOMENCLATURES

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of the instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two semesters i.e., (one odd + on even).

AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University Kakinada, Kakinada) and State Government.

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry, English etc., are considered to be foundational in nature.

Betterment: Betterment is a way that contributes towards improvement of the student's grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

Board of Studies (BoS): BoS is an authority as defined in UGC regulations, constituted by HeadoftheDepartmentforallthedepartmentsseparately.Theyareresponsibleforcurriculum design and updating all the programs offered by the department.

Branch: Means specialization in a program like B.Tech degree program in Mechanical Engineering, B.Tech degree program in Computer Science and Engineering etc.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

CoE: Controller of Examinations

Compulsory course: Course required to be undertaken for the award of the degree as per the program.

Continuous Internal Assessment (CIA): It is an examination conducted towards internal assessment.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

Credit: A credit is a unit that gives a weight age to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its

credit value. One credit is equivalent to one lecture hour per week.

Credit point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities and extra-curricular activities involving both teaching and non-teaching staff and other resources in the process of study for a degree.

Dropping of the Semester: A student who doesn't want to register for any semester, can apply in writing in the prescribed format before commencement of that semester.

Core Courses: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective or Open Elective.

Massive Open Online Course (MOOC): MOOC courses inculcate the habit of self learning. MOOC courses would be additional choices in all the elective group courses.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Grade: It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

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

Institute: Means SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY, Cheyyeru, East Godavari Dist, Andhra Pradesh unless indicated otherwise by the context.

Pre-requisite: A course, the knowledge of which is required for registration into higher level course.

Program: Means, Bachelor of Technology (B.Tech) degree program PG degree program: Master of Technology (M.Tech).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project work: It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

Re-Appearing: A student can reappear only in the semester end examination for the theory component of a course, subject to the regulations contained herein.

Registration: Process of enrolling into a set of courses in a semester of a Program.

Regulations: The regulations, common to all B.Tech programs offered by Institute are designated as "SR21 Academic Regulations" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd Semester usually starts in July and even semester in December month.

Semester End Examinations (SEE): It is an examination conducted for all the courses offered in a semester after completion of that semester class work.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

University: Means the Jawaharlal Nehru Technological University Kakinada, Kakinada.

2. ACADEMIC REGULATIONS

B.Tech. Regular Four Year Degree Programme (For the batches admitted from the academic year 2021-22) & (B.Tech. Lateral Entry Scheme For the batches admitted from the academic year 2022 – 23). For pursuing four year undergraduate Bachelor Degree Programme of study in Engineering (B.Tech) offered by SRINIVASA INSTITUTE OF ENGINEERING AND TECHNOLOGY under autonomous status and herein after referred to as SIET.

3. CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching-learning process and enables vertical and horizontal mobility in learning.

The credit based semestersystemprovidesflexibilityindesigningcurriculumandassigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project

work / comprehensive Examination /seminars/assignments/alternative assessment tools/presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

- Choose electives from a wide range of elective courses offered by the departments.
- Undergo additional courses of interest.
- Adopt an interdisciplinary approach in learning.
- Make the best use of expertise of the available faculty.

4. ELIGIBILITY FOR ADMISSION

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.

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines vide G.O No.52.

- The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.
- Under Category A: 70% of the seats are filled through EAPCET counseling.
- Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE.

Admission eligibility-Under Lateral Entry Scheme Students with diploma qualification have an option of direct admission into II year B. Tech. (Lateral entry scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three year B.Tech lateral entry Programme will be through ECET. The maximum period to complete B. Tech. under lateral entry scheme is six consecutive academic years from the date of joining.

5. DURATION OF PROGRAMME

The course duration for the award of the Degree in **Bachelor of Technology** will be four academic years, with two semesters in each year. However, if a student is unable to complete the course within 4 academic years, student can do so by giving more attempts but within 8 consecutive academic years from the date of admission.

Academic Calendar

For all the eight semesters a common academic calendar shall be followed in each semester by having an average of sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

6. MEDIUM OF INSTRUCTION

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

7. BRANCHES OF STUDY

- Civil Engineering(CE)
- Electrical & Electronics Engineering(EEE)
- Mechanical Engineering(ME)
- Electronics & Communication Engineering(ECE)
- Computer Science & Engineering(CSE)
- Artificial Intelligence and Machine Learning(AI&ML)

8. TYPES OF COURSES

Basic Science Course:

Basic Science courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill subjects are those areas in which one needs to develop a set of skills to learn anything at all levels. They are basics to learning any subject.

Professional Core Course:

Professional Core Course is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

Professional Elective Course:

Professional Electives provide breadth of experience in respective branch and application areas. Professional Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An elective may be discipline centric (Professional Elective) focusing on those courses which add generic proficiency to the students or may be chosen from an unrelated discipline called as "Open

Elective".

There are four professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives is to be selected.

Open Elective Course:

Open elective course by other department students will have learning awareness and job-oriented benefits. Students require the opportunity to choose any open elective course from different departments to acquire knowledge in that field of course. Learning and employment benefits are not only through their own course subjects but also through open elective courses.

Mandatory Course:

For mandatory courses like Induction Training, Environmental Sciences, Indian Constitution, Essence of Indian Traditional Knowledge, a student has to secure 25 marks out of 50 marks (i.e 50% of the marks allotted) in the end examination for passing the subject/course. For **Mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

No marks or letter grade shall be allotted for all mandatory/non-credit courses.

NCC / NSS Activities:

NSS/NCC training is optional to the Undergraduate students. The activities shall be beyond class hours. The student participation shall be for a minimum period of 45 hours for certification in case of NSS.

9. SEMESTER STRUCTURE

Each academic year is divided into two semesters, TWO being MAIN SEMESTERS (one odd + one even). Main Semesters are for regular class work. However, the following cases are exempted:

a. Students admitted on transfer from JNTUK affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.
b. Each semester shall be of 21 weeks (Table 1) duration and this period includes time for registration of courses, course work, examination preparation and conduct of examinations.
c. Each semester shall have a minimum of 90 working days, out of which number of contact days for theory / practical are 75 and 15 days for conduct of examinations and preparation.
d. The academic calendar shown in **Table 1** is declared at the beginning of the academic year.

Table 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Examinations			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation/Summer Internship			10weeks

10. REGISTRATION

Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses in time. The registration will be organized department wise under the supervision of the Head of the Department.

IN ABSENTIA registration will not be permitted under any circumstances.

At the time of registration, students should have cleared all the dues of Institute and Hostel in the previous semesters, paid the prescribed fee for the current semester and not been debarred from the institute for a specified period on disciplinary or any other ground.

11. UNIQUE COURSE IDENTIFICATION CODE

Every course of the B.Tech program will be placed in one of the four groups of courses as listed in the Table 2. The various courses and their two-letter codes are given below;

Table 2: Courses and their codes

S. No	Branch	Code
1	Civil Engineering	01
2	Electrical & Electronics Engineering	02
2	Mechanical Engineering	03
3	Electronics & Communication Engineering	04

4	Computer Science & Engineering	05
5	Artificial Intelligence & Machine Learning	61

12. CURRICULUM AND COURSESTRUCTURE

The curriculum shall comprise Foundation/ Skill Courses, Core Courses, Elective Courses, Open Electives, Laboratory Courses, Technical Seminar, Communication Skills Practice, Soft Skills Practice, Professional Society Activities, Community Service Project, Summer Internship and Major Project. The list of elective courses may include subjects from allied disciplines also.

Contact Periods: Depending on the complexity and content of the course, the number of contact periods per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours/weeks as follows:

- Contact classes (Theory/Tutorial):1creditperlecturehourperweek.
- Laboratory Hours(Practical):0.5creditfor1Practicalhourperweek.
- Summer Internship:2credits
- Project Work and Full Semester Summer Internship (6 Months): 12Credits
- MOOCS: 2 Credits per course
- Comprehensive Viva Voce: 1Credit
- Mandatory Courses(MC):**Non-Credit**
- Induction Program: **Non-Credit**

Credit distribution for courses offered is shown in Table 3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core/Foundation/Elective)	3	3
2	Professional Core Courses	3	3
3	Professional Elective Courses	3	3
4	Open Elective Courses	3	3
5	Engineering Science courses (Engineering Graphics/Engineering Workshop)	1L+4P	3
6	Engineering Science courses	3	3
7	Laboratory Courses	3	1.5
8	MOOC Courses	0	2
9	Skill Oriented Course / Certification Course	1L+2P	2
10	Skill Advanced Course / Certification Course	1L+2P	2
11	Soft Skill Course / Certification Course	1L+2P	2

12	Summer Internship (8 Weeks)	-	2
13	Community Service Project	-	4
13	Seminar	-	1
14	Project Work	-	10
15	Mandatory Courses	2	0
16	Minor Degree Courses	4	4

Course Structure

Every program of study shall be designed to have **36** theory courses, **5** Skill Oriented / Certification Courses, Summer Internship, Community Service Project, **5** Mandatory Courses and **17** laboratory courses. Every course of the B.Tech program will be placed in one of the 10 categories with minimum credits as listed in the **Table 4**. In addition, a student has to carry out a Project Work.

Table 4: Category Wise Distribution of Credits

S. No	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	**10**
2	Basic Sciences (BSC) including Mathematics, Physics and Chemistry.	BSC (10% to 15%)	**21**
3	Engineering Sciences (ESC), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ESC (10% to 15%)	**24**
4	Professional – Core Courses (PCC), relevant to the chosen specialization/ branch.	PCC (30% to 40%)	**51**
5	Professional Electives Courses (PEC), relevant to the chosen specialization/ branch.	PE (5% to 10%)	**15**
6	Open Electives Subjects / MOOCs - (OEC), from other technical and/or emerging subject areas.	OEC (5% to 10%)	**12**
7	Project Work through full Semester	PW 5% to 10%	**17**

	Summer Internship and Summer Internships (PW)		
8	Skill Oriented Courses/Certification Courses project	SC (5% to 7%)	**10**
9	Mandatory Courses(Induction Program, Indian Constitution, Essence of Indian Traditional Knowledge, Social Values and Professional Ethics)	MC (0%)	**0**
TOTAL CREDITS			**160**

For Four-Year Regular Programme:

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech I Semester	2 Basic Science+ 1 Humanities and Social Science + 2Engineering Science	1 Humanities and Social Science Lab + 1 Basic Science Lab + 1 Engineering Science Lab + Induction Training	19.5
B.Tech II Semester	2 Basic Science + 3 Engineering Sciences	2 Engineering Science Lab + 1 Basic Science Lab+ Environmental Science (MC)	19.5
B.Tech III Semester	1 Basic Science + 4 Professional Core subjects	3 Professional Core Lab + Skill Oriented Course + Essence of Indian Traditional Knowledge (MC)	21.5
B.Tech IV Semester	1 Basic Science + 2 Professional Core + 1 Engineering Science / Professional Core (Interdisciplinary) + Humanities and Social Science	Engineering Science / Professional Core (Interdisciplinary) Lab + 2 Professional Core Lab + Skill Oriented Course+ Basics of Indian Constitution (MC)	21.5

B.Tech V Semester	3 Professional Core + 1 Open Elective/ Job Oriented Elective - I+ Professional Elective – I	2 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course + Summer Summer Internship 2 Months afterSecond Year (To be Evaluatedduring V Semester) + Professional Ethics and Human Values (MC)	24
B.Tech VI Semester	3 Professional Core+ Professional Elective - II+ Open Elective/ Job Oriented Elective – II	3 Professional Core Lab + 1 Skill Advanced Course / Soft Skill Course +IPR & Patents (MC)	21.5
B.Tech VII Semester	3 Professional Elective-III,IV&V + Open Elective/ Job Oriented Elective –III, IV+ Humanities and Social Science Elective	Industry Oriented Mini Project+ Comprehensive Viva Voce+ 1 Skill Advanced Course / Soft Skill Course.	21.5
B.Tech VIII Semester	Project Work Seminar		11
Total	6 Basic Science + 3 Humanities and Social Sciences + 5 Engineering Science+ 12 Professional Core + 1 Professional Inter disciplinary Core+ 5 Professional Electives + 4 Open Electives / Job Oriented Electives + Project Work	1 Humanities and Social Sciences Lab + 2 Basic Science Lab + 3 Engineering Science Lab + 1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab + 2 Professional Elective Lab + 2 Skill Oriented Course + 3 Skill Advanced Course / Soft Skill Course + Summer Internship + +Community Service Project + Mandatory Courses (Non-	160

		Credit)	

For Three year lateral entry programme :

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
B.Tech III Semester	1 Basic Science + 4 Professional Core subjects	3 Professional Core Lab + Skill Oriented Course + Essence of Indian Traditional Knowledge (MC)	21.5
B.Tech IV Semester	1 Basic Science + 2 Professional Core + 1 Engineering Science / Professional Core (Interdisciplinary) + Humanities and Social Science	Engineering Science / Professional Core (Interdisciplinary) Lab + 2 Professional Core Lab + Skill Oriented Course+ Basics of Indian Constitution (MC)	21.5
B.Tech V Semester	3 Professional Core + 1 Open Elective/ Job Oriented Elective - I+ Professional Elective – I	2ProfessionalCoreLab+1 Skill Advanced Course / Soft Skill Course + Summer Internship 2 Months after Second Year (To be Evaluated during	21.5

		V Semester) + Professional Ethics and Human Values (MC)	
B.Tech VI Semester	3 Professional Core+ Professional Elective - II+ Open Elective/ Job Oriented Elective – II	3ProfessionalCoreLab+1 Skill Advanced Course / Soft Skill Course +IPR& Patents (MC)	24
B.Tech VII Semester	3 Professional Elective-III,IV&V + Open Elective/ Job Oriented Elective –III, IV+ Humanities and Social Science Elective	Industry Oriented Mini Project+ Comprehensive Viva Voce+ 1 Skill Advanced Course / Soft Skill Course.	21.5
B.Tech VIII Semester	Project Work Seminar		11
Total	2 Basic Science + 2 Humanities and Social Sciences + 12 Professional Core + 1 Professional Core (Interdisciplinary)+ 5 Professional Electives + 4 Open Electives / Job Oriented Electives + Project Work through Summer Internship (6 Months)	1 Engineering Science / Professional Core (Interdisciplinary) Lab + 10 Professional Core Lab + 2 Professional Elective Lab + 2 Skill Oriented Course + 3 Skill Advanced Course / Soft Skill Course + Summer Internship +Industry Oriented Mini Project+ Comprehensive Viva Voce + Basics of Indian Constitution (MC) + Professional Ethics and Human Values (MC) +	121

		Essence of Indian Traditional Knowledge (MC) +IPR & Patents (MC)	

Course wise break-up for Regular Program:

Total Theory Courses - 36 (6 Basic Science + 3 Humanities and Social Sciences + 5 Engineering Science + 12 Professional Core + 1ProfessionalCore(Interdisciplinary)+5ProfessionalElectives+ 4 Open Electives / Job Oriented Electives)	36@3credits each	108
Laboratory Courses –17 (2 Basic Science Lab +1 Humanity Science Lab+ 3 Engineering Science Lab + 1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab	17 @ 1.5 credits each	25.5
Summer Internship	1@1.5credit	1.5
Community Service Project	1 @4 credit	04
Seminar	1 @ 1 credit	01
Skill Oriented Courses / Certification Courses-2	2 @ 2credits each	04

Skill Advanced Courses / Soft Skill Courses / Certification Courses-3	3 @2 credit	06
Project Work	1 @10credits	10
Mandatory Courses	5 @ 0 credits	0
Total Credits		**160**

Course wise break-up for three years lateral entry program:

Total Theory Courses - 26 (2 Basic Science +2 Humanities and Social Sciences + 12 Professional Core + 1 Professional Core(Interdisciplinary) + 5 Professional Electives + 4 Open Electives / Job Oriented Electives)	26 @3credits each	78
Laboratory Courses –11 (1 Engineering Science / Professional Core(Interdisciplinary) Lab + 10 Professional Core Lab)	11 @ 1.5 credits each	16.5
Summer Internship	1 @1.5 credit	1.5
Community Service Project	1 @4 credit	04
Seminar	1 @ 1 credit	01
Skill Oriented Courses / Certification Courses - 2	2 @2credits each	04
Skill Advanced Courses / Soft Skill Courses / Certification Courses – 3	3 @2 credit	06
Project Work	1 @10credits	10
Mandatory Course	4 @ 0 credits	0
Total Credits		**121**

13. EVALUATION METHODOLOGY

The performance of a student in each semester shall be evaluated through Continuous Internal Assessment (CIA) and /or Semester End Examination (SEE) conducted semester wise.

S. No	Course	Marks	Examination and Evaluation		Scheme of Examination
1	Theory	70	Semester end examination of 3 hours duration (External Evaluation)		Shall be evaluated as given in 13.2
		30	Internal Examination		Shall be evaluated as given in 13.3
2	Laboratory	35	Semester end Laboratory Examination for 3 hours duration (External Evaluation)		Shall be evaluated as given in 13.5
		15	10	Day to Day Evaluation for performance in Laboratory experiments	Shall be evaluated as given in 13.6
			05	Practical Test (Internal Evaluation)	
3	i. Summer Internship ii. Community Service Project	100 100	Internal Evaluation Internal Evaluation		The evaluation shall be done by the Department Evaluation Committee (DEC) as given in 13.7
4	Skill Oriented Courses/ Skill Advanced Courses / Soft Skill Courses	30	Internal Evaluation		Shall be evaluated as given in 13.8
		70	End Semester Evaluation		
5	MOOCs	100	Semester End Evaluation		Shall be evaluated as given in 13.9

6	Project Work	60	Internal Evaluation	Continuous evaluation shall be done by the Project Evaluation Committee (PEC)as given in 13.10
		140	Semester End Evaluation	Project Work Viva- Voce Examination shall be conducted by a Committee at the end of the semester as given in 13.11
7	Mandatory Course	-	-	Shall be evaluated as given in 13.12

13.1Theory Course:

The performance of a student in every theory course shall be evaluated for total of 100 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 30 marks and 70 marks respectively.

13.2 External Evaluation for Theory Course - Semester End Examination:

The Semester End Examination (SEE) in each theory subject shall be conducted for 3 hours duration at the end of the semester for 70 marks.

Pattern of the Semester End Examination question paper is as follows:

The semester end examinations will be conducted institute 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.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept
30 %	To test the analytical skill of the concept
20 %	To test the application skill of the concept

13.3 Internal Evaluation for Theory Course:

a. For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of

   i. One objective examination (20 multiple choice questions) for 10 marks for a duration of 20 minutes

   ii. One descriptive examination(3full questions for10 marks each)which will be

reduced to 15 marks for a duration of 90 minutes and

iii. One assignment for 5marks.

iv. All the internal exams shall be conducted as per institute norms from 50% of the syllabi.

b. The total marks secured by the student in each mid-term examination are evaluated for 30 marks. Which consists of marks of objective examination, descriptive examination and assignment shall be submitted to the Institute examination section within one week after completion of the mid-term examinations.

c. Internal marks can be calculated with 80% weightage for better of the two mids and 20% Weightage for other mid exam.

Example:

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

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

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

If a student scores 23 marks and 24 marks in the first and second mid-term examinations respectively, then Weighted Average Marks = 24 x 0.8 + 23 x 0.2

= 23.8, rounded to 24 Marks.

d. With the above criteria, institute examination section shall be displayed in the concerned college notice boards. If any discrepancy found, it shall be brought to the notice of institute examination section through proper channel within one week with all proofs. Discrepancies brought after the given deadline will not be entertained under any circumstances.

13.4 Laboratory Course:

The performance of a student in every practical course shall be evaluated for total of 50 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 15 marks and 35 marks respectively.

13.5 External Evaluation for Practical Course:

Out of **35** marks **30** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks. Readings, calculations & results-10 marks and Records – 5 marks) and **5** marks for viva-voce examination.

Each Semester External Lab Examination shall be evaluated by an Internal Examiner along with an External Examiner appointed by the Principal.

A student has to secure not less than a minimum of 35% of marks (17marks) exclusively at the

Semester End Examinations in each of the practical subjects in which the candidate had appeared. A candidate shall be declared to have passed in individual lab course if he secures a minimum of 40% aggregate marks (20 marks out of 50 marks) (Internal & Semester External Examination marks put together).

13.6 Internal Evaluation for Laboratory Course:

For practical subjects there shall be a Continuous Internal Evaluation during the semester for15internalmarks.Outofthe15 marks for internal evaluation, day-to-day assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 05 marks conducted by the laboratory teacher concerned.

13.7 Summer Internship and Community Service Project

Summer Internship each of 8 weeks / 2 Months duration at the end of II B.Tech (i.e., IV Semester) are Mandatory with 1.5 credits.

The Summer Internship after II year shall be in the form of community service project as mentioned below,

- Community Service Project is an experiential learning strategy that integrates meaningful community service with instruction, participation, learning and community development.
- Community Service Project involves students in community development and service
- activities and applies the experience to personal and academic development.
- Community Service Project is meant to link the community with the college for mutual benefit. The community will be benefited with the focused contribution of the college students for the village/ local development. The college finds an opportunity to develop social sensibility and responsibility among students and also emerge as a socially responsible institution.

Objective:

Community Service Project should be an integral part of the curriculum, as an alternative to the 2 months of Summer Internships/Apprenticeships/On Job Training, whenever there is an exigency when students cannot pursue their Summer Internships. The specific objectives are;

- Tosensitizethestudentstothelivingconditionsofthepeoplewhoarearoundthem.
- To help students to realize the stark realities of the society.
- To bring about an attitudinal change in the students and help them to develop societal consciousness, sensibility, responsibility and accountability.
- To make students aware of their inner strength and help them to find new /out of box solutions to the social problems.
- To make students socially responsible citizens who are sensitive to the needs of

the disadvantaged sections.

- To help students to initiate developmental activities in the community in coordination with public and government authorities.
- To develop a holistic life perspective among the students by making them study culture, traditions, habits, lifestyles, resource utilization, wastages and its management, social problems, public administration system and the roles and responsibilities of different persons across different social systems.

Implementation of Community Service Project:

- Every student should put in a minimum of **180 hours** for the Community Service Project during the summer vacation.
- Each class/section should be assigned with a mentor.
- Specific Departments could concentrate on their major areas of concern. For example, Dept. Of Computer Science can take up activities related to Computer Literacy to different sections of people like - youth, women, house-wives, etc.
- A log book has to be maintained by each of the student, where the activities undertaken/involved to be recorded.
- Thelogbookhastobecountersignedbytheconcernedmentor/facultyin-charge.
- Evaluation to be done based on the active participation of the student and grade could be awarded by the mentor/faculty member.
- The final evaluation to be reflected in the grade memo of the student.
- TheCommunityServiceProjectshouldbedifferentfromtheregularprogrammesof NSS/NCC/Green Corps/Red Ribbon Club,etc.
- Minor project report should be submitted by each student. An internal Viva shall also be conducted by a committee constituted by the principal of the college.
- Award of marks shall be made as per the guidelines of Summer Internship/apprentice/on the job training.

Procedure:

- A group of students or even a single student could be assigned for a particular habitation or village or municipal ward, as far as possible, in the near vicinity of their place of stay, so as to enable them to commute from their residence and return back by evening or so.
- The Community Service Project is a twofold one–First; the student/s could conduct a survey of the habitation, if necessary, in terms of their own domain or subject area. Or it can even be a general survey, incorporating all the different areas. A common survey format could be designed. This should not be viewed as a duplication of work by the

Village or Ward volunteers; rather, it could b e another primary source of data.

- Secondly, the student/s could take up a social activity, concerning their domain or subject area. The different areas, could be like–
- Agriculture, Health, Marketing and Cooperation, Animal Husbandry, Horticulture, Fisheries, Sericulture, Revenue and Survey, Natural Disaster Management, Irrigation, Law & Order, Excise and Prohibition, Mines and Geology, Energy, Internet, Free Electricity, Drinking Water

Suggestive List of Programmes under Community Service Project:

The following the recommended list of projects for engineering students. The lists are not exhaustive and open for additions, deletions and modifications. Colleges are expected to focus on specific local issues for this kind of projects. The students are expected to carry out these projects with involvement, commitment, responsibility and accountability. The mentors of a group of students should take the responsibility of motivating, facilitating, and guiding the students. They have to interact with local leadership and people and appraise theobjectivesandbenefitsofthiskindofprojects.Theprojectreportsshallbeplacedinthe college website for reference. Systematic, Factual, methodical and honest reporting shall be ensured.

For Engineering Students

- Water facilities and drinking water availability
- Health and hygiene
- Stress levels and coping mechanisms
- Health intervention programmes
- Horticulture
- Herbal plants
- Botanical survey
- 8Zoologicalsurvey
- Marine products
- Aqua culture
- Inland fisheries
- Animals and species
- Nutrition
- Traditional health care methods
- Food habits
- Air pollution
- Water pollution
- Plantation

- Soil protection
- Renewable energy
- Plant diseases
- Yoga awareness and practice
- Health care awareness programmes and their impact
- Use of chemicals on fruits and vegetables
- Organic farming
- Crop rotation
- Floury culture
- Access to safe drinking water
- Geological survey
- Sericulture
- Study of species
- Food adulteration
- Incidence of Diabetes and other chronic diseases
- Human genetics
- Blood groups and blood levels
- Internet Usage in Villages
- Android Phone usage by different people
- Utilisation of free electricity to farmers and related issues
- Gender ration in schooling level- observation.
- Complimenting the community service project, the students may be involved to take up some awareness campaigns on social issues/special groups. The suggested list of programmes are;

Programmes for School Children:

- Reading Skill Programme (Reading Competition)
- Preparation of Study Materials for the next class.
- Personality / Leadership Development
- Career Guidance for X class students
- Screening Documentary and other educational films
- Awareness Programme on Good Touch and Bad Touch(Sexual abuse)
- Awareness Programme on Socially relevant themes.

Programmes for Women Empowerment:

- Government Guidelines and Policy Guidelines
- Women's Rights

- Domestic Violence
- Prevention and Control of Cancer
- Promotion of Social Entrepreneurship

General Camps:

- General Medical camps
- Eye Camps
- Dental Camps
- Importance of protected drinking water
- ODF awareness camp
- Swatch Bharath
- AIDS awareness camp
- Anti Plastic Awareness
- Programmes on Environment
- Health and Hygiene
- Hand wash programmes
- Commemoration and Celebration of important days.

Programmes for Youth Empowerment:

- Leadership
- Anti-alcoholism and Drug addiction
- Anti-tobacco
- Awareness on Competitive Examinations
- Personality Development

Common Programmes:

- Awareness on RTI
- Health intervention programmes
- Yoga
- Tree plantation
- Programmes in consonance with the Govt. Departments like Agriculture, Health, Marketing and Cooperation, Animal Husbandry, Horticulture, Fisheries, Sericulture, Revenue and Survey, Natural Disaster Management, Irrigation, Law & Order, Excise and Prohibition, Mines and Geology, Energy, Natural Disaster Management, Irrigation

Role of Students:

- Studentsmaynothavetheexpertisetoconductalltheprogrammesontheirown. The students then can play a facilitator role.

- For conducting special camps like Health related, they will be coordinating with the Governmental agencies.
- AsandwhenrequiredtheCollegefacultythemselvesactasResourcePersons.
- Students can work in close association with Non-Governmental Organizations like Lions Club,Rotary Club, etc or with any NGO actively working in that habitation.
- AndalsowiththeGovernmentalDepartments.Iftheprogrammeisrolledout,the
- District Administration could be roped in for the successful deployment of the programme.
- An in-house training and induction programme could be arranged for the faculty and participating students, to expose them to the methodology of Service Learning.

Timeline for the Community Service Project Activity Duration: 8weeks

1.Preliminary Survey (One Week)

- ✓ A preliminary survey including the socio-economic conditions of the allotted habitation to be conducted.
- ✓ A survey form based on the type of habitation to be prepared before visiting the habitation with the help of social sciences faculty. (However, a template could be designed for different habitations, rural/urban.
- ✓ The Governmental agencies, like revenue administration, corporation and municipal authorities and village secretariats could be aligned for the survey.

2. Community Awareness Campaigns (Two Weeks)

Based on the survey and the specific requirements of the habitation, different awareness campaigns and programmes to be conducted, spread over two weeks of time. The list of activities suggested could be taken into consideration.

3.Community Immersion Programme (Four Weeks)

Along with the Community Awareness Programmes, the student batch can also work with any one of the below listed governmental agencies and work in tandem with them. This community involvement programme will involve the students in exposing themselves to the experiential learning about the community and its dynamics. Programmes could be in consonance with the Govt. Departments.

4.Community Exit Report (One Week)

During the last week of the Community Service Project, a detailed report of the outcome of the 8 weeks work to be drafted and a copy shall be submitted to the local administration. This report will be a basis for the next batch of students visiting that particular habitation. The same report submitted to the teacher- mentor will be evaluated by the mentor and suitable

marks are awarded for onward submission to the University. Throughout the Community Service Project, a daily log-book need to be maintained by the student's batch, which should be countersigned by the governmental agency representative and the teacher mentor, who is required to periodically visit the students and guide them.

Evaluation of Summer Internship

Evaluation of the Summer Internship / Community Service Project shall be through the departmental committee. A student will be required to submit a detailed project report to the concerned department and appear for an oral presentation before the departmental committee.

- Day to day assessment log book - 20Marks
- Summer Internship / Project Report -40Marks
- Presentation and Viva-Voce - 40Marks

A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

13.8 Skill Oriented / Skill Advanced / Soft Skill Courses:

- For skill oriented/skill advanced /Soft skill Courses, one theory and 2 practical hours may be allotted or two theory hours may be adopted as per the decision of concerned BoS.
- From the five skill courses two shall be skill-oriented programs related to the domain and shall be completed in 2ndyear. The remaining 3 skill courses, one shall be necessarily a soft skill course and the remaining 2 skill-advanced courses can be in the same domain or Job oriented skills which can be interdisciplinary.
- A pool of interdisciplinary job-oriented skill courses shall be prepared by joint Board of studies and the syllabus along with the pre requisites shall be prepared for each of the requirements of laboratory infrastructure. The list of such courses shall be included in the curriculum of each branch of Engineering, so as to enable the student to choose from the list.
- The student shall be given an option to choose between the skill advanced courses being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies.
- The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.
- The credits assigned to the skill advanced course shall be awarded to the student upon producingthecertificateofskillfromtheagency/professionalbodiesasapprovedbythe Board of studies.
- If a student prefers to take a certificate course offered by external agency, the

department shall mark 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 as approved by the concerned board of studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

Evaluation Procedure

Evaluation of the Skill oriented / Skill advanced / Soft skills / Certificate course shall be through the departmental committee. A student will be registered for the courses being offered by the department or interdisciplinary. The evaluation procedure is,

Internal Examination - 30 Marks (CIA Mode) External Examination - 70 Marks (SEE Mode)

A student will be registered for the course being offered by industries / Professional bodies / APSSDC or any other accredited bodies. The Merit / Pass certificate obtained from the course are considered for **2** credits.

13.9 Massive Open Online Courses (MOOCs):

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOCs (Massive Open Online Courses) have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list of courses from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shallberesponsibletoguidestudentsinselectingonlinecoursesandprovideguidancefor the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOCs shall be displayed in Grade card of a student, provided student submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than **8** weeks.

Two credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

Internal Evaluation for Design/ Drawing Courses:

For the subject having design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing, production drawing and building drawing) the internal marks distribution shall be 15 marks for day-to-day performance and 15 marks for Mid-Term Examinations.

External Evaluation for Design/ Drawing Courses:

The Semester End Examination in Design / Drawing Course shall be conducted for 3 hours duration at the end of the semester for 70 marks.

Pattern of the Semester End Examination question paper is as follows:

- ✓ A total of two Sections (Section-I &Section-II)
- ✓ Section-I contains five two mark questions. One question from each unit and a student has to be answered all the five questions compulsory(5x2=10Marks)
- ✓ Section-II contains ten questions are to be designed taking two questions from each unit (Unit Wise-Either or type)of the total five units. (5x12=60Marks)
- ✓ A student has to secure not less than a minimum of 40% of marks (24 marks) exclusively at the Semester End Examinations in each of the theory subjects in which the candidate has appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

Project Work

13.10 Internal Evaluation for Project Work and Full Semester Summer Internship at Industry:

The object of Project Work and Summer Internship is to enable the student to take up investigative study in the broad field of his branch of Engineering/Interdisciplinary, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the department on an individual basis or three/four students in a group under the guidance of a supervisor/ guide. This is expected to provide a good initiation for the student(s) in R&D work.

The total internal weightage for Project work, Summer Internship course is 60 marks and will be evaluated as follows,

- Submission of Abstract (Identification of Problem & Literature Survey)Profile and Abstract–Student has to submit the industry profile and abstract of the project within four weeks from date of commencement of Summer Internship through mail or post -15Marks
- Review-1 – at 6thweek from date of commencement of Summer Internship - 10Marks
- Review-2 – at 12thweek from date of commencement of Summer Internship - 15 Marks

• Review-3–at18th weekfromdateofcommencementofSummer Internship - 20Marks

13.11 External Evaluation for Project Work and Full Semester Summer Internship at Industry:

The external evaluation based on the report submitted and viva-voce exam for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be based on the report submitted and a viva-voce exam for 140 marks by a committee comprising the Head of the Department, the project supervisor and an external examiner. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

Project Work through full Semester Summer Internship in the Industry carry 12 credits. During Full semester Summer Internship, student has to spend one full semester (6 Months) in an identified industry /firm / organization and has to carry out the Summer Internship as per the stipulated guidelines of that industry / firm / organization and the institute.

Distribution of Project Work &Full Semester Summer Internship Marks

Summer Internship Certificate is Mandatory

1	Project Report	- 30 Marks
2	Seminar on Summer Internship	- 50 Marks
3	Project Viva Voce	- 60 Marks

13.12 Mandatory Courses:

Mandatory courses carry **"ZERO"** credits. There shall be **NO Semester-end** examination. However, ATTENDANCE in Mandatory courses shall be considered while calculatingaggregateattendanceinasemester.Theinternalexaminationshallbeconducted and evaluated similar to the THEORY courses for 50 Marks. The student shall be declared to have passed the mandatory courses only when Student secures **40% marks in the internal examination.** If the student FAILS, a re-examination shall be conducted for FAILED candidates in the Consecutive semester. The performance of the student shall be indicated in the grade sheets "**COMPLETED" (or) "NOT COMPLETED** "as given in 1.1.The student should pass all the mandatory courses, for the award of B.Tech degree.

For the Mandatory Courses, if the student obtained 40% or more marks, then his performance shall be indicated as COMPLETED, otherwise the performance shall be indicated as NOT COMPLETED in the grade sheet.

14. GRADING PROCEDURE

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	A+ (Outstanding)	10
80 and less than 90%	A(Excellent)	9
70 and less than 80%	B (Very Good)	8
60 and less than 70%	C (Good)	7
50 and less than 60%	D (Fair)	6
40 and less than 50%	E (Pass)	5
Absent	AB	0
For Mandatory & Audit Courses		
Greater than or equal to 40%	Completed	-
Below 40%	Not Completed	-

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practical's, Skill oriented Course / Skill Advanced course / Soft Skill course, Summer Internships, Project Work and Full Semester Summer Internship in Industry (6 Months). Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item11above,a corresponding letter grade shall be given. As a measureoftheperformanceofastudent,a10-pointabsolutegradingsystemusingthe following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks for theory & practical shall be followed as mentioned in the table.

A student who has 'failed' in any subject is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

To a student who has not appeared for an examination in any subject, 'AB' grade will be allocated in that subject, and he is deemed to have 'failed'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = grade point (GP) x credits …. For a course

A student passes the subject/ course only when GP ('E' grade or above)

- A student to obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.
- For Mandatory courses "Completed" or "Not Completed shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (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.,

$$SGPA = \sum_{i=1}^{n} (C_i G_i) / \sum_{i=1}^{n} C_i$$

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 manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \Sigma (C_{ui} \times S_i) / \Sigma C_{ui}$$

iii. Where, "S_i" is the SGPA of the i^{th} semester and C_{ui} is the total number of credits in that semester.

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

v. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

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 and E.

Example: Computation of SGPA and CGPA Illustration for SGPA

Course	Credit (C_i)	Grade Letter	Grade Point(G_i)	Credit Point (C_ixG_i)
Course-I	3	A+	10	3x10=30
Course-II	3	A	9	3x9=27
Course-III	3	B	8	3x8=24
Course-IV	3	D	6	3x6=18
Course-V	2	B	8	2x8=16

Course-VI	1	C	7	1x7=7
	15			122

Thus SGPA = $\frac{122}{15}$ **=8.13**

Illustration for CGPA

I Semester	II Semester	III Semester	IV Semester
Credit: 19 SGPA: 8.13	Credit: 19.5 SGPA: 6.9	Credit: 21.5 SGPA: 7.3	Credit: 21.5 SGPA: 6.8
V Semester	**VISemester**	**VII Semester**	**VIII Semester**
Credit:22 SGPA:8.2	Credit: 21.5 SGPA: 7.4	Credit: 21 SGPA: 7.2	Credit: 14 SGPA: 7.8

Thus, CGPA = $\frac{(19\times8.13)+(19.5\times6.9)+(21.5\times7.3)+(21.5\times6.8)+(22\times8.2)+(21.5\times7.4)+(21\times7.2)+(14.\times7.8)}{160}$

=7.45

15. AWARD OF CLASS

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

CGPA ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.0 and < 6.5	CGPA ≥ 4.0 and < 5.0	CGPA < 4.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

A student with final CGPA is < 4.00 will not be eligible for the Award of the Degree.

16. CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

Semester end examination shall be conducted by the Controller of Examinations (CoE) by inviting Question Papers from the External Examiners

Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by CoE and senior subject expert before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.

The answer papers of semester end examination should be evaluated by the examiner immediately after the completion of exam and the award sheet should be submitted to CoE in a sealed cover.

CoE shall invite required number of external examiners to evaluate all the end-semester answer

scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

Examinations Control Committee shall consolidate the marks awarded by the examiners and award grades.

17. SUPPLEMENTARY EXAMINATIONS

Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

18. ATTENDANCE REQUIREMENTS AND DETENTIONPOLICY

A candidate shall put in a minimum required attendance of 75 % in that semester. Otherwise, The student shall be declared detained and has to repeat semester. For cases of medical issues, deficiency of attendance in a semester to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% and 65% in a semester, subjected to submission of medical certificates and other needful documents to the concerned departments. The condonation is permitted maximum of two times during the entire course of study.

A prescribed fee shall be payable towards condonation of shortage of attendance. A student shall not be promoted to the next semester unless student satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, student shall not be eligible for readmission into the same class.

Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

19. PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned for promotion to higher classes

i. A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement as per University norm.

ii. A student will be promoted from II to III year if he fulfillstheacademicrequirementof40% 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.

A student shall register and put-up minimum attendance in all 160 credits and earns all 160 credits.Marksobtainedinall160creditsshallbeconsideredforthecalculationofaggregate percentage of marks obtained. In the course structure, If the student did not complete the course within eight academic years from the year of their admission, course and their admission shall stand cancelled

A lateral entry student shall register and put-up minimum attendance in all 121credits and earn all the 121credits. Marks obtained in all 121credits shall be considered for the calculation of aggregate percentage of marks obtained. If the student did not complete the course within six academic years from the year of admission, their seat shall surrender in B.Tech. Course and their admission shall stands cancelled.

20. MAJOR DEGREE WITH A MINOR:

1. Students, whoaredesirousofpursuingtheirspecialinterestareasotherthanthechosen 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; student will get Major degree of Mechanical Engineering with minor degree of Civil Engineering.
2. Student can opt the Industry relevant tracks of any branch to obtain the Major degree with Minor, for example, a B.Tech Mechanical Engineering student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.
3. A student shall be permitted to register for Minors program at the beginning of 4^{th}semester provided that the student must have acquired 7.5 SGPA (Semester Grade point average) upto the end of 2^{nd}semester without any history of backlogs. It is expectedthatthe3^{rd}semesterresultsmaybeannouncedafterthecommencementofthe 4^{th}semester, if a student fails to acquire 7.5 SGPA upto 3^{rd}semester or failed in any course, his registration for Minors program shall stand cancelled. An SGPA of 7.5 has to be maintained in the subsequent semesters without any backlog in order to keep the Minor registration active.
4. Minor degree will cumulatively require additional **20** credits in the specified area in addition to the credits essential for obtaining the under graduate degree in Major discipline (i.e., 160credits).
5. 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, CSE(AI), CSE(DS), ECE, EEE,CE,ME etc. or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science(DS), Robotics, Electric vehicles, VLSI etc. The list of disciplines/ branches

eligible to opt for an industry relevant minor specialization shall be clearly mentioned in the respective BOS.

6. Student must complete 4 courses each of 4 credits by choosing from six courses mentioned in the course structure of the department.
7. Inadditiontoacquiring16creditsfromcourses,students shall have to pursueatleast2 courses for two credits each through MOOCS/NPTEL. The concerned BOS shall list the MOOCS/NPTEL courses to be pursued by the student. Attendance will not be monitored for this MOOCS course. A student has to acquire a certificate of MOOCS/NPTEL course from the agencies approved by the BOS in order to earn the required credits, and that should be evaluated by Department committee for the credits.
8. Student can opt the Industry relevant minor specializations as approved by the concerned departmental BoS or student can opt the courses from skill development
9. corporation (APSSDC) or student can opt the courses from an external agency recommendedandapprovedbyconcernedBOSandshouldproducecoursecompletion 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 skill based on industrial demand.
10. A committee should be formed at the level of College/Universities/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.
11. If a student prefers to take test from an external agency, student must take a comprehensive viva-voce conducted at University level and the marks assigned for the Viva-voce will be assigned to that course. However, if students wish to take the courses from the department, student should take examination conducted by the University only. Also, if a student completes courses from external agency without taking test are also eligible to get minor degree after fulfilling all the formalities assigned by the departmental committee.
12. It is the responsibility of the student to acquire prerequisite knowledge of the minor program domain before taking the course. The University/Institution BoS concerned shall prepare the list of subjects and prerequisites for each minor rack.
13. 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 "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.

14. In case a student fails to meet the CGPA requirement for B.Tech Degree with Minor at any point after registration, student 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 bythem.

21. HONORS PROGRAM:

1. Students from same department are eligible for Honor program.
2. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired 7.5 SGPA upto 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 7.5 SGPA upto 3rdsemester or failed in any course, his/her registration for Honors program shall stand cancelled.
3. Students can select advanced subjects from their respective branch in which they are pursuing the degree. E.g. If Mechanical Engineering student completes the selected advanced subjects from the same branch under this scheme, student will be awarded B.Tech (Honors) in Mechanical Engineering.

4. Student must complete 4 courses @ 4 credits from each pool and 2 MOOC/NPTEL courses @ 2 credits (Total 20credits)
5. The student who has registered for Honours shall choose one course from each pool. There shall be 4 pools with 5 courses each as mentioned in course structure of Honours program. The board of studies concerned will decide the courses under each pool for Honors programs.
6. For Honors program, all the courses offered in each pool shall be domain specific courses and advanced courses.
7. In addition to the 4 courses chosen, one from each pool, students shall have to pursue at least 2 courses through MOOCS/NPTEL. The concerned BoS shall list the MOOCS/NPTEL courses to be pursued by the student. Attendance will not be

monitored for this MOOCS course. Student has to acquire a certificate of MOOCS/NPTEL course from the agencies approved by the BoS in order to earn 2 credits. BoS concerned shall prepare the list of advanced courses for each pool taking into consideration the core courses offered in the curriculum. If a course comes with a lab component, that component has to be cleared separately. The concerned BoS shall provide pre requisites to take the specific course by the student. It is the responsibility of the student to acquire/complete prerequisite before taking the course.

8. If a student drops (or terminated) from the Honors 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 "Pass" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Honors will be shown in the transcript. None of the courses done under the dropped Honors will be shown in the transcript.
9. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, student will be dropped from the list of students eligible for degree with Honors and they will receive B.Tech Degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

22. GRADUATION REQUIREMENTS

The following academic requirements shall be met for the award of the B.Tech degree.

- ✓ Student shall register and acquire minimum attendance in all courses and secure 160 credits for regular program and 121 credits for lateral entry program.
- ✓ A student of a regular program, who fails to earn 160 credits within eight consecutive academic years from the year of their admission with a minimum CGPA of 4.0, is not eligible to get degree.
- ✓ A student of a lateral entry program, who failstoearn121creditswithin six consecutive academic years from the year of their admission with a minimum CGPA of 4.0, shall not get their degree and the admission stands cancelled.

23. REVALUATION

A student, who seeks the re-evaluation of the answer script, is directed to apply for the photocopy of their semester examination answer paper(s) in the theory course(s), within 5 working days from the declaration of results in the prescribed format with prescribed fee to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the

recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. If COE found the difference between the evaluation and reevaluation is more than 10 marks, then the COE shall arrange another evaluation. Revaluation is not permitted to the courses other than theory courses.

24. TERMINATION FROM THE PROGRAMME

The admission of a student to the program may be terminated and the student is asked to leave the institute in the following circumstances:

- The student fails to satisfy the requirements of the program within the stipulated maximum period for that program.
- A student shall not be permitted to study any semester more than three times during the entire Program of study.
- The student fails to satisfy the norms of discipline specified by the institute from time totime.

25. WITH-HOLDING OF RESULTS

If the candidate has any dues not paid to the institute or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and student will not be allowed/ promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

26. TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health)and to rejoin the program after the break from the commencement of the respective semester as and when it is offered , she/he shall apply to the Principal in advance. Such application shall be submitted before the of the semester in question commencement and forwarded through the Head documents and endorsement of his / her parent / guardian.

a. The institute shall examine such type of applications, and if it finds the case to be genuine, it may permit the student to rejoin. Such permissions are accorded only to those who do not have any outstanding dues like tuition fee etc.
2. The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period of 8 years for regular and 6 years for lateral entry students. The maximum period includes the break period.

27. STUDENT TRANSFERS

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh, University and institute from time to time.

28. GRADUATION DAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

29. CONDUCT AND DISCIPLINE

- Students shall have a good conduct within and outside the premises of the Institute in a decent and dignified manner befitting the students of Srinivasa Institute of Engineering &Technology.
- As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with the following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.
- Lack of courtesy and decorum, indecent behavior anywhere within or outside the college campus.
- Damage of college property or Possession, consumption and distribution of Alcoholic drinks or any kind of narcotics to fellow students /citizens.
    - Mutilation or unauthorized possession of library books.
    - Noisy and unruly behavior, disturbing studies of fellow students.
    - Hacking in computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber crime etc.
    - Usage of camera /cell phones in the campus.
    - Plagiarism of any nature.
    - Any other act of gross indiscipline as decided by the college academic council from time to time.
    - Commensurate with the severity of offense, the punishment may be reprimand, fine, expulsionfromtheinstitute/hostel,debarringfromexamination,disallowingtheuse of certain facilities of the Institute, rustication for a specified period or even

outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.

- For an offence committed in (i) the hostel (ii) department or in a class room an elsewhere, the chief Warden, the concern Head of the Department and the

❖ Principal respectively, shall have the authority to reprimand or impose fine.

- Cases of adoption of unfair means and/ or any malpractice in an examination shall be reported to the principal for taking appropriate corrective action.
- All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Academic council of the college.
- The Institute Level Standing Disciplinary Action Committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- The Principal shall deal with any problem, which is not covered under these rules and regulations.

30. GRIEVANCE REDRESSALCOMMITTEE

Grievance and Redressal Committee constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. All the students must abide by the code and conduct rules prescribed by the college from time to time.

31. TRANSITORYREGULATIONS

Required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semesters she/he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

a) Four Year B.Tech Regular course:

A student who is under Jawaharlal Nehru Technological University Kakinada (JNTUK) curriculum and detained due to shortage of attendance at the end of the first semester shall join the autonomous batch of first semester. Such students shall study all the courses prescribed for the batch in which the student joined and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students

from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

b) Three Year B.Tech program under Lateral Entry Scheme:

A student who is following JNTUK curriculum and detained due to shortage of attendance at the end of the first semester of second year shall join the autonomous batch of third semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with Lateral Entry regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

c) Transfer candidates (from non-autonomous college affiliated to JNTUK):

A student who is following JNTUK curriculum, transferred from other college to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the

award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester under JNTUK regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

d) Transfer candidates (from an autonomous college affiliated to JNTUK):

A student who has secured the required credits up to previous semesters as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

32. REVISION OF REGULATIONS ANDCURRICULUM

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

33. B.TECH - PROGRAM OUTCOMES (POS)

PO-1: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering Knowledge**).

PO-2 : Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences **(Problem Analysis).**

PO-3 : 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 **(Design/Development of Solutions).**

PO-4 : 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 **(Conduct Investigations of Complex Problems).**

PO-5: 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 **(Modern Tool Usage).**

PO-6 : 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 **(The Engineer and Society).**

PO-7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development **(Environment and Sustainability).**

PO-8 : Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice **(Ethics).**

PO-9 : Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

PO-10: 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 **(Communication).**

PO-11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12: 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 **(Life-long learning).**

34. FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUTAUTONOMY

1. Who grants Autonomy? UGC, Govt., AICTE or University

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

2, Shall Srinivasa Institute of Engineering &Technology award its own Degree?

No. Degree will be awarded by Jawaharlal Nehru Technological University Kakinada, with a mention of the name Srinivasa Institute of Engineering & Technology on the Degree Certificate.

3. What is the difference between a Deemed to be University and an Autonomy College?

A Deemed to be University is fully autonomous to the extent of awarding its own Degree. A Deemed to be University is usually a Non-Affiliating version of a University and has similar

responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4. How will the Foreign Universities or other stake – holders know that we are an Autonomous College?

Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Andhra Pradesh mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5. What is the change of Status for Students and Teachers if we become Autonomous?

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

6. Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?

There is a built in mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition the highest academic council also supervises the academic matters. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7. Will the students of Srinivasa Institute of Engineering & Technology as an Autonomous College qualify for University Medals and Prizes for academic excellence?

No. Srinivasa Institute of Engineering &Technology has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

8. Can Srinivasa Institute of Engineering & Technology have its own Convocation?

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at Srinivasa Institute of Engineering & Technology.

9. Can Srinivasa Institute of Engineering& Technology give a provisional degree certificate?

Since the examinations are conducted by Srinivasa Institute of Engineering & Technology and the results are also declared Srinivasa Institute of Engineering & Technology, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

10. Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly, the number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11. What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 60 % external and 40% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12. Is it possible to have complete Internal Assessment for Theory or Practical?

Yes indeed. We define our own system. We have the freedom to keep the proportion of external and internal assessment component to choose.

13. Why Credit based Grade System?

The credit based grade system is an accepted standard of academic performance the world over in all Universities. The acceptability of our graduates in the world markets hall improve.

14. What exactly is a Credit based Grade System?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like S,A+,A, B+,B,C,F etc. are assigned for a Range of Marks. (e.g. 90% and above is S, 80 to 89 % could be A+ etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

15. What are the norms for the number of Credits per Semester and total number of Credits for UG/PG programme?

These norms are usually defined by UGC or AICTE. Usually around 28 Credits per semester is the accepted norm.

16. What is a Semester Grade Point Average(SGPA)?

The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

$$SGPA = \sum_{i=1}^{n} (C_i G_i) / \sum_{i=1}^{n} C_i$$

Where, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and"i" represent the course number in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

17. What is a Cumulative Grade Point Average (CGPA)?

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \Sigma (C_{ui} \times S_i) / \Sigma C_{ui}$$

Where, S_i is the SGPA of the i^{th} semester and C_{ui} is the total number of credits up to the that semester CGPA is rounded to two decimal places.

18. Is there any Software available for calculating Grade point averagesand converting the same into Grades?

Yes, the institute has its own MIS software for calculation of SGPA, CGPA, etc.

19. Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

20.Will there be any Revaluation or Re-Examination System?

No. There will double valuation of answer scripts. There will be a makeup Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a 'summer term' (compressed term) followed by the End Semester Exam, to save the precious time of students.

21. How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

22. Will the Degree be awarded on the basis of only final year performance?

No. The CGPA will reflect the average performance of all the semester taken together.

23. What are Statutory Academic Bodies?

Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in everybody is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

24. Who takes Decisions on Academic matters?

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Board of Studies level are to be ratified at the Academic Council and Governing Body.

25. What is the role of Examination committee?

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and makeup Examinations. All matters involving the conduct of examinations, spot valuations, tabulations, preparation of Grade Cards etc, fall within the duties of the Examination Committee.

26. Is there any mechanism for Grievance Redressal?

The institute has grievance redressal committee, headed by Dean-Student affairs and Dean-IQAC.

27. How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulation

28. Who declares the result?

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29. Who will keep the Student Academic Records, University or Srinivasa Institute of Engineering & Technology?

It is the responsibility of the Dean, Academics of the Autonomous College to keep and preserve all the records.

30. What is our relationship with the JNT University?

We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

31. Shall we require University approval if we want to start any New Courses?

Yes, the approval from the university is required.

32. Shall we get autonomy for PG and Doctoral Programmes also?

Yes, presently our PG programmes also enjoying autonomous status.

35. MALPRACTICES RULES

DISCIPLINARY ACTION FOR MISCONDUCT IN DURING EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
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.

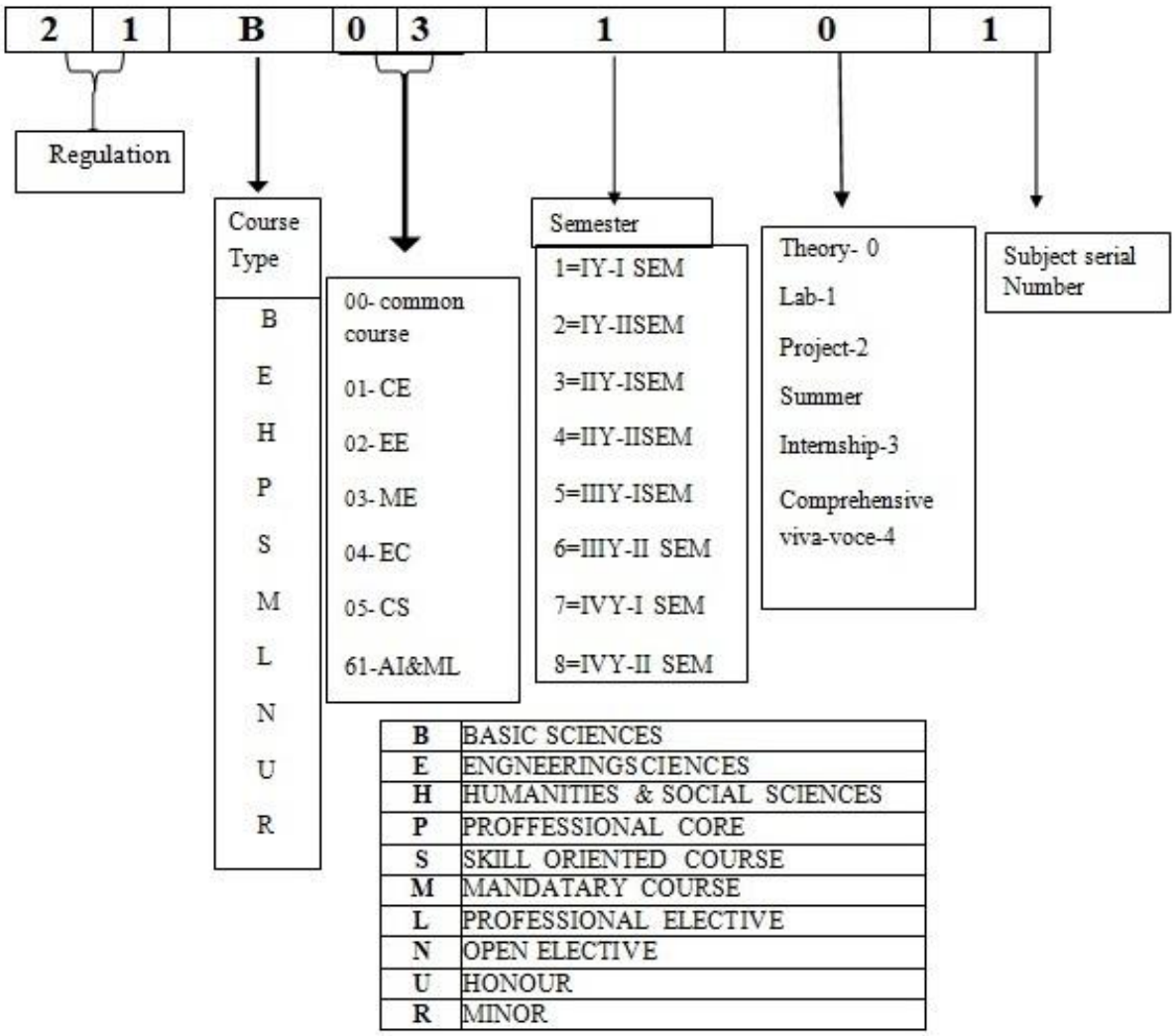
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance 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 Controller of Examinations.
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. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's 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 semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is 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 semester end 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 Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in	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 give up their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	any other act of mis- conduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute premises 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.	
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 semester end 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 gives up 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 colleges 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 gives up 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	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 Director/Principal for further action to awards suitable punishment.	

COURSE CODING STRUCTURE



B	BASIC SCIENCES
E	ENGNEERINGSCIENCES
H	HUMANITIES & SOCIAL SCIENCES
P	PROFFESSIONAL CORE
S	SKILL ORIENTED COURSE
M	MANDATARY COURSE
L	PROFESSIONAL ELECTIVE
N	OPEN ELECTIVE
U	HONOUR
R	MINOR

COURSE STRUCTURE

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

COURSE STRUCTURE – B.Tech 2021-2022

I B.Tech I Semester – Artificial Intelligence and Machine Learning

S. No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	Total	
1	21B00101	Mathematics-I	4	1	0	30	70	100	3
2	21B00104	Applied Physics	3	0	0	30	70	100	3
3	21H00102	Managerial Economics for Engineers	3	0	0	30	70	100	3
4	21E05101	Programming in C	3	1	0	30	70	100	3
5	21E61101	Introduction to Advanced Computer Technology	3	1	0	30	70	100	3
6	21E05112	Basic IT Workshop	0	0	3	15	35	50	1.5
7	21B00114	Applied Physics Laboratory	0	0	3	15	35	50	1.5
8	21E05111	Programming in C Lab	0	0	3	15	35	50	1.5
9	21M00201	Environmental Science	2	0	0	50	0	50	-
Total			**19**	**3**	**9**	**245**	**455**	700	**19.5**

I B.Tech II Semester – Artificial Intelligence and Machine Learning

S. No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	Total	
1	21B00201	Mathematics-II	4	1	0	30	70	100	3
2	21B00203	Applied Chemistry	3	0	0	30	70	100	3
3	21H00201	Communicative English	3	0	0	30	70	100	3
4	21E04201	Principles of Digital Logic Design	3	1	0	30	70	100	3
5	21E05202	Python Programming	3	1	0	30	70	100	3
6	21H00211	Communicative English Laboratory	0	0	3	15	35	50	1.5
7	21B00213	Applied Chemistry Laboratory	0	0	3	15	35	50	1.5
8	21E05212	Python Programming Laboratory	0	0	3	15	35	50	1.5
Total			**16**	**3**	**9**	**195**	**455**	**650**	**19.5**

B.Tech III- Semester – Artificial Intelligence and Machine Learning

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P05303	Data Structures	3	1	0	30	70	100	3
2	21P05302	Computer Organization	3	1	0	30	70	100	3
3	21P61301	Fundamentals of Artificial Intelligence and Machine Learning	3	1	0	30	70	100	3
4	21P61302	Object Oriented Programming through JAVA	3	1	0	30	70	100	3
5	21B05301	Probability & Statistics	3	0	0	30	70	100	3
6	21P05311	Data Structures Lab	0	0	3	15	35	50	1.5
7	21P61311	.Fundamentals of AI and ML Lab	0	0	3	15	35	50	1.5
8	21P61312	Object Oriented Programming through JAVA Lab	0	0	3	15	35	50	1.5
9	21S05311	Applications of Python Numpy / Any skill Development course or any certification course approved by skill development cell like APSSDC etc.,	1	0	2	30	70	100	2
10	21M00301	Basics of Indian Constitution	2	0	0	50	0	50	0
Total			**18**	**4**	**11**	**275**	**525**	**800**	**21.5**

B.Tech IV- Semester – Artificial Intelligence and Machine Learning

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P05403	Data Base Management Systems	3	1	0	30	70	100	3
2	21P61401	Advanced AI Techniques	3	1	0	30	70	100	3
3	21E05401	Software Engineering	3	1	0	30	70	100	3
4	21E05402	Formal Language and Automata Theory	3	1	0	30	70	100	3
5	21B00401	Mathematical Foundations of ComputerScience	3	0	0	30	70	100	3
6	21P05411	Data Base Management System Lab	0	0	3	15	35	50	1.5
7	21P05412	Software Engineering Lab	0	0	3	15	35	50	1.5
8	21P05413	R- Programming	0	0	3	15	35	50	1.5
9	21S61412	NLP with Python / certification courseoffered by APSSDC/NPTEL	1	0	3	30	70	100	2
Total			**16**	**4**	**12**	**225**	**525**	**750**	**21.5**
Community Service Project 2 Months during Summer Vacation									

III B.Tech- I Semester – Artificial Intelligence and Machine Learning

S. No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	Total	
1	21P05501	Data Warehousing and Data Mining	3	1	0	30	70	100	3
2	21P61502	Operating Systems	3	1	0	30	70	100	3
3	21P61503	Machine Learning	3	1	0	30	70	100	3
4	21N61501	**Open Elective–I**	3	0	0	30	70	100	3
5	**Professional Elective-I**		3	0	0	30	70	100	3
	21L61501 21L61502 21L61503	1. Design and Analysis of Algorithms 2. Data Visualization 3. Computer Vision							
6	21P61512	Operating Systems Lab	0	0	3	15	35	50	1.5
7	21P61513	Machine Learning using Python Lab	0	0	3	15	35	50	1.5
8	21S61511	Employability Skills – I	1	0	2	30	70	100	2
9	21P61531	Community Service Project	0	0	0	100	0	100	4
10	21M00501	Professional Ethics and Human Values	2	0	0	50	0	50	0
	Total		**18**	**3**	**9**	**360**	**490**	**850**	**24**

III B.Tech -II Semester–Artificial Intelligence and Machine Learning

S. No	Course Code	Course Title	Hours Per Week			Marks			Credits
			L	T	P	IM	EM	Total	
1	21P61601	Compiler Design	3	1	0	30	70	100	3
2	21P61602	Deep Learning	3	1	0	30	70	100	3
3	21P05602	Computer Networks	3	1	0	30	70	100	3
4	21N61601	**Open Elective–II**	3	0	0	30	70	100	3
5	**Professional Elective-II**		3	0	0	30	70	100	3
	21L61601 21L61602 21L61603	1. Software Project Management 2. Distributed Systems 3. Internet of Things							
6	21P05612	Computer Networks Lab	0	0	3	15	35	50	1.5
7	21P61612	Deep Learning with TensorFlow Lab	0	0	3	15	35	50	1.5
8	21P61613	Data Mining Lab	0	0	3	15	35	50	1.5
9	21S61611	Employability Skills – II	1	0	2	30	70	100	2
10	21M00601	IPR&P	2	0	0	50	0	50	0
	Total		**18**	**3**	**11**	**275**	**525**	**800**	**21.5**

***Internship 2 months during summer vacation to be evaluated in IV B.Tech I semester**

IV B.Tech– I Semester–Artificial Intelligence and Machine Learning

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	**Professional Elective-III**		3	1	0	30	70	100	3
2	21L61701 21L61702 21L61703	1. Reinforcement Learning 2. Cryptography and Network Security 3. Block chain Technologies							
3	**Professional Elective-IV**		3	1	0	30	70	100	3
4	21L61704 21L61705 21L61706	1.CloudComputing 2.Robotic Process Automation 3. Bigdata Analytics							
5	**Professional Elective-V**		3	1	0	30	70	100	3
6	21L61707 21L61708 21L61709 21L61710	1.Social Network Analysis 2. Object Oriented Analysis and Design 3.AIChatbots 4. MOOCS Using /NPTEL/SWAYAM) Duration:12 Weeks Minimum							
7	21N61701	**Open Elective-III**	3	0	0	30	70	100	3
8	21N61702	**Open Elective –IV**	3	0	0	30	70	100	3
9	**Humanities and Social Science Elective**		3	0	0	30	70	100	3
10	21H00701 21H00702 21H00703	1. Sociology & Elements of Indian History for Engineers 2. Law for Engineers 3. Business Communication and Presentation Skills							
7	21P61721	**Summer Internship**	0	0	0	100	0	100	1.5
8	21S61701	MEAN Stack Technologies	1	0	2	30	70	100	2
Total			**19**	**3**	**2**	**310**	**490**	**800**	**21.5**

IV B.Tech–II Semester–Artificial Intelligence and Machine Learning

S.No	Course Code	Course Title	Hours per Week			Marks			Credits
			L	T	P	IM	EM	T	
1	21P61831	Seminar	0	0	0	100	0	100	1
2	21P61821	Project Work	0	0	0	60	140	200	10
Total									11

Open Elective I

S.No.	Dept.	Course Code	Course Title
1	CE	21N01501	Basic of Civil Engineering
2	EEE	21N02501	Fundamentals of Utilization of Electrical Energy
3	MECH	21N03501	Non-Conventional Energy Resources
4	ECE	21N04501	Principles Of Communication

Open Elective II

S.No.	Dept.	Course Code	Course Title
1	CE	21N01601	Sustainability Concepts in Civil Engineering
2	EEE	21N02601	Fundamentals of Electrical Machines
3	MECH	21N03601	Fundamentals of Manufacturing Processes
4	ECE	21N04601	IC Applications

Open Elective III

S.No.	Dept.	Course Code	Course Title
1	CE	21N01701	Air Pollution and Control
2	EEE	21N02701	Fundamentals of Power System Engineering
3	MECH	21N03701	Fundamentals of Automobile Engineering
4	ECE	21N04701	Fundamentals of Microprocessors and Microcontrollers

Open Elective IV

S.No.	Dept.	Course Code	Course Title
1	CE	21N01702	Green Buildings
2	EEE	21N02702	Electrical Measurements and Instrumentation
3	MECH	21N03702	Introduction To Additive Manufacturing
4	ECE	21N04702	Electronic Measurements and Instrumentation

Minor Degree Program Courses

List of Minor Courses offered by Electronics and Communication Engineering Department

S.No	Name of the Minor Course
1	Fundamentals of signals and systems
2	Embedded systems and applications
3	Fundamentals of communication systems
4	Principles of electronic instrumentation
5	Fundamentals of digital signal processing
6	Digital system design

List of Minor Courses offered by Civil Engineering Department

S.No	Name of the Minor Course
1	Surveying & Geomatics
2	Construction technology
3	Fundamentals of transportation Engineering
4	Basic soil mechanics
5	Environmental engineering and management
6	Smart Cities

List of Minor Courses offered by Mechanical Engineering Department

S.No	Name of the Minor Course
1	Fundamentals of Manufacturing Processes
2	Fundamentals of Automobile Engineering
3	Non-Conventional Energy Resources
4	Introduction to Additive Manufacturing
5	Engineering Materials
6	Product Lifecycle Management

List of Minor Courses offered by Electrical and Electronics Engineering Department

S.No	Name of the Minor Course
1	Electrical Power Generation, Transmission & Economic Aspects
2	Electrical Safety Course
3	Principles Of Electric Power Conversion
4	Renewable Energy Sources
5	Electric Vehicles
6	Power Systems For Data Centres

I-B.TECH.-I-SEMESTER SYLLABUS

MATHEMATICS – I

(Linear Algebra and Calculus)
(Common to All Branches)

I-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21B00101	**4**	**1**	**0**	**3**

Pre Requisite: Nil

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

1. develop the use of matrix algebra techniques that is needed by engineers for solving system of linear equations in practical applications.
2. verify Cayley – Hamilton theorem and reduce quadratic forms to canonical form by orthogonal transformation
3. test the convergence of an infinite series and verify mean value theorems for a continuous function
4. apply the techniques of multi variable differential calculus to determine extrema and series expansions
5. apply double integration techniques in evaluating areas bounded by region and triple integration techniques in evaluating volumes of solids

Unit-I: Solving systems of linear equations, Eigen values and Eigen vectors **12 hours**

Rank of a matrix by echelon form and normal form - Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method - Eigen values and Eigen vectors and problems on properties (without proofs) of Eigen values

Unit-II: Cayley–Hamilton theorem and Quadratic forms **12 hours**

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

Unit-III: Sequences, Series and Mean value theorems **12 hours**

Sequences and Series : Convergence and divergence - Ratio test - Comparison test - Integral test - Cauchy's root test - Alternate series- Leibnitz's rule. 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, Problems and applications on the above theorems.

Unit-IV: Partial differentiation **12 hours**

Introduction – Homogeneous function – Euler's theorem- Total derivative- Chain rule- Jacobian – Functional dependence -Taylor's and MacLaurin's series expansion of functions of two variables. Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method of undetermined multiplier

Unit-V: Multiple integrals **10 hours**

Double and Triple integrals – Change of order of integration in double integrals – Change of variables to polar, cylindrical and spherical coordinates. Applications: Finding Area and Volume.

Textbooks:

1. **B. S. Grewal,** Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. **R. K. Jain & S. R. K. Iyengar** Advanced Engineering Mathematics, 5th Edition NarosaPublishing House

References:

1. A text book of Engineering Mathematics, N.P. Bali and Manish Goyal, Laxmi Pub., Reprint, 2008.
2. Higher Engineering Mathematics, Ramana B.V., TMH, 11th Reprint.
3. Calculus and Analytic Geometry by G.B.Thomas and R.L.Finney, 9thEdn, Pearson, Reprint, 2002.

APPLIED PHYSICS

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21B00202 **3 0 0 3**
Pre Requisite: Nil

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

1. analyze the optical applications using the concepts of Interference and diffraction and Polarization
2. apply the basics of Laser Mechanism and fiber optics for the communications systems
3. understand the concepts of quantum mechanics for calculation of free quantum particle energies and phenomenon of electrical & thermal conductivities to sub microscopic particles
4. understand the Band formation, electrical conductivities in semiconductors.
5. apply the basics of phenomenon related to dielectric materials and Magnetic Materials to study their dependence on temperature and frequency response.

Unit-I: Wave Optics **11 hours**

Interference: Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings- Determination of wavelength and refractive index. **Diffraction:** Introduction - Fresnel and Fraunhofer diffraction - Fraunhofer diffraction due to single slit, double slit - N-slits (Qualitative) – Diffraction Grating - Dispersive power and resolving power of Grating(Qualitative). **Polarization:** Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

Unit-II Laser and Fiber Optics **08 hours**

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein's coefficients – Population inversion – Lasing action - Pumping mechanisms – Ruby laser – He-Ne laser - Applications of lasers. **Fiber optics:** Introduction – Principle of optical fiber- Acceptance Angle - Numerical Aperture -Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers – Applications.

Unit-III: Quantum Mechanics, Free Electron Theory and Band theory **10 hours**

Quantum Mechanics: Dual nature of matter - Heisenberg's Uncertainty Principle - Significance and properties of wave function - Schrodinger's time independent and dependent wave equations- Particle in a one-dimensional infinite potential well.
Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory- Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy.
Band theory of Solids: Bloch's Theorem (Qualitative) - Kronig - Penney model (Qualitative)- E vs K diagram - v vs K diagram - effective mass of electron – Classification of crystalline solids- concept of hole.

Unit-IV: Dielectric and Magnetic Materials **08 hours**

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility and Dielectric constant - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field- Clausius-Mossotti equation- Piezoelectricity.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Origin of permanent magnetic moment - Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferri magnetic materials - Domain concept for Ferromagnetism & Domain walls (Qualitative) - Hysteresis - soft and hard magnetic materials- Engineering applications

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Unit-V: Semiconductors and Superconductors 10 hours

Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein's equation- Hall effect – Hall coefficient –Applications of Hall effect.

Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC) – SQUIDs – High Tc superconductors – Applications of superconductors**.**

Text Books:

1. M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S.Chand Publications, 11th Edition 2019.
2. Engineering Physics" by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).

Refercence Books:

1. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley &Sons
2. Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
3. Shatendra Sharma, Jyotsna Sharma, " Engineering Physics", Pearson Education, 2018
4. Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press

MANAGERIAL ECONOMICS FOR ENGINEERS

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code : 21H00102	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. apply Managerial Economic concepts for decision making
2. perform cost analysis in Production
3. apply management theories in Markets & Firms
4. industrial & business organizations & its financial management
5. illustarte the concepts of capital & capital budgeting in decision Making

Unit-I: Introduction to managerial economics and demand analysis **10 hours**

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

Unit-II: **Theory of production and cost analysis** **08 hours**

Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs – Cost –Volume Profit analysis-Determination of Breakeven point(problems)-Managerial Significance and limitations of Breakeven point.

Unit-III: Introduction to markets, managerial theories of the firm &pricing policies 08 hours

Market structures: Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition. Price-Output Determination under Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly Managerial theories of the firm - Marris and Williamson's models. Pricing Policies: Methods of Pricing-Marginal Cost Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Bundling Pricing, and Peak Load Pricing. Internet Pricing Models: Flat rate pricing, Usage sensitive pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model, Smart market
mechanism model.

Unit-IV: Types of industrial organization & introduction to business cycles **10 hours**

Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types. Changing business environment in post-liberalization scenario.

Financial management: Functions of financial management, simple and compound interest, Methods of evaluating alternatives

Depreciation: common methods of depreciation

Unit-V: Capital and capital budgeting **10 hours**

Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting, Rate of Return (ARR), IRR and Net Present Value Method (simple problems)

Text Books:

1. Managerial Economics and Financial Analysis, by J.V.Prabhakar Rao, Maruthi Publications, 2011
2. Managerial Economics and Financial Analysis, by N. Appa Rao. & P. Vijaya Kumar, Cengage Publications, New Delhi, 2011

Reference Books:

1. Managerial Economics and Financial Analysis, by A R Aryasri, TMH 2011
2. Managerial Economics by Suma damodaran, Oxford 2011
3. Mangerial Economice and Financial Analysis by S.A. Siddiqui & A.S. Siddiqui, New AgeInternational Publishers, 2011.

PROGRAMMING IN C

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E05101 **3 1 0 3**
Pre Requisite: Nil

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

1. write algorithms and to draw flowcharts for solving problems.
2. use different operators, data types and write programs that use two-way/ multi way selection.
3. select the best loop construct for a given problem.
4. make use of Arrays in solving complex problems.
5. solve problems using concept of structures, unions and File I/O operations

UNIT-I **10 hours**

Introduction to Computers: Computer Systems, Computer software and hardware, Computing Environments, Computer Languages.

Introduction to the C Language: Algorithm and Flow chart, Structure of C Program, Creating and running programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions.

UNIT-II **10 hours**

Control Structures: Selection Statements (making decisions) – Two Way Selection (if-else), Multi way Selection (nested if and switch) statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, Jump statements related to looping – break, continue, go to. Simple C Program examples.

UNIT-III **10 hours**

Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Example Programs

Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String, Example Programs.

UNIT-IV **10 hours**

Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter Function Communication, Standard Functions, Storage Classes, Scope and lifetime, Passing Array to Functions, Command Line Arguments and Recursion.

Pointers: Concept of pointer, declaring and initializing pointer variables, pointer expressions and address arithmetic, null pointers, generic pointers, pointers as function arguments, pointers and arrays, pointer and strings, pointer to pointer, dynamic memory allocation, dangling pointer.

UNIT-V **10 hours**

Structures &Union: The Type Definition (Type def), Enumerated Types, Structure, Unions, and Example Programs.

Data Files: Introduction to Files, Using files In C, Reading from Text Files, Writing to Text files, Random Access File.

Text Books:

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, CENGAGE.
2. Programming in C, Reema Thareja, and OXFORD University press.

Reference Books:

1. Computer Fundamentals and Programming, Sumithabha Das, McGraw Hill.
2. Programming in C, Ashok N. Kamthane, AmitKamthane, and Pearson.
3. C Programming – Balaguruswamy, McGraw Hill
4. Let us C- A Kamthane

INTRODUCTION TO ADVANCED COMPUTER TECHNOLOGY

	L	T	P	C
I-B.Tech-I-Sem.				
Subject Code : 21E05101	**4**	**1**	**0**	**3**

Pre Requisite: Nil

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

1. understand importance of AI and its applications.
2. Iilustrate the concept of input and output devices of Computers and how it works and recognize the basic terminology used in computer programming.
3. recognize the Computer networks, types of networks and topologies and use of IoT
4. understand Human Computer Interaction and use of GUI
5. understand the basic of Security and privacy

UNIT-I: Evolution of Computers **10 hours**

A Simple Computer System: Central processing unit, the further need of secondary storage, Types of memory, Hardware, Peripheral Devices: Input, Output and storage, Generations of Computers, Types of Computers Software: - Introduction, Types of Software, Applications of Software, Characteristics of Software (Textbook 1)

UNIT-II: Human Computer Interactio **10 hours**

Introduction, definition, goals ,why is hci important ,defining the user interface, the importance of good design, the importance of the user interface ,a brief history of screen design ,Popularity of graphics, The Concept of Direct Manipulation, Graphical system ,characteristics.

UNIT-III: Introduction to Artificial Intelligence **10 hours**

Introduction to AI, History, Intelligent Systems, foundations of AI, applications, tic-tac-toe game playing, development of AI languages ,current trends of AI
(Text Book 2)

UNIT-IV: Introduction to Internet and IOT **10 hours**

Introduction to Internet : History, Types of Network, Network Topology,Network Devices- Hub, Repeater, Switch, Bridge, Router, Gateway, Applications of Internet , World Wide Web,(Textbook1)
IOT:The Internet of Things: Introduction, Evolution of IoT, Conceptual Framework, IoT Architectural View, Technology behind IoT, Applications (Text Book 4)

UNIT-V: Security and Privacy **10 hours**

Introduction, Basic Principles Security Goals, Cryptographic Attacks, Services and Mechanisms.Privacy: Introduction, Ethics, Defining Privacy, Legislative Privacy (Textbook 5)

Text Books

1. Fundamentals of Computers –ReemaThareja-Oxford higher education
2. Artificial Intelligence- SarojKaushik, CENGAGE Learning

Reference Books:

1. Artificial Intelligence by Luger (Pearson Education)
2. Introduction to Information Technology – ITL education Solution Limited, Pearson
3. Designingthe Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
4. Network Security and Cryptography, Bernard Meneges, Cengage Learning.

IT WORKSHOP

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E05112 **0 0 3 1.5**
Pre Requisite: Nil

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

1. assemble and disassemble components of a computer
2. construct a fully functional virtual machine, Summarize various Linux operating system commands,
3. secure a computer from cyber threats, Learn and practice programming skill in Github, Hacker rank, Code chef, Hacker Earth etc.
4. recognize characters & extract text from scanned images, Create audio files and podcasts
5. create video tutorials and publishing, Use office tools for documentation, Build interactive presentations, Build websites, Create quizzes & analyse responses.

LIST OF EXPERIMENTS

Computer Hardware:

Experiment 1: Identification of peripherals of a computer

1. Block diagram of the CPU along with the configuration of the each peripheral and its functions

Experiment 2: System Assembling and Disassembling

a) Disassembling the components of a PC
b) Assembling the components back to working condition

Experiment 3: Virtual Machine setup:

a) Setting up and configuring a new Virtual Machine
b) Setting up and configuring an existing Virtual Machine
c) Exporting and packaging an existing Virtual Machine into a portable format

Experiment 3: Operating System

a) Installing of windows Operating System.
b) Installing of Linux Operating System

Experiment 4: Linux Operating System commands:

a) General command syntax
b) Basic help commands
c) Basic File system commands
d) Date and Time
e) Basic Filters and Text processing
f) Basic File compression commands
g) Miscellaneous: apt-get, vi editor

Experiment 5: Networking and Internet

a) Networking commands
b) Configuring proxy and firewall settings
c) Exploring Internet and World Wide Web
d) Exploring search Engines, Cyber hygiene

Experiment 6: Productivity Tools

a) Basic HTML tags
b) Introduction to HTML5 and its tags

Experiment 7: Productivity Tools II

Preparation of a simple home page

Experiment 8: Office Tools-I

Demonstration and Practice on Text Editors like Notepad++, Sublime Text, Atom, Brackets, Visual code, etc

Experiment 9: Office Tools-II

a) Demonstration and practice on Microsoft Word, Power Point

b) Demonstration and practice on Microsoft Excel

Experiment 10: I o T

A Study Experiment on IOT Fundamental application, Protocols, Communication models, architecture, I o T Devices

APPLIED PHYSICS LAB

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21B00212 **0 0 3 1.5**
Pre Requisite: Nil

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

1. demonstrate diffraction techniques, strain gauge methods for material investigations
2. apply magnetism and optics for determining various physical characteristics.
3. apply the techniques of physical instruments for thickness evaluation,laws of string and other parameters.

LIST OF EXPERIMENTS

List of Applied Physics Experiments

1. Determination of thickness of thin object by wedge method.
2. Determination of radius of curvature of a given plano convex lens by Newton's rings.
3. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
4. Determination of dispersive power of the prism.
5. Determination of dielectric constant using charging and discharging method.
6. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
7. Determination of numerical aperture and acceptance angle of an optical fiber.
8. Determination of wavelength of Laser light using diffraction grating.
9. Estimation of Planck's constant using photoelectric effect.
10. Determination of the resistivity of semiconductor by four probe method.
11. To determine the energy gap of a semiconductor using p-n junction diode.
12. Magnetic field along the axis of a current carrying circular coil by Stewart & Gee's Method
13. Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
14. Measurement of resistance of a semiconductor with varying temperature.
15. Resistivity of a Superconductor using four probe method & Meissner effect.

PROGRAMMING IN C LAB

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21E05111 **0 0 3 1.5**
Pre Requisite: Nil

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

1. Gains knowledge on various concepts of a C language.
2. Draw flowcharts and write algorithms.
3. Design and development of C problem solving skills.
4. Design and develop modular programming skills.
5. Trace and debug a program

LIST OF EXPERIMENTS

Exercise - 1 Basics I

a) Write a simple program using printf ( ), scanf ( )

b) C Program to Perform Adding, Subtraction, Multiplication and Division of two numbers

Exercise - 2 Basics II

a) Write a C Program to Simulate 3 Laws at Motion (v=u+at,s=ut+1/2at 2 , v2-u 2=2as)

b) Write a C Program to convert Celsius to Fahrenheit and vice versa

Exercise - 3 Control Flow - I

a) Write a C Program to Find Whether the Given Year is a Leap Year or not.

b) Write a C Program to Add Digits & Multiplication of a number

Exercise - 4 Control Flow - II

a) i) Write a C Program to Find Whether the Given Number is Prime Number or Not
ii) Write a C Program to Find Whether the Given Number is Armstrong Number or not

b) Write a C program to print Floyd Triangle

Exercise - 5 Control Flow - III

a) Write a C Program to print Pascal Triangle

b) Write a C Program to make a simple Calculator to Add, Subtract, Multiply or Divide Using Switch-case statement.

Exercise – 6 Arrays

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

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

Exercise – 7 Functions

a) Write a C Program demonstrating of parameter passing in Functions and returning values.

b) Write a C Program illustrating Fibonacci, Factorial with Recursion without Recursion

Exercise – 8 Functions

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

b) Write a program in C to swap elements using call by reference

Exercise – 9 Arrays and Pointers

a) Write a C Program to Access Elements of an Array Using Pointer

b) Write a C Program to find the sum of numbers with arrays and pointers.

Exercise – 10Strings

a) Implementation of string manipulation operations with library function.

i) copy ii) concatenate iii) length iv) compare

b) Implementation of string manipulation operations without library function.

i) copy ii) concatenate iii) length iv) compare

Exercise – 11 Structures

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

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

Exercise -12 Files

a) Write a C programming code to open a file and to print it contents on screen.

b) Write a C program to copy files.

ENVIRONMENTAL SCIENCE

I-B.Tech-I-Sem. **L T P C**
Subject Code : 21M00201 **2 0 0 3**
Pre Requisite: Nil

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

1. articulate the interconnected and interdisciplinary nature of environmental studies.
2. demonstrate an integrative approach to environmental issues with a focus on sustainability.
3. use critical thinking, problem-solving, and the methodological approaches of the social sciences, natural sciences, and humanities in environmental problem solving.
4. adopt sustainability as a practice in life, society and industry through rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation.
5. outline the effect of value education and welfare programmes.

Unit-I: Multidisciplinary Nature of Environmental Studies **08 hours**

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-II: Ecosystems & Biodiversity and Its Conservation **12 hours**

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: Forest ecosystem, Grassland ecosystem, Desert ecosystem Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) Biodiversity And Its Conservation :Introduction, Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, 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. resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.
Land resources: Land as a resource, land degradation.

Unit-III: Environmental Pollution & Solid Waste Management **10 hours**

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-IV: Social Issues and the Environment **10 hours**

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-V: Human Population And The Environment **08 hours**

Human Population And The Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – 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..

I-B.TECH.-II-SEMESTER SYLLABUS

MATHEMATICS-II
(Differential Equations and Numerical Methods)

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00201 **4 1 0 3**
Pre Requisite: Nil

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

1. solve the differential equations related to various engineering fields
2. apply the concept of differential equations in L-C-R circuits and L-C circuits
3. evaluate the approximate roots of polynomial and transcendental equations by different algorithms
4. apply Newton's forward & backward interpolation for equal intervals and Lagrange's formulae for unequal intervals
5. apply numerical integral techniques to different Engineering problems and apply different algorithms for approximating the solutions of ordinary differential equations with initial conditions to its analytical computations

Unit-I: Differential equations of first order and first degree **12 hours**

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

Unit-II: Linear differential equations of Higher order **12 hours**

Homogeneous and Non-homogeneous differential equations of higher order with constant coefficients - with non-homogeneous term of the type $e^{ax}, \sin ax, \cos ax$, polynomials in x, $e^{ax}V(x)$ and $x^m V(x)$ - Method of Variation of parameters. Applications : L-C-R circuits and L-C circuits

Unit-III: Iterative methods **12 hours**

Introduction- Bisection method- Method of false position- Iteration method – Newton-Raphson method (One variable) for finding solutions of algebraic and transcendental equations- Gauss Jacobi and Gauss- Seidel methods for solving system of equations numerically.

Unit-IV: Interpolation and Numerical differentiation **12 hours**

Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences -Central differences - Relations between operators - Newton's forward and backward formulae for interpolation - Interpolation with unequal intervals - Lagrange's interpolation formula - Numerical differentiation using interpolating polynomial

Unit-V: Numerical Integration and Numerical Solution of ordinary differential equations with initial conditions **10 hours**

Numerical Integration by Trapezoidal rule- Simpson's 1/3rd and 3/8th rule - Numerical Solution of initial value problems by Taylor's series- Picard's method of successive approximations- Euler's method -Modified Euler's method – Runge - Kutta method (fourth order).

Text Books:

1. B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers.
2. R. K. Jain and S. R. K. Iyengar Advanced Engineering Mathematics, Fifth Edition Narosa Publishing House

Refercence Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley & Sons, 2011
2. V.Ravindranath P & Vijayalaxmi, Mathematical Methods, Himalaya Publishing House.
3. B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.
4. Engineering Mathematics, Dr.T.K.V. Iyengar, S. Chand publications

APPLIED CHEMISTRY

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00103 **3 0 0 3**
Pre Requisite: Nil

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

1. Develop polymer composites, synthetic polymers, plastic materials and their use in design.
2. Apply the principles and applications of batteries and fuel cells
3. Identify different types of corrosion and categorize the reasons for corrosion.
4. Synthesize commonly used industrial materials and understand the principles of Green synthesis
5. Design models for energy by different natural sources.

Unit-I: Polymer Technology **08 hours**

Polymerisation: Introduction, methods of polymerization (emulsion and suspension), mechanical properties. **Plastics:** Thermo plastics & Thermosetting plastics, Compounding of plastics, Compounding, fabrication (compression, injection, extrusion and Transfer), preparation, properties and applications (PVC, Bakelite and polycarbonates), recycling of e-plastic waste (waste to wealth).
Elastomers: Natural rubber, Processing of natural rubber, Compounding, Vulcanisation, preparation, properties and applications (Buna-S, thiokol and Poly urethanes).
Composite materials: Fiber reinforced plastics, conducting polymers, biodegradable polymers with examples

Unit-II: Electrochemical Cells and Corrosion **10 hours**

Galvanic cells, Single electrode potential, Concentration cells, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, Batteries: Dry cell, Li- ion battery, Lead-acid battery, Fuel cells: Construction and working of H2-O2, CH3OH-O2 **Corrosion:** Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, pitting corrosion, galvanic series, factors influencing rate of corrosion, Corrosion control methods: proper designing and cathodic protection, cathodic coatings, anodic coatings, electroplating and electro-less plating, Paints (constituents and functions).

Unit-III: Chemistry of Engineering Materials **08 hours**

Nano materials: Introduction – Carbon nanotubes and fullerenes- Sol-gel method, BET and TEM methods, Carbon nanotubes and fullerenes: Types, preparation, properties and applications
Green synthesis: Principles, Methods of synthesis with examples
Liquid crystals: Introduction-types-applications,Super conductors: Type -I, Type II, Characteristics and applications

Unit-IV: Non Conventional Energy Sources and Storage Devices **10 hours**

Solar Energy: Construction and working of Photovoltaic cell, applications
Non-conventional energy sources:

i) Hydropower - Hydropower plant (schematicdiagram)
ii) Geothermal energy: Introduction-schematic diagram of a geothermal powerplant
iii) Tidal and wave power: Introduction- Design andworking
iv) Ocean thermal energy: Introduction, ocean thermal energy conversion (OTEC), open cycle OTEC, closed-cycle OTEC, hybrid OTEC- schematic diagram andexplanation.
v) Biomass andbiofuels

Fuel cells: Introduction, Cell representation, Design and working, advantages and limitations. Types of fuel cells: H2-O2 Fuel cell, CH3OH-O2 Fuel cell, Phosphoric acid fuel cell, molten carbonate fuel cells.

Unit-V: Material Chemistry & Computational Chemistry **10 hours**

Non-elemental semiconducting Materials: Stoichiometric, controlled valency & Chalcogen photo/semiconductors, Preparation of Semiconductors

Semiconductor Devices: p-n junction diode as rectifier

Magnetic materials: Ferro and Ferri magnetic materials, Hall Effect and its applications.

Computational chemistry: Introduction, Ab Initio studies

Text Books:

1. Engineering Chemistry by Jain and Jain; Dhanpat Rai PublicatingCo.
2. Applied Chemistry by Dr. Bharathi Kumari Yalamanchili; VGSPublishers

Reference Books:

1. Engineering Chemistry of Wiley India Pvt. Ltd., Vairam and others, 2014 edition(second).
2. Engineering Chemistry by Prasanth Rath, Cengage Learning, 2015edition
3. Applied Chemistry by H.D. Gesser, SpringerPublishers

Text book of Nano-science and nanotechnology by B.S. Murthy, P. Shankar and others, University Press,IIM

COMMUNICATIVE ENGLISH

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21H00201 **3 0 0 3**
Pre Requisite: Nil

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

1. identify the context, topic, and pieces of specific information.
2. apply the concepts of communication in various channels to introduce one/other.
3. benchmark with standards to comprehend effective communication.
4. quantify expression by using adjectives, adverbs and antonyms.
5. write technical/academic proposals through appropriate glossary of words

Unit-I: **10 hours**

Lesson-1: A Drawer full of happiness from "Infotech English", Maruthi Publications Lesson-2: Deliverance by Premchand from "The Individual Society",Pearson Publications. (Non-detailed)
Listening: Listening to short audio texts and identifying the topic. Listening to prose, prose andconversation.
Speaking: Asking and answering general questions on familiar topics such as home, family, work,studies and interests. Self introductions and introducing others.
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.
Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers,sign posts and transition signals; mechanics of writing - punctuation, capital letters.
Vocabulary: Technical vocabulary from across technical branches (20)
GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; Nouns: countable and uncountable; singular and plural basic sentence structures; simple questionform - wh-questions; word order in sentences.

Unit-II: **10 hours**

Lesson-1: Nehru's letter to his daughter Indira on her birthday from "InfoTech English", Maruthi Publications
Lesson-2: Bosom Friend by Hira Bansode from "The Individual Society", PearsonPublications.(Non-detailed)
Listening: Answering a series of questions about main idea and supporting ideas after listening toaudio texts, both in speaking and writing.
Speaking: Discussion in pairs / small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.
Reading: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.
Writing: preparing posters, slides and presentation papers
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications) Grammar: Use of articles and zero article; prepositions.

Unit-III: **08 hours**

Lesson-1: Stephen Hawking-Positivity 'Benchmark' from"InfoTech English", Maruthi Publications
Lesson-2: Shakespeare's Sister by Virginia Woolf from "The Individual Society", Pearson Publications.(Non-detailed)

Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing.
Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing.
Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading.
Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing- mail etiquette, Writing CV's.
Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words
Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Unit-IV **10 hours**

Lesson-1: Liking a Tree, Unbowed: Wangari Maathai-biography from "InfoTech English", Maruthi Publications
Lesson-2: Telephone Conversation-Wole Soyinka from "The Individual Society", Pearson Publications.(Non-detailed)
Listening: Making predictions while listening to conversations/ transactional dialogues without video(only audio); listening to audio-visual texts.
Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting,and Inviting.
Reading: Studying the use of graphic elements in texts to convey information, revealtrends/patterns/relationships, communicative process or display complicated data.
Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20words) (Antonyms and Synonyms, Word applications) Cloze Encounters.
Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees ofcomparison; use of antonyms

Unit-V: **08 hours**

Lesson-1: The Chief Software Architect from "English Encounters", Maruthi Publications
Lesson-2. Still I Rise by Maya Angelou from "The Individual Society", Pearson Publications.(Non-detailed)
Lesson-3: G.D.Naidu 'Trail Blazers' by Orient Black Swan Pvt. Ltd. Publishers
Listening: Identifying key terms, understanding concepts and interpreting the concepts both inspeaking and writing.
Speaking: Formal oral presentations on topics from academic contexts - without the use of PPTslides. Functional English: Suggesting/Opinion giving.
Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive readingtechniques.
Writing: Writing academic proposals- writing research articles: format and style.
Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions.
Grammar: Editing short texts – identifying and correcting common errors in grammar and usage(articles, prepositions, tenses, subject verb agreement)

Text Books:

1."Infotech English", Maruthi Publications. (Detailed)
2."The Individual Society", Pearson Publications.(Non-detailed)

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; 2ndEdition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

PRINCIPLES OF DIGITAL LOGIC DESIGN

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E05101 **4 0 0 4**
Pre Requisite: Nil

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

1. Define different number systems, binary addition and subtraction, 2'scomplement representation and operations with this representation.
2. Understand the different switching algebra theorems and apply them forlogic functions.
3. Design and Analyze Combinational Circuits.
4. Design various sequential circuits starting from flip-flop toregisters and counters.
5. Design various logic gates starting from simple ordinary gates tocomplex programmable logic devices.

Unit-I: Digital systems and binary numbers **12 hours**

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

Unit-II: Concept of Boolean algebra **12 hours**

Basic Theorems and Properties of Boolean algebra, Boolean Functions, Canonical and Standard Forms, Minterms and Maxterms.
Gate level Minimization: Map Method, Three-Variable K-Map, Four Variable K-Maps. Products of Sum Simplification, Sum of Products Simplification, Don't – Care Conditions, NAND and NOR Implementation, Exclusive OR Function.

Unit-III: Combinational logic circuits **08 hours**

Introduction, Analysis Procedure, Binary Adder-Subtractor, Binary Multiplier, Decoders, Encoders, Multiplexers, Demultiplexers, Priority Encoder, Code Converters, Magnitude Comparator

Unit-IV: Sequential logic circuits **12 hours**

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

Unit-IV: Programmable logic devices **12 hours**

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

Text Books:
1. M. Morris R. Mano, Michael D. Ciletti, ¯Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog‖, 6th Edition, Pearson Education, 2017
Reference Books:
1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2 .John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design‖, Tata Mc Graw Hill, 2003.

PYTHON PROGRAMMING

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21E05202 **3 1 0 3**
Pre Requisite: Engineering Physics

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

1. Develop essential programming skills in computer programming concepts like data types, containers
2. Apply the basics of programming in the Python language
3. Solve coding tasks related conditional execution, loops
4. Solve coding tasks related to the fundamental notions and techniques used in object oriented programming

Unit-I: **10 hours**

Introduction : Introduction 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.
Data types and Expressions: Strings, Assignment and Comments, Numeric Data Types and Character Sets

Unit-II: **08 hours**

Control Flow- if, if –else, if-elif-else statements, Nested Decision Structures,
Repetitions structures introduction, for, while, Input Validation Loops, Nested Loops, break, continue, pass.
Data Structures: List-operations, slicing, methods; Tuples, sets, dictionaries, sequences, comprehensions

Unit-III: **10 hours**

Strings and Text Files: Accessing Characters and Substrings in a String, Strings and Number systems. Data encryption, string methods, text files
Functions: Defining Functions, calling function, passing arguments, keyword arguments, default arguments, variable length arguments, Anonymous functions, fruitful functions, scope of variables-local and global variables, Modules-modules, Standard modules, packages

Unit-IV: **08 hours**

Object-Oriented Programming: concept of class, object and instances, constructor, class attributes and destructors, Inheritance, overlapping and overloading, adding and retrieving dynamic attributes of classes, programming with OOPS support
Design with classes: Data modeling examples, case study of an ATM, Structuring classes with Inheritance and Polymorphism.

Unit-V: **10 hours**
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defines Exceptions
Graphical User Interfaces: Behaviour 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. Kenneth A. Lambert, the Fundamentals of Python: First Programs, 2011, Cengage Learning.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing

Refercence Books:

1. Introduction to Python Programming, Gowrie Shankar's, Veena A, CRC Press.
2. Introduction to Programming Using Python, Y. Daniel Liang, Pearson.
3. 3.Python Programming using Problem Solving Approach, Reema Threja, OUP.

COMMUNICATIVE ENGLISH LABORATORY

	L	T	P	C
I-B.Tech-II-Sem.				
Subject Code : 21H00111	**0**	**0**	**3**	**1.5**

Pre Requisite: Nil

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

1. Demonstrate nuances of language through audio-visual experience and Group activities.
2. Identify accent for intelligibility.
3. Demonstrate in conversation, jams and public speaking. Make use of the concepts to communicate confidently and competently in English Language in all spheres..

LIST OF EXPERIMENTS

PRACTICE 1: Greeting, Introducing, and taking leave ---Pure Vowel

PRACTICE 2: Giving Information and Asking for Information –Diphthongs

PRACTICE 3: Inviting, Accepting and Declining Invitations –Consonants

PRACTICE 4: Commands, Instructions and Requests--Accent and Rhythm

PRACTICE 5: Suggestions and Opinions --Intonation

APPLIED CHEMISTRY LABORATORY

I-B.Tech-II-Sem. **L T P C**
Subject Code : 21B00113 **0 0 3 1.5**
Pre Requisite: Nil

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

1. students are exposed to a few instrumental methods of chemical analysis, thus they gain technical knowledge of measuring, operating and testing of chemical instruments and equipments
2. student can acquire some experimental skills to enhance the analytical thinkingcapabilities in the modern trends of engineering and technology.

LIST OF EXPERIMENTS

Experiment 1: Introduction to Chemistry Laboratory- Molarity, Normality, Primary and Secondary standard solutions, volumetric titrations, Quantitative analysis and Qualitative analysis

Experiment 2: Determination of HCl using standard Na2CO3 solution
Experiment 3: Estimation of KMnO4 by Oxalic acid
Experiment 4: Estimation of Ferrous Iron by K2Cr2O7
Experiment 5: Determination of total hardness of water by EDTA method
Experiment 6: Determination of Alkalinity of water sample.
Experiment 7: Determination of Chlorides present in water sample.
Experiment 8: Determination of pH of water and soil sample
Experiment 9: Conductometric titration of strong acid Vs strong base.
Experiment 10: Conductometric titration of strong acid Vs Weak base
Experiment 11: Potentiometric titration of strong acid Vs strong base.
Experiment 12: Potentiometric titration of strong acid Vs weak base.
Experiment 13: Preparation of Phenol formaldehyde resin
Experiment 14: Preparation of Urea formaldehyde resin.
Experiment 15: Determination of Mg+2 present in Antacid
Experiment 16: Determination of Zinc by complexometric method

PYTHON PROGRAMMING LAB

I-B.Tech-II-Sem. **L T P C**
Subject Code :21E05212 **0 0 3 1.5**
Pre Requisite: Nil
Course Outcomes: At the end of the course, the students will be able to

1. develop essential programming skills in computer programming concepts like data types, containers
2. apply the basics of programming in the Python language
3. solve coding tasks related conditional execution, loops
4. solve coding tasks related to the fundamental notions and techniques used in objectoriented programming

LIST OF EXPERIMENTS

Exercise - 1

a) 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.

b) 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.

Exercise - 2

a) Write a program that uses a for loop to print the numbers 8, 11, 14, 17, 20, . . . , 83, 86, 89.

b) 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.

Exercise - 3

a) Use a for loop to print a triangle like the one below. Allow the user to specify how high the triangle should be.

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b) 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.

Exercise - 4

a) 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.

b) Write a program that asks the user to enter a word and prints out whether that word Contains any vowels.

c) 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.

Exercise - 5

a) 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.

b) 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.

Exercise - 6

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.

Exercise - 7

a) Write a program that asks the user for an integer and creates a list that consists of the Factors of that integer.

b) 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.

c) 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].

Exercise - 8

a) 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, millimeters, centimeters, meters, or kilometers. 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.

b) Write a function called sum_digits that is given an integer num and returns the sum of the digits of num.

Exercise - 9

a) 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.

b) Write a function called number_of_factors that takes an integer and returns how many factors the number has.

c) Write a function called is_sorted that is given a list and returns True if the list is sorted and False otherwise.

Exercise - 10

a) Write a function called root that is given a number x and an integer n and returns x1/n. In the function definition, set the default value of n to 2.

b) 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.

Exercise - 11

a) 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.

b) 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.

Exercise - 12

a) 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 a 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.

Exercise - 13

a) 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.

b) 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.

Exercise - 14

a) Write a Python class to reverse a string word by word.

b) Write a program to demonstrate Try/except/finally.

c) Write a GUI for an Expression Calculator using tk.

II-B.TECH.-I-SEMESTER SYLLABUS

DATA STRUCTURES

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P05303 **3 0 0 3**
Pre Requisite: Nil

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

1. summarize the properties, interfaces, and behaviors of basic abstract data types
2. discuss the computational efficiency of the principal algorithms for sorting &searching
3. use arrays, records, linked structures, stacks, queues, trees and Graphs in writing programs
4. demonstrate different methods fort reversing trees

UNIT-I **10 hours**

Data Structures - Definition, Classification of Data Structures, Operations on Data Structures, Abstract Data Type (ADT), Preliminaries of algorithms. Time and Space complexity.

Searching - Linear search, Binary search, Fibonacci Search.

Sorting- Insertion sort, Selection sort, Exchange (Bubble sort, quick sort), distribution (radix sort), merging (Merge sort) algorithms

UNIT-II **10 hours**

Linked List: Linear list ADT-array representation and linked representation, Singly Linked Lists-Operations-Insertion, Deletion, Circularly linked lists-Operations for Circularly linked lists,

Doubly Linked Lists- Operations- Insertion, Deletion.

UNIT-III **10 hours**

Stacks: Introduction to Stacks, Array Representation of Stacks, Operations on Stacks, Linked list Representation Of Stacks, Operations on LinkedStack , Applications Reversing list,Infix to Postfix Conversion,Evaluating Postfix Expressions

Queues: Introduction to Queues, Representation of Queues-using Arrays and using Linked list, Implementation of Queues-using Arrays and using Linked list, Application of Queues-Circular Queues , Deques , Priority Queues

UNIT-IV **10 hours**

Trees: Basic Terminology in Trees, Binary Trees-Properties, Representation of Binary Trees using Arrays and Linked lists. Binary Search Trees- Basic Concepts, BST Operations: Insertion, Deletion, Tree Traversals, Applications-Expression Trees, Heap Sort, Balanced Binary TreesAVL Trees, Insertion, Deletion and Rota

UNIT-V **10 hours**

Graphs: Basic Concepts, Representations of Graphs-Adjacency Matrix and using Linked list, Graph Traversals (BFT & DFT), Applications- Minimum Spanning Tree Using Prims & Kruskals Algorithm, Dijkstra's shortest path

Text Books:

1. Data Structures Using C. 2 ndEdition.ReemaThareja, Oxford.
2. Data Structures and algorithm analysis in C, 2 nded, Mark Allen Weiss

Refercence Books:

1. Fundamentals of Data Structures in C, 2ndEdition,Horowitz,Sahni, Universities Press.
2. DataStructures:APseudoCodeApproach,2/e,RichardF.Gilberg,BehrouzA.Forouzon.
3. Data Structures with C, Seymour Lipchitz TMH

COMPUTER ORGANIZATION

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P05302 **3 1 0 3**
Pre Requisite: Nil

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

1. develop a detailed understanding of computer systems
2. cite different number systems, binary addition and subtraction, standard, floating-point, and micro operations
3. develop a detailed understanding of architecture and functionality of central processing unit
4. exemplify in a better way the I/O and memory organization
5. illustrate concepts of parallel processing, pipelining and inter processor communication

Unit-I: **10 hours**

Basic Structure of Computers: Basic Organization of Computers, Historical Perspective, Bus Structures, Data Representation: Data types, Complements, Fixed Point Representation. Floating, Point Representation. Other Binary Codes, Error Detection Codes.
Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms

Unit-II: **08 hours**

Register Transfer Language and Micro operations: Register Transfer language. Register Transfer Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit.
Basic Computer Organization and Design: Instruction Codes, Computer Register, Computer Instructions, Instruction Cycle, Memory – Reference Instructions. Input –Output and Interrupt, Complete Computer Description.

Unit-III: **08 hours**

Central Processing Unit: General Register Organization, STACK Organization. Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.
Micro programmed Control: Control Memory, Address Sequencing, Micro Program example, Design of Control Unit.

Unit-IV: **08 hours**

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.
Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupts, Direct Memory Access.

Unit-V: **10 hours**

Multi Processors: Introduction, Characteristics of Multiprocessors, Interconnection Structures, Inter Processor Arbitration.
Pipeline: Parallel Processing, Pipelining, Instruction Pipeline, RISC Pipeline, Array Processor

Text Books:

1. Computer System Architecture, M. Morris Mano, Third Edition, Pearson, 2008.
2. Computer Organization, Carl Hamacher, Zvonko Vranesic, Safwat Zaky, 5/e, McGraw Hill, 2002.

Refercence Books:

1. Computer Organization and Architecture, William Stallings, 6/e, Pearson, 2006.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4/e, Pearson, 2005.
3. Fundamentals of Computer Organization and Design, Sivarama P. Dandamudi, Springer.

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P6301 **3 1 0 3**
Pre Requisite: Nil

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

1. enumerate the history and foundations of Artificial Intelligence x
2. apply the basic principles of AI in problem solving
3. choose the appropriate representation of Knowledge
4. enumerate the Perspectives and Issues in Machine Learning

Unit-I: **10 hours**

Introduction: What Is AI? The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit-II: **10 hours**

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions**.**

Unit-III: **10 hours**

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

Unit-IV: **10 hours**

Introduction to Machine Learning: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning. Concept Learning and The General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate-Elimination, Inductive Bias

Unit-V: **10 hours**

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

Text Books:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" , 3rd Edition, Pearson
2. Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013

Refercence Books:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill
3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.

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OBJECT ORIENTED PROGRAMMING USING JAVA

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21E02404 **3 1 0 3**
Pre Requisite: Nil

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

1. understand Java programming concepts and utilize Java Graphical User Interface in Program writing.
2. write, compile, execute and troubleshoot Java programming for networking concepts.
3. build Java Application for distributed environment.
4. design and Develop multi-tier applications.
5. identify and Analyze Enterprise applications

UNIT-1 **10 hours**

Introduction to OOP, procedural programming language and object oriented language, principles of OOP, applications of OOP, history of java, java features, JVM, program structure. Variables, primitive data types, identifiers, literals, operators, expressions, precedence rules and Associativity, primitive type conversion and casting, flow of control.

UNIT-II **8 hours**

Classes and objects, class declaration, creating objects, methods, constructors and constructor Overloading, garbage collector, importance of static keyword and examples, this keyword, arrays, command line arguments, nested classes.

UNIT-III **8 hours**

Inheritance, types of inheritance, super keyword, final keyword, overriding and abstract class. Interfaces, creating the packages, using packages, importance of CLASSPATH and java.lang package. Exception handling, importance of try, catch, throws throws and finally blocks, userdefined exceptions, Assertions

UNIT-IV **8 Hours**

Multithreading: introduction, thread life cycle, creation of threads, thread priorities, threads synchronization, communication between threads. Reading data from files and writing data to files, random access file,

UNIT-V **8 Hours**

Applet class, Applet structure, Applet life cycle, sample Applet programs. Event handling: event delegation model, sources of event, Event Listeners, adapter classes, inner classes.
AWT: introduction, components and containers, Button, Label, Checkbox, Radio Buttons, List Boxes, Choice Boxes, Container class, Layouts, Menu and Scrollbar.

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson

Reference Books:

1. Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers.
2. Introduction to Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box.

PROBABILITY AND STATISTICS

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21B05401 **3 0 0 3**
Pre Requisite: Nil

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

1. classify the concepts of data science and its importance
2. interpret the association of characteristics and through correlation and regression tools
3. apply discrete and continuous probability distributions
4. determine the mean and variance of a sampling distribution of means
5. design the components of a classical hypothesis test for large samples

Unit-I: Descriptive statistics and methods for data science **10 hours**

Data science – Statistics Introduction – Population vs Sample – Collection of data – primary and secondary data – Type 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 Regression **10 hours**

Correlation and Curve fitting: Correlation – correlation coefficient – rank correlation – Regression coefficients and properties – regression lines – Method of least squares – Fit a Straight line – parabola – Exponential – Power curves.

Unit-III: Rndom Variables, Distributions and Sampling theory **10 hours**

Random variables – Discrete and Continuous random variables – Distribution function – Mathematical Expectation and Variance – Binomial, Poisson and Normal distributions. Sampling Theory: Introduction – Population and samples – Sampling distribution of Means and Variance (definition only) – Central limit theorem (without proof).

Unit-IV: Estimation and Test of Hypothesis (Large Samples) **10 hours**

Point and Interval estimations – Maximum error of estimate – Confidence interval – Test of Hypothesis – Null and Alternative Hypothesis – Type I and Type II errors – Level of significance – One tail and two-tail tests – Tests concerning one proportion and two proportions – Z-Test concerning one mean and two means (Large samples

Unit-V: Tests of Hypothesis (Small Ssamples) **10 hours**

Hypothesis concerning one mean and two means (Small Samples) using t -Test – Tests concerning difference of two variances (Small samples) using F-test – X2 -test for goodness of fit and independence of attributes

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 l. 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.

DATA STRUCTURES LAB

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P05312 **0 0 3 1.5**
Pre Requisite: Nil

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

1. use basic data structures such as arrays and linked list.
2. programs to demonstrate fundamental algorithmic problems include Tree Traversals, Graph traversals, and shortest paths.
3. use various searching and sorting algorithms

LIST OF EXPERIMENTS

Exercise -1 (Searching)

1. Write C program that use both recursive and non recursive functions to perform Linear search for a Key value in a given list.
2. Write C program that use both recursive and non recursive functions to perform Binary search for a Key value in a given list.

Exercise -2 (Sorting-I)

1. Write C program that implement Bubble sort, to sort a given list of integers in ascending order
2. Write C program that implement Quick sort, to sort a given list of integers in ascending order
3. Write C program that implement Insertion sort, to sort a given list of integers in ascending order

Exercise -3(Sorting-II)

1. Write C program that implement radix sort, to sort a given list of integers in ascending order
2. Write C program that implement merge sort, to sort a given list of integers in ascending order

Exercise -4(Singly Linked List)

1. Write a C program that uses functions to create a singly linked list
2. Write a C program that uses functions to perform insertion operation on a singly linked list
3. Write a C program that uses functions to perform deletion operation on a singly linked list
4. Write a C program to reverse elements of a single linked list.

Exercise -5(Queue)

1. Write C program that implement Queue (its operations) using arrays.
2. Write C program that implement Queue (its operations) using linked lists

Exercise -6(Stack)

1. Write C program that implement stack (its operations) using arrays
2. Write C program that implement stack (its operations) using Linked list
3. Write a C program that uses Stack operations to evaluate postfix expression

Exercise -7(Binary Tree)

1. Write a recursive C program for traversing a binary tree in preorder, inorder and postorder.

Exercise -8(Binary Search Tree)

1. Write a C program to Create a BST
2. Write a C program toinsert a node into a BST.
3. Write a C program to delete a node from a BST

JAVA PROGRAMMING LAB

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P05314 **0 0 3 1.5**
Pre Requisite: Nil

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

1. evaluate default value of all primitive data type, Operations, Expressions, Controlflow, Strings
2. determine Class, Objects, Methods, Inheritance, Exception, Runtime Polymorphism,
3. user defined Exception handling mechanism
4. illustrating simple inheritance, multi-level inheritance, Exception handling Mechanism
5. construct Threads, Event Handling, implement packages, developing applets.

LIST OF EXPERIMENTS

Exercise – 1

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke Them inside main method

b) Write a JAVA program to implement constructor.

Exercise - 2 (Methods)

a) Write a JAVA program to implement constructor overloading.

b) Write a JAVA program implement method overloading.

Exercise - 3 (Inheritance)

a) Write a JAVA program to implement Single Inheritance

b) Write a JAVA program to implement multi level Inheritance

Exercise - 4 (Inheritance - Continued)

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

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

Exercise - 5 (Exception)

a) Write a JAVA program that describes exception handling mechanism

b) Write a JAVA program Illustrating Multiple catch clauses

Exercise – 6 (Runtime Polymorphism)

a) Write a JAVA program that implements Runtime polymorphism

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

Exercise – 7 (User defined Exception)

a) Write a JAVA program for creation of illustrating throw

b) Write a JAVA program for creation of Illustrating finally

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

Exercise – 8 (Packages)

a) Write a JAVA program illustrate class path

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

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

Exercise - 9 (Applet)

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

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

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

Exercise - 10 (Event Handling)

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

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

INTRODUCTION TO ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LAB

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P61311 **0 0 3 1.5**
Pre Requisite: Nil

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

1. apply the basic principles of AI in problem solving using LISP/PROLOG
2. implement different algorithms using LISP/PROLOG
3. develop an Expert System using JESS/PROLOG.

LIST OF EXPERIMENTS

Artificial Intelligence:

1. Implementation of DFS for water jug problem using LISP/PROLOG
2. Implementation of BFS for tic-tac-toe problem using LISP/PROLOG/Java
3. Implementation of TSP using heuristic approach using Java/LISP/Prolog
4. Implementation of Simulated Annealing Algorithm using LISP/PROLOG
5. Implementation of Hill-climbing to solve 8- Puzzle Problem
6. Implementation of Monkey Banana Problem using LISP/PROLOG
7. Implementation of Medical Diagnosis Expert System using red cuts and green cuts in PROLOG

Machine Learning:

1. Implement and demonstrate FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .csv file.
2. For a given set of training data examples stored in a .csv file, implement and demonstrate the candidate elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree classifier. Use appropriate dataset for building the decision tree and apply this knowledge to classify a new sample.
4. Write a program to demonstrate the working of Decision tree regressor. Use appropriate dataset for decision tree repressor

APPLICATION OF PYTHON USING NUM PY

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21S05311 **0 0 3 1.5**
Pre Requisite: Nil

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

1. Explain how data is collected, managed and stored for processing
2. Understand the workings of various numerical techniques, different descriptive
3. measures of Statistics, correlation and regression to solve the engineering problems
4. Understand how to apply some linear algebra operations to n-dimensional arrays
5. Use NumPy perform common data wrangling and computational tasks in Python

LIST OF EXPERIMENTS

1) NumPy Installation using different scientific python distributions(Anaconda, Python(x,y), WinPython, Pyzo)
2) NumPy Basics (np.array, np.arrange, np.linespace, np.zeros, np.ones, np.random.random, np.empty)
3) Arrays (array.shape, len(array), array.ndim, array.dtype, array.astype(type), type(array))
4) Array Manipulation (np.append, np.insert, np.resize, np.delete, np.concatenate, np.vstack, np.hstack)
5) Mathematical Operations(np.add, np.substract, np.divide, np.multiply, np.sqrt, np.sin, np.cos, np.log, np.dot, np.roots) , Statistical Operations(np.mean, np.median, np.std, array.corrcoef( ))
6) NumPy data types
7) NumPy ndarray
8) NumPy String Operations
9) NumPy Financial functions
10) NumPy Functional Programming

II-B.TECH.-II-SEMESTER SYLLABUS

DATABASE MANAGEMENT SYSTEMS

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P05403 **3 1 0 3**
Pre Requisite: Nil

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

1. identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
2. use Structured Query Language (SQL) for database manipulation
3. design and build simple database systems
4. develop application to interact with databases.
5. interact with database using Structured Query Launguage Commands

Unit-I: **10 hours**

Introduction to Database: Introduction, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture, data independence, database languages.

Unit-II: **10 hours**

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization.

Introduction to the Relational Model: Relational Model Concepts,Unary and Binary relational operations, Integrity constraint over relations, enforcing integrity constraints

Unit-III: **10 hours**

SQL: QUERIES, CONSTRAINTS, TRIGGERS: Specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE and UPDATE statements in SQL, Introduction to Nested Queries, Correlated Nested Queries, Set –Comparison Operators, Aggregate Operators, NULL values, Logical connectives – AND, OR and NOT, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Databases.

Unit-IV: **10 hours**

Normalization: Schema refinement ,Problems Caused by redundancy , reasoning about FDS ,FIRST, SECOND, THIRD Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies, FORTH, Fifth Normal Form

Unit-V: **10 hours**

Transaction Processing: Transaction Concept, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability,

Concurrency Control in Databases: Lock Based Protocols, Two-phase locking techniques for Concurrency control, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log Based Recovery, Recovery with Concurrent Transactions.

Text Books:

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH.
.2. Database System Concepts, 6th Edition, SilberschatzKorth and Sudharshan, Mc-GrawHill, 2013.

Reference Books:

1. Introduction to Database Systems, C.J.Date Pearson Education.
2. Data base Management System, ElmasriNavrate Pearson Education
3. Data base Management System,Raghuram
4. Introduction to Data base Management System,.Professional Publications

SOFTWARE ENGINEERING

II-B.Tech-I-Sem. **L T P C**
Subject Code : 21P05302 **3 1 0 4**
Pre Requisite: Nil

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

1. understand the different software process models and their significance.
2. distinguish various requirements gathering procedures and architectural views.
3. analyze various aspects of the system such as functionality, object and user Interface.
4. identify the testing strategies for conventional and object oriented applications.
5. plan and implement various software project management activities

Unit-I: **10 hours**

Software and Software Engineering: The nature of Software, Software Engineering, Software process, Software Engineering Practice, Software myths

Process models: A Generic Process model, Process assessment and improvement, Prescriptive Process models, specialized process models, The Unified Process

Unit-II: **10 hours**

Software Requirement analysis and Specification: Software Requirements, Problem analysis, Requirements specification, Functional Specification with use cases, validation.

Software Architecture: Role of Software Architecture, Architecture views, Component and Constructor views, Architecture styles for C&C Views.

Unit-III: **10 hours**

Function Oriented Design: Design Principles, Module level concepts, Design notation and specifications, structure Design methodology

Object Oriented Design: Object Oriented Analysis and design, Object Oriented Concepts, Design Concepts, UML, A Design methodology

User Interface Design: Interface analysis, Interface design steps.

Unit-IV: **10 hours**

Testing Conventional applications: Software testing fundamentals, Internal and external views of testing, White Box testing, Basis path testing, Control structure testing, Black-Box testing, Model based testing.

Testing Object Oriented Applications: Testing OOA and OOD models, Object Oriented Testing strategies, Object Oriented Testing Methods, Testing methods applicable at class level

Unit-V: **10 hours**

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process

Planning a Software Project: Process Planning, Effort Estimation, Project Scheduling and Staffing Software Configuration Management Plan, Quality Plan, Risk Management, Project Monitoring Plan

Text Books:

1. Software Engineering: A Practitioner's approach, Roger S Pressman, 7th edition.
2. An integrated Approach to Software Engineering, PankajJalote, 3rd edition

Reference Books:

1. Fundamentals of Software Engineering, Rajibmall, 3rd edition.
2. Software Engineering, Ian Sommerville, 9th edition.

FORMAL LANGUAGES AND AUTOMATA THEORY

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21B05402 **3 1 0 3**
Pre Requisite: Nil

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

1. classify machines by their power to recognize languages
2. explain finite state machines to solve problems in computing
3. explain deterministic and non-deterministic machines,
4. explain the concepts of Turing Machines, Undesirability, church thesis.
5. apply discrete and continuous probability distributions

Unit-I: Finite Automata **10 hours**

Why Study Automata Theory? The Central Concepts of Automata Theory, Finite Automation, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with Transitions, Eliminating Transitions, Minimization of Finite Automata, Mealy and Moore Machines, Equivalence of Mealy and Moore Machines, Applications and Limitation of Finite Automata.

Unit-II: Regular Expressions **10 hours**

Regular Expressions, Regular Sets, Identity Rules, Equivalence of two Regular Expressions, Finite Automata and Regular Expressions, Conversion of Regular Expression to NFA with -Transitions, Conversion of DFA to Regular Expression, Arden‟s Theorem, Pumping Lemma for Regular Languages, Applications of pumping lemma, Closure Properties of Regular Languages, Regular Grammar, Conversion of Finite Automata to Regular Grammars, Applications of Regular Expressions.

Unit-III: Context Free Grammars **10 hours**

Grammars, Classification of Grammars, Chomsky Hierarchy, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols,Productions and Unit Productions, Normal Forms for Context Free GrammarsChomsky Normal Form and Greibach Normal Form,Pumping Lemma for CFL, Closure Properties, Applications of Context Free Grammars

Unit-IV: Pushdown Automata **10 hours**

Pushdown Automata, Definition, Graphical Notation, Instantaneous Description, Language Acceptance of pushdown Automata-Acceptance by empty stack and final state, Design of Pushdown Automata-Deterministic and Non-Deterministic PDA, Conversion of Pushdown Automata to Context Free Grammars, Conversion of Context Free Grammars to Pushdown Automata, Application of Pushdown Automata.

Unit-V: Turning Machine **10 hours**

Turing Machine, Definition, Representation of Turing MachinesInstantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Church‟s Thesis, Universal Turing Machine, Introduction to Decidable and Undecidable Problems, Halting Problem of Turing Machines, Post‟s Correspondence Problem, Modified Post‟s Correspondence Problem, Introduction to Classes of P and NP, NP-Hard and NP-Complete Problems.

Text Books:

1. Introduction to Automata Theory, Languages and Computation, J.E.Hopcroft, R.Motwani and J.D.Ullman, 3rd Edition, Pearson, 2008.
.2.Theory of Computer Science-Automata, Languages and Computation, K.L.P.Mishra and N.Chandrasekharan, 3rd Edition, PHI, 2007

Reference Books:

1. Formal Language and Automata Theory, K.V.N.Sunitha and N.Kalyani, Pearson, 2015.
2. Introduction to Automata Theory, Formal Languages and Computation, ShyamalenduKandar, Pearson, 2013.
3. Theory of Computation, V.Kulkarni, Oxford University Press, 2013.
4. Theory of Automata, Languages and Computation, Rajendra Kumar, McGraw Hill.

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P05304 **3 0 0 3**
Pre Requisite: Nil

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

1. Demonstrate skills in solving mathematical problems
2. Comprehend mathematical principles and logic
3. Demonstrate knowledge of mathematical modeling and proficiency in using mathematical software
4. Manipulate and analyze data numerically and/or graphically using appropriate Software
5. Communicate effectively mathematical ideas/results verbally or in writing

UNIT-1 **10 hours**

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

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

UNIT-II **10 hours**

Set Theory: Introduction to Set Theory, Principle of Inclusion-Exclusion, Relations: Properties, Operations, Partition and Covering, Transitive Closure, Equivalence, Compatibility and Partial Ordering, Hasse Diagrams, Functions: Bijective, Composition, Inverse, Permutation, and Recursive Functions, Lattice and its Properties

UNIT-III **10 hours**

Algebraic Structures: Algebraic Systems, Properties, Semi Groups and Monoids, Group, Subgroup and AbelianGroup, Homomorphism, Isomorphism.

Combinatorics: Permutations, Permutations with Repetitions, Circular and Restricted Permutations, Combinations, Restricted Combinations, Number Theory: Properties of Integers, Division Theorem. Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic, Fermat's and Euler's Theorems

UNIT-IV **10 hours**

Recurrence Relations: Generating Functions, Function of Sequences, Partial Fractions, Calculating Coefficient of Generating Functions, Recurrence Relations, Formulation as Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, Method of Characteristic Roots, Solving Inhomogeneous Recurrence Relation

UNIT-V **10 hours**

Graph Theory: Basic Concepts, Graph Theory and its Applications, Sub graphs, Graph **Representations:** Adjacency and Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multi graphs, Bipartite and Planar Graphs, Euler's Theorem,Graph Clouring and Covering, Chromatic Number, Spanning Trees, Prim's and Kruskal's Algorithms, BFS and DFS Spanning Trees.

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, 3rd Edition, Tata McGraw Hill.

Reference Books:

1. Discrete Mathematics for Computer Scientists and Mathematicians, J. L. Mott, A. Kandel and T. P. Baker, 2nd Edition, Prentice Hall of India.
2. Discrete Mathematical Structures, Bernand Kolman, Robert C. Busby and Sharon Cutler Ross, PHI.
3. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, K.H. Rosen, 7th Edition, Tata McGraw Hill

ADVANCEED AI TECHNIQUES

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21P61401 **3 0 0 3**
Pre Requisite: Nil

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

1. ability to formulate an efficient problem space for a problem expressed in natural language.
2. select a search algorithm for a problem and estimate its time and space complexities.
3. possess the skill for representing knowledge using the appropriate technique for a given problem.
4. possess the ability to apply AI techniques to solve problems of game playing, and machine learning.

UNIT-1 **10 hours**

Problem Solving by Search-I: Introduction to AI, Intelligent Agents
Adversarial Search: Games, Optimal Decisions in Games, Alpha-beta Pruning, Imperfect Real-time Decisions, Stochastic Games, Partially Observable Games, State of art game Program, Alternative Approaches.

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UNIT-II **10 hours**

Constraint Satisfaction Problems: Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Local Search for CSPs, The Structure of Problems
First-Order Logic: Representation, Syntax and Semantics of First-Order Logic, Using First-Order Logic, Knowledge Engineering in First-Order Logic

UNIT-III **10 hours**

Classical Planning: Definition of Classical Planning, Algorithms for Planning with State-Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Planning and **Acting in the Real World:** Time, Schedules, and Resources, Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

UNIT-IV **10 hours**

Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First-Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

UNIT-V **10 hours**

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.
Knowledge in Learning: Logical Formulation of Learning, Knowledge in Learning, Explanation-Based Learning, Learning Using Relevance Information, Inductive Logic Programming.
Learning Probabilistic Models:
Statistical Learning, Learning with Complete Dat**a**

Text Books:

1. Artificial Intelligence – A Modern Approach – Stuart J. Russell, Peter Norvig , Pearson Edu Thirst Edition.
2. Artificial Intelligence- Saroj Kaushik, CENGAGE Learning

.**Reference Books:**

1. AI – A Modern Approach, Stuart Russel, Peter Norvig, 4th Edition, Pearson Education, 2010.
2. Artificial Intelligence, Kevin Knight, Elaine Rich, Shivshankar B. Nair, 3rd Edition, Tata Mc-Graw Hill Education, 2019.
3. Machine Learning, Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, Pearson.

DATA BASE MANAGEMENT SYSYTEMS LAB

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21E02411 **0 0 3 1.5**
Pre Requisite: Nil

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

1. Write SQL commands for defining, constructing and manipulating databases.
2. Write PL/SQL programs.
3. Develop application for the given problem.

LIST OF EXPERIMENTS

Structured Query Language (SQL) used with the RDBMS including Features of two commercial RDBMS packages such as ORACLE, DB2, MS Access, MYSQL

I. SQL

a. Query-structure

b. DDL-create, alter, drop, rename and Truncate

c. DML-select, insert, update, delete and lock

d. DCL-grant and revoke

e. TCL- Commit, save point, rollback and set transaction.

f. Single line functions

g. Set operations- union, intersection and except;

h. Joins

i. Aggregate Operations, group-by and having

j. Nested sub-queries and views

k. Indexes, Sequence and Synonyms

l. Use of Forms and Report

II. PL/SQL

a. Block structure, variables, operators, data types, control structures

b. Cursors - Implicit and Explicit

c. Exception handling- Predefined and user-defined

d. Stored procedures and functions

e. Triggers- Data manipulation triggers.

R PROGRAMMING LAB

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21S03413 **0 0 4 2**
Pre Requisite: Nil

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

1. access online resources for R and import new function packages into the R workspace
2. import, review, manipulate and summarize data-sets in R
3. explore data-sets to create testable hypotheses and identify appropriate statistical tests
4. perform appropriate statistical tests using R.

LIST OF EXPERIMENTS

1. Write a R program to take input from the user (name and age) and display the values. also print the version of R installation.
2. Write a R program to get the details of the objects in memory.
3. Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
4. Write a R program to create a simple bar plot of five subjects marks.
5. Write a R program to get the unique elements of a given string and unique numbers of vector.
6. Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
7. Write a R program to create a 5 x 4 matrix , 3 x 3 matrix with labels and fill the matrix by rows and 2 × 2 matrix with labels and fill the matrix by columns.
8. Write a R program to combine three arrays so that the first row of the first array is followed by the first row of the second array and then first row of the third array.
9. Write a R program to create a two-dimensional 5x3 array of sequence of even integers greater than 50.
10. Write a R program to create an array using four given columns three given rows, and two given tables and display the content of the array.
11. Write a R program to create an empty data frame.
12. Write a R program to create a data frame from four given vectors.
13. Write a R program to create a data frame using two given vectors and display the duplicated elements and unique rows of the said data frame.
14. Write a R program to save the information of a data frame in a file and display the information
15. Write a R program to create a matrix from a list of given vectors.
16. Write a R program to concatenate two given matrices of same column but different rows.
17. Write a R program to find row and column index of maximum and minimum value in a given matrix.

18. Write a R program to append value to a given empty vector.
19. Write a R program to multiply two vectors of integers type and length 3.
20. Write a R program to find Sum, Mean and Product of a Vector, ignore element like NA orNaN.
21. Write a R program to list containing a vector, a matrix and a list and give names to the elements in the list.
22. Write a R program to create a list containing a vector, a matrix and a list and give names to the elements in the list. Access the first and second element of the list.
23. Write a R program to create a list containing a vector, a matrix and a list and remove the second element
24. Write a R program to select second element of a given nested list.
25. Write a R program to merge two given lists into one list.
26. Write a R program to create a list named s containing sequence of 15 capital letters, starting from 'E'.
27. Write a R program to assign new names "a", "b" and "c" to the elements of a given list.
28. Write a R program to find the levels of factor of a given vector.
29. Write a R program to create an ordered factor from data consisting of the names of months.
30. Write a R program to concatenate two given factor in a single factor.

NLP WITH PYTHON LAB

II-B.Tech-II-Sem. **L T P C**
Subject Code : 21S61411 **0 0 4 2**
Pre Requisite: Nil

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

1. Explore natural language processing (NLP) libraries in Python
2. Learn various techniques for implementing NLP including parsing & text processing
3. Understand how to use NLP for text feature engineering

LIST OF EXPERIMENTS

Python Libraries: nltk, re, word2vec

List of Experiments

1. Demonstrate Noise Removal for any textual data and remove regular expression pattern such as hash tag from textual data.
2. Perform lemmatization and stemming using python library nltk.
3. Demonstrate object standardization such as replace social media slangs from a text.
4. Perform part of speech tagging on any textual data.
5. Implement topic modeling using Latent Dirichlet Allocation (LDA) in python.
6. Demonstrate Term Frequency – Inverse Document Frequency (TF – IDF) using python
7. Demonstrate word embeddings using word2vec.
8. Implement Text classification using naïve bayes classifier and text blob library.
9. Apply support vector machine for text classification.
10. Convert text to vectors (using term frequency) and apply cosine similarity to provide closeness among two text.
11. Case study 1: Identify the sentiment of tweets In this problem, you are provided with tweproducts of netizens. 12. Case study 2: Detect hate speech in tweets. The objective of this task is to detect hate speech in tweets. For the sake of simplicity, we say a tweet contains hate speech if it has a racist or sexist sentiment associated with it. So, the task is to classify racist or sexist tweets from other tweets.

III-B.TECH.-I-SEMESTER SYLLABUS

DATA WAREHOUSING AND DATA MINING

III-B.Tech-I-Sem. **L T P C**
Subject Code: 21P05501 **3 1 0 3**
Pre Requisite: Nil

Course Outcomes: At the end of the course, the students will be able to
1. summarize the architecture of data warehouse
2. apply different preprocessing methods, Similarity, Dissimilarity measures for any given raw data.
3. construct a decision tree and resolve the problem of model over fitting
4. compare Apriority and FP-growth association rule mining algorithms for frequent item set generation
5. apply suitable clustering algorithm for the given data set.

Unit-I: Data Warehouse and OLAP Technology **12 hours**

An Overview: Data Warehouse, A Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, From Data Warehousing to Data Mining. (Han &Kamber)

Unit-II: Data Mining **10 hours**

Introduction, What is Data Mining?, Motivating challenges, The origins of Data Mining, Data Mining Tasks, Types of Data, Data Quality. Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature creation, Discretization and Binar ization, Variable Transformation, Measures of Similarity and Dissimilarity. (Tan & Vipin)

Unit-III: Classification and Model Overfitting **12 hours**

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction. Model Overfitting: Due to presence of noise, due to lack of representation samples, evaluating the performance of classifier: holdout method, random sub sampling, cross-validation, bootstrap. Bayes Theorem, Naïve Bayes Classifier (Tan & Vipin)

Unit-IV: Association Analysis **12 hours**

Association Analysis: Basic Concepts and Algorithms: Problem Definition, Frequent Item Set Generation, Apriori Principle, Apriori Algorithm, Rule Generation, Compact Representation of Frequent Itemsets, FPGrowth Algorithm. (Tan & Vipin)

Unit-IV: Cluster Analysis **10 hours**

Cluster Analysis: Basic Concepts and Algorithms: Overview, What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan &Vipin).

Textbooks:

1. Introduction to Data Mining : Pang-Ning Tan & Michael Steinbach, Vipin Kumar, Fifth Impression, Pearson, 2015.
2. Data Mining concepts and Techniques, 3rd Edition, Jiawei Han, Michel Kamber, Elsevier, 2011

References Books:

1. Data Mining Techniques and Applications: An Introduction, Hongbo Du, Cengage Learning, 2010
2. Data Mining : Introductory and Advanced topics : Dunham, First Edition, Pearson, 2020
3. Data Warehousing Data Mining & OLAP, Alex Berson, Stephen Smith, TMH, 2008

OPERATING SYSTEMS

III-B.Tech-I-Sem. **L T P C**
Subject Code: 21P61502 **3 1 0 3**
Pre Requisite: Nil

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

1. describe various generations of Operating System and functions of Operating System
2. describe the concept of program, process and thread
3. analyze various CPU Scheduling algorithms and compare their performance
4. solve Inter Process Communication problems using Mathematical Equations by various methods
5. compare various Memory Management Schemes especially paging and Segmentation in Operating System and apply various Page Replacement Techniques and outline File Systems in Operating System like UNIX/Linux and Windows

Unit-I: **10 hours**

Operating Systems Overview: Operating system functions, Operating system structure, Operating systems operations, Computing environments, Open-Source Operating Systems.

System Structures: Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

Unit-II **12 hours**

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues.

Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling.

Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem

Unit-III: **10 hours**

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation.

Virtual Memory Management: Introduction, Demand paging, Copy on-write, Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation.

Unit-IV: **08 hours**

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection and recovery, Deadlock avoidance, Deadlock prevention.

File Systems: Files, Directories, File system implementation, management and optimization. Secondary Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

Unit-V: **08 hours**

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights.

System Security: Introduction, Program threats, System and network threats, Cryptography for security, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer security classification**.**

Case Studies: Linux, Microsoft Windows

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008.

Reference Books:

1. Dhamdhere D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw-Hill, 2012.
2. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
3. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004.

MACHINE LEARNING

	L	T	P	C
III-B.Tech-I-Sem.				
Subject Code: 21P61503	**3**	**1**	**0**	**3**

Pre-Requisite: Nil

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

1. explain the fundamental usage of the concept Machine Learning system
2. demonstrate on various regression Technique
3. analyze the Ensemble Learning Methods
4. illustrate the Clustering Techniques and Dimensionality Reduction Models in Machine Learning.
5. discuss the Neural Network Models and Fundamentals concepts of Deep Learning

Unit-I: **10 hours**

Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.

Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit-II: **10 hours**

Supervised Learning (Regression/Classification): Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, Linear Models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Binary Classification: Multiclass/Structured outputs, MNIST, Ranking..

Unit-III: **12 hours**

Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting, Random Forests, Boosting, Stacking. Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.

Unit-IV: **10 hours**

Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures. Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA

Unit-V: **10 hours**

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Books:

1. . Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow, 2nd Edition, O'Reilly Publications, 2019
2. Data Science and Machine Learning Mathematical and Statistical Methods,Dirk P. Kroese, Zdravko I. Botev, Thomas Taimre, Radislav Vaisman,25th November 2020

Reference Books:

1. Machine Learning Probabilistic Approach, Kevin P. Murphy, MIT Press, 2012.

DESIGN AND ANALYSIS OF ALGORITHMS

(Professional Elective - I)

III-B.Tech-I-Sem. **L T P C**
Subject Code:21L61501 **3 0 0 3**
Pre-Requisite: Nil

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

1. analyze the performance of a given algorithm, denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms
2. list and describe various algorithmic approaches and Solve problems using divide and conquer &greedy Method
3. synthesize efficient algorithms dynamic programming approaches to solve in common engineering design situations.
4. organize important algorithmic design paradigms and methods of analysis: backtracking, branch and bound algorithmic approaches
5. demonstrate NP- Completeness theory, lower bound theory and String Matching

UNIT-I: **10 hours**

Introduction: Algorithm Definition, Algorithm Specification, performance Analysis, Performance measurement, asymptotic notation, Randomized Algorithms.

UNIT-II: **10 hours**

Divide and Conquer: General Method, Defective chessboard, Binary Search, finding the maximum and minimum, Merge sort, Quick sort. The Greedy Method: The general Method, knapsack problem, minimum-cost spanning Trees, Optimal Merge Patterns, Single Source Shortest Paths.

UNIT-III: **10 hours**

Dynamic Programming: The general method, multistage graphs, All pairs-shortest paths, optimal Binary search trees, 0/1 knapsack, The traveling salesperson problem

UNIT-IV: **10 hours**

Backtracking: The General Method, The 8-Queens problem, sum of subsets, Graph coloring, Hamiltonian cycles, knapsack problem

UNIT-V: **10 hours**

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

Text Books

1. Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2 nd Edition, Universities Press
2. Introduction to Algorithms Thomas H. Cormen, PHI Learning
3. Harsh Bhasin, "Algorithms Design & Analysis", Oxford University Press

Reference Books:

1. Horowitz E. Sahani S: "Fundamentals of Computer Algorithms", 2 nd Edition, Galgotia Publications, 2008
2. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press
.

DATA VISUALIZATION

(Professional Elective - I)

	L	T	P	C
III-B.Tech-I-Sem.				
Subject Code: 21L61502	**3**	**0**	**0**	**3**

Pre-Requisite: Nil

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

1. understand basics of Data Visualization
2. implement visualization of distributions
3. write programs on visualization of time series, proportions & associations
4. apply visualization on Trends and uncertainty
5. explain principles of proportions

UNIT-I: Introduction **10 hours**

Introduction To Visualization: Visualizing Data-Mapping Data onto Aesthetics, Aesthetics and Types of Data, Scales Map Data Values onto Aesthetics, Coordinate Systems and Axes- Cartesian Coordinates, Nonlinear Axes, Coordinate Systems with Curved Axes, Color Scales- Color as a Tool to Distinguish, Color to Represent Data Values, Color as a Tool to Highlight, Directory of Visualizations Amounts, Distributions, Proportions, x–y relationships, Geospatial Data

UNIT-II: **10 hours**

Visualizing Distributions: Visualizing Amounts-Bar Plots, Grouped and Stacked Bars, Dot Plots and Heatmaps, Visualizing Distributions: Histograms and Density Plots- Visualizing a Single Distribution, Visualizing Multiple Distributions at the Same Time, Visualizing Distributions: Empirical Cumulative Distribution Functions and Q-Q Plots-Empirical Cumulative Distribution Functions, Highly Skewed Distributions, Quantile Plots, Visualizing Many Distributions at Once-Visualizing Distributions Along the Vertical Axis, Visualizing Distributions Along the Horizontal Axis

UNIT-III: **12hours**

Visualizing Associations & Time Series: Visualizing Proportions-A Case for Pie Charts, A Case for Side-by-Side Bars, A Case for Stacked Bars and Stacked Densities, Visualizing Proportions Separately as Parts of the Total ,Visualizing Nested Proportions- Nested Proportions Gone Wrong, Mosaic Plots and Treemaps, Nested Pies ,Parallel Sets. Visualizing Associations Among Two or More Quantitative Variables-Scatterplots, Correlograms, Dimension Reduction, Paired Data. Visualizing Time Series and Other Functions of an Independent Variable-Individual Time Series , Multiple Time Series and Dose– Response Curves, Time Series of Two or More Response Variable

UNIT-IV: **10 hours**

Visualizing Uncertainty: Visualizing Trends-Smoothing, Showing Trends with a Defined Functional Form, Detrending and Time-Series Decomposition, Visualizing Geospatial Data- Projections, Layers, Choropleth Mapping, Cartograms, Visualizing Uncertainty-Framing Probabilities as Frequencies, Visualizing the Uncertainty of Point Estimates, Visualizing the Uncertainty of Curve Fits, Hypothetical Outcome Plots

UNIT-V: **10 hours**

Principle Of Proportional Ink: The Principle of Proportional Ink-Visualizations Along Linear Axes, Visualizations Along Logarithmic Axes, Direct Area Visualizations, Handling Overlapping Points Partial Transparency and Jittering, 2D Histograms, Contour Lines, Common Pitfalls of Color Use-Encoding.Too Much or Irrelevant Information ,Using Nonmonotonic Color Scales to Encode Data Values, Not Designing for Color-Vision Deficiency

Text Books

1. Claus Wilke, "Fundamentals of Data Visualization: A Primer on Making Informative and Compelling Figures", 1st edition, O'Reilly Media Inc, 2019.
2. Ossama Embarak, Data Analysis and Visualization Using Python: Analyze Data to Create Visualizations for BI Systems, Apress, 2018

Reference Books:

1. Tony Fischetti, Brett Lantz, R: Data Analysis and Visualization, O'Reilly, 2016

COMPUTER VISION
(Professional Elective – I)

	L	T	P	C
III-B.Tech-I-Sem.				
SubjectCode:21L61503	**3**	**0**	**0**	**3**

Pre-Requisite: Nil

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

1. identify basic concepts, terminology, theories, models and methods in the field of computer vision,
2. describe known principles of feature detection and matching,
3. describe basic methods of computer vision related to image stitching, photography like high dynamic range imaging and blur removal.
4. suggest a design of a computer vision system for a 3D Reconstruction, Albedos, image based rendering views and depths.

UNIT-I **10 hours**

Introduction: Image Formation: Geometric Primitives and Transformation, Photometric Image Formation, Digital Camera, Image Processing: Point Operators, Linear Filtering, More Neighborhood Operators, Fourier Transforms, Pyramids and Wavelets, Geometric Transformations, Global Optimization

UNIT-II **10 hours**

Feature Detection and Matching: Points and Patches, Edges, Lines, Segmentation: Active Contours, Split and Merge, Mean Shift and Mode Finding, Normalized Cuts, Feature-Based Alignment: 2D and 3D Featurebased Alignment, Pose Estimation, Geometric Intrinsic Calibration.

UNIT-III **10 hours**

Structure and Motion: Triangular, Two-frame Structure from Motion, Factorization, Bundle Adjustment, Constrained Structure and Motion, Dense Motion Estimation: Translation Alignment, Parametric Motion, Spline-based Motion, Optical Flow, Layered motion

UNIT-IV **10 hours**

Image Stitching: Motion Models, Global Alignment, Composing, Computational Photography: Photometric Calibration, High Dynamic Range Imaging, Super-Resolution and Blur Removal, image Matting and Compositing, Texture Analysis and Synthesis.

UNIT-V **10 hours**

3D Reconstruction: Shape From X, Active Range Finding, Surface Representation, Point-based Representation, Volumetric Representation, Model-based Reconstruction, Recovering Texture Maps and Albedos, Image- based Rendering: View Interpolation, Layered Depth Images, Light Fields and Lumigraphs, Environment Mattes, Video-based Rendering.

Text Books:

1. Richard Szeliski, Computer Vision: Algorithms and Applications, Springer-Verlag London Limited, 2011.
2. Simon J.D Prince, Computer Vision: Models, Learning and Inference, 1st Edition, 2012.

Reference Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Haralick & Shapiro, “Computer and Robot Vision”, Vol II
3. Gerard Medioni and Sing Bing Kang “Emerging topics in computer vision”92

OPERATING SYSTEMS LAB

	L	T	P	C
III-B.Tech-I-Sem.				
SubjectCode:21P61512	**0**	**0**	**3**	**1.5**

Pre-Requisite: Nil

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

1. use Unix utilities and perform basic shell control of the utilities.
2. use the Unix file system and file access control.
3. use Linux environment efficiently.
4. solve problems using bash for shell scripting.

LIST OF EXPERIMENTS

Excercise1:

a) Study of Unix/Linux general purpose utility command list: man,who,cat, cd, cp, ps, ls, mv, rm, mkdir, rmdir, echo, more, date, time, kill, history, chmod, chown, finger, pwd, cal, logout, shutdown.

b) Study of vi editor

c) Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system

d) Study of Unix/Linux file system (tree structure)

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

Exercise2:

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

Exercise3:

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

Exercise4:

Write a C program that illustrates how to execute two commands concurrently with a command pipe. Ex: - ls –l | sort

Exercise5:

Simulate the following CPU scheduling algorithms:

(a) Round Robin (b) SJF (c) FCFS (d) Priority

Exercise6:

Multiprogramming-Memory management-Implementation of fork (), wait (), exec() and exit (),System calls

Exercise7:

Simulate the following:

a) Multiprogramming with a fixed number of tasks (MFT)

b) Multiprogramming with a variable number of tasks (MVT)

Exercise8:

Simulate Bankers Algorithm for Dead Lock Avoidance

Exercise9:

Simulate Bankers Algorithm for Dead Lock Prevention.

Exercise – 10:

Simulate the following page replacement algorithms:

a) FIFO b) LRU c) LFU

Exercise – 11:
Simulate the following File allocation strategies
(a) Sequenced (b) Indexed (c) Linked

Exercise – 12:
Write a C program that illustrates two processes communicating using shared memory

Exercise – 13:
Write a C program to simulate producer and consumer problem using semaphores

Exercise – 14:
Write C program to create a thread using pthreads library and let it run its function.

Exercise – 15:
Write a C program to illustrate concurrent execution of threads using pthreads library

MACHINE LEARNING USING PYTHONLAB

	L	T	P	C
I-B.Tech-I-Sem.				
SubjectCode:21P61513	**0**	**0**	**3**	**1.5**

Pre-Requisite: Nil

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

1. implement procedures for the machine learning algorithms
2. design and Develop Python programs for various Learning algorithms
3. apply appropriate data sets to the Machine Learning algorithms
4. develop Machine Learning algorithms to solve real world problems

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

LIST OFEXPERIMENTS

Exercise1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file

Exercise2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the CandidateElimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Exercise3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Exercise4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Exercise5:
Develop a program for Bias, Variance, Remove duplicates , Cross Validation

Exercise6:
Write a program to implement Categorical Encoding, One-hot Encoding

Exercise7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Exercise8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Exercise9:
Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Exercise10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Exercise11:
Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Exercise12:
Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Exercise13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Exercise14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Exercise15:
Write a program to Implement Principle Component Analysis

EMPLOYABILITY SKILLS -I

(Skill Oriented Course)

	L	T	P	C
III-B.Tech-I-Sem.				
SubjectCode:21S61511	**1**	**0**	**2**	**2**

Pre-Requisite: Nil

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

1. understand the corporate etiquette.
2. make presentations effectively with appropriate body language.
3. be composed with positive attitude.
4. understand the core competencies to succeed in professional and personal life.

UNIT I:
Analytical Thinking & Listening Skills: Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception. Communication Skills: Verbal Communication; Non Verbal Communication (Body Language)

UNIT II: Self-Management Skills: Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities Etiquette: Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

UNIT III: Standard Operation Methods: Note Making, Note Taking, Minutes Preparation, Email & Letter Writing Verbal Ability: Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies, Spotting Errors, Sentence Completion, Course of Action -Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work

UNIT IV: Job-Oriented Skills –I: Group Discussion, Mock Group Discussions

UNIT V: Job-Oriented Skills –II: Resume Preparation, Interview Skills, Mock Interviews

Text Books:

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.

Reference Books:

1. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
2. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford UniversityPress,2011.

PROFESSIONAL ETHICS AND HUMAN VALUES

(Mandatory Course)

	L	T	P	C
III-B.Tech-I-Sem.				
Subject Code: 21M0501	**2**	**0**	**0**	**0**

Pre-Requisite: Nil

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

1. illustrate diverse ethical issues rooted in society and its impact on trade, business and societalissues.
2. impart professional skills as managers, advisors, experts and consultants.
3. apply observations of a spiritual discourse for a better society.
4. make use of professional ethics and rights
5. apply the principles of professional ethics for a better practice in the field of choice

Unit-I: **08 hours**

Human Values: Morals, values, ethics – integrity – work ethics –service learning –civic virtue – respect for others- living peacefully - Caring –sharing –honesty – courage –valuing time – cooperation – commitment –empathy – self-confidence –spirituality – character- Mini-Cases

Unit-II: **06 hours**

Professional Ethics: Profession- and professionalism - Two models of professionalism –Professional etiquette -Three types of Ethics or morality Responsibility in Engineering – Engineering standards– Engineering Ethics – Positive and Negative Faces. Professional Codes and Code of conduct of Institute of Engineers . Mini-cases .

Unit-III: **06 hours**

Professional Responsibilities: Ethical standards Vs Professional Conduct – Zero Tolerance for Culpable Mistakes – Hazards and Risks - congeniality, collegiality and loyalty. Respect for authority – conflicts of interest –Mini-Cases.

Unit-IV: **07 hours**

Professional Rights: professional rights and employee rights communicating risk and public policy – Whistle blowing - Professionals /engineers as managers, advisors, experts, witnesses and consultants – moral leadership- Monitoring and control- Mini-Cases

Unit-V: **06 hours**

Ethics in global context: Global issues in MNCs- Problems of bribery, extortion, and greasepayments – Problem of nepotism, excessive gifts – paternalism – different business practices –Negotiating taxes - Mini-Cases

Text Books:

1. S B George, Human Values and Professional Ethics, Vikas Publishing.
2. KR Govindan & Saenthil Kumar: Professional Ethics and Human Values, Anuradha Publications
3. S K Chakraborthy & D.Chakraborthy: Human Values and Ethics, Himalaya.

Reference Books:

1. M. Govindarajan, S. Natarajan, & V.S. Senthilkumar: Engineering Ethics(Includes HumanValues), HILearning Pvt. Ltd., New Delhi – 110001

III-B.TECH.-II-SEMESTER SYLLABUS

COMPILER DESIGN

III-B.Tech-II-Sem. **L T P C**
Subject Code:21P61601 **3 1 0 3**
Pre-Requisite: Nil

Course Outcomes: At the end of the course, the students will be able to
1. demonstrate phases in the design of compiler
2. organize Syntax Analysis, Top Down and LL(1) grammars
3. design Bottom Up Parsing and Construction of LR parsers
4. analyze synthesized, inherited attributes and syntax directed translation schemes
5. determine algorithms to generate code for a target

Unit-I: Lexical Analysis **12 hours**

Lexical Analysis: Language Processors, Structure of a Compiler, Lexical Analysis, The Role of the Lexical Analyzer, Bootstrapping, Input Buffering, Specification of Tokens, Recognition of Tokens, Lexical Analyzer Generator-LEX, Finite Automata, Regular Expressions and Finite Automata, Design of a Lexical Analyzer Generator.

Unit-II: Syntax Analysis **12 hours**

Syntax Analysis: The Role of the Parser, Context-Free Grammars, Derivations, Parse Trees, Ambiguity, Left Recursion, Left Factoring, Top-Down Parsing: Pre-Processing Steps of Top-Down Parsing, Backtracking, Recursive Descent Parsing, LL (1) Grammars, Non-recursive Predictive Parsing, Error Recovery in Predictive Parsing.

Unit-III: Bottom-Up Parsing **12 hours**

Bottom-Up Parsing: Introduction, Difference between LR and LL Parsers, Types of LR Parsers, Shift Reduce Parsing, SLR Parsers, Construction of SLR Parsing Tables, More Powerful LR Parses, Construction of CLR (1) and LALR Parsing Tables, Dangling Else Ambiguity, Error Recovery in LR Parsing, Handling Ambiguity Grammar with LR Parsers.

Unit-IV: Syntax Directed Translation **12 hours**

Syntax Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. Intermediate Code Generation: Variants of Syntax Trees, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Intermediate Code for Procedures.

Unit-V: Run Time Environments and Code Generation **10 hours**

Run Time Environments: Storage Organization, Run Time Storage Allocation, Activation Records, Procedure Calls, Displays, Code Optimization: The Principle Sources of Optimization, Basic Blocks, Optimization of Basic Blocks, Structure Preserving Transformations, Flow Graphs, Loop Optimization, Data-Flow Analysis, Peephole Optimization,
Code Generation: Issues in the Design of a Code Generator, Object Code Forms, Code Generation Algorithm, Register Allocation and Assignment.

Text Books:

1. Compilers: Principles, Techniques and Tools, Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffry D. Ullman, Pearson Publishers, 2007.

Reference Books:

1. Compiler Construction, Principles and Practice, Kenneth C Louden, Cengage Learning, 2006
2. Modern compiler implementation in C, Andrew W Appel, Revised edition, Cambridge University Press.
3. Optimizing Compilers for Modern Architectures, Randy Allen, Ken Kennedy, Morgan Kauffmann, 2001.
4. Levine, J.R., T. Mason and D. Brown, Lex and Yacc, edition, O'Reilly & Associates, 1990

DEEP LEARNING

III-B. Tech-II-Sem. **L T P C**
Subject Code:21P61602 **3 1 0 3**
Pre-Requisite: Nil

Course Outcomes: At the end of the course, the students will be able to
1. demonstrate the fundamental concepts learning techniques of Artificial Intelligence, Machine Learning and DeepLearning
2. discuss the Neural Network training, various random models
3. explain the Techniques of Keras, TensorFlow, Theano and CNTK
4. classify the Concepts of CNN and RNN
5. implement Interactive Applications of Deep Learning.

Unit-I: Fundamentals of Deep Learning and Machine Learning **08 hours**
Fundamentals of Deep Learning: Artificial Intelligence, History of Machine learning: Probabilistic Modeling, Early Neural Networks, Kernel Methods, Decision Trees, Random forests and Gradient Boosting Machines, Fundamentals of Machine Learning: Four Branches of Machine Learning, Evaluating Machine learning Models, Overfitting and Underfitting. [Text Book 2]

Unit-II: Introduction to Deep Learning **10 hours**
Introducing Deep Learning: Biological and Machine Vision, Human and Machine Language, Artificial Neural Networks, Training Deep Networks, Improving Deep Networks. [Text Book3]

Unit-III: Neural Networks **08 hours**
Neural Networks: Anatomy of Neural Network, Introduction to Keras: Keras, TensorFlow, Theano and CNTK, setting up Deep Learning Workstation, Classifying Movie Reviews: Binary Classification, Classifying newswires: Multiclass Classification. [Text Book 2]

Unit-IV: Convolutional Neural Networks **10 hours**
Convolutional Neural Networks: Nerual Network and Representation Learing, Convolutional Layers, Multichannel Convolution Operation, Recurrent Neural Networks: Introduction to RNN, RNN Code, PyTorch Tensors: Deep Learning with PyTorch, CNN in PyTorch. [Text Book 3]

Unit-V: Interactive Applications of Deep Learning and Deep Learning Research 10 hours Interactive Applications of Deep Learning: Machine Vision, Natural Language processing, Generative Adversial Networks, Deep Reinforcement Learning. [Text Book 1]
Deep Learning Research: Autoencoders, Deep Generative Models: Boltzmann Machines RestrictedBoltzmann Machines, Deep Belief Networks. [Text Book 1]

Text Books:
1. Deep Learning- Ian Goodfellow, Yoshua Bengio and Aaron Courvile, MIT Press, 2016
2. Deep Learning with Python - Francois Chollet, Released December 2017, Publisher(s): Manning Publications,ISBN: 9781617294433
3. Deep Learning Illustrated: A Visual, Interactive Guide to Artificial Intelligence - Jon Krohn, Grant Beyleveld, Aglaé Bassens, Released September 2019, Publisher(s): Addison-Wesley Professional, ISBN: 9780135116821

Reference Books:
1. Deep Learning from Scratch - Seth Weidman, Released September 2019, Publisher(s): O'Reilly Media, Inc.,ISBN: 9781492041412
2. Artificial Neural Networks, Yegnanarayana, B., PHI Learning Pvt. Ltd, 2009.
3. Matrix Computations, Golub, G.,H., and Van Loan,C.,F, JHU Press,2013
4. Neural Networks: A Classroom Approach, Satish Kumar, Tata McGraw-Hill Education, 2004.

COMPUTER NETWORKS

III-B.Tech-II-Sem. **L T P C**
SubjectCode:21P0560 **3 1 0 3**
Pre-Requisite: Nil

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

1. demonstrate different network models for networking links OSI, TCP/IP, B-ISDN, N-BISDN and get knowledge about various communication techniques, methods and protocol standards.
2. discuss different transmission media and different switching networks.
3. analyze data link layer services, functions and protocols like HDLC and PPP.
4. compare and classify medium access control protocols like ALOHA, CSMA, CSMA/CD, CSMA/CA, Polling, Token passing, FDMA, TDMA, CDMA protocols
5. determine application layer services and client server protocols working with the client server paradigms like WWW, HTTP, FTP, e-mail and SNMP etc.

Unit-I: **10 hours**

Introduction: Network Types, LAN, MAN, WAN, Network Topologies Reference models- The OSI Reference Model- the TCP/IP Reference Model - A Comparison of the OSI and TCP/IP Reference Models, OSI Vs TCP/IP, Lack of OSI models success, Internet History. Physical Layer –Introduction to Guided Media- Twisted-pair cable, Coaxial cable and Fiber optic cable and unguided media: Wireless-Radio waves, microwaves, infrared.

Unit-II: **10 hours**

Data link layer: Design issues, Framing: fixed size framing, variable size framing, flow control, error control, error detection and correction codes, CRC, Checksum: idea, one's complement internet checksum, services provided to Network Layer, Elementary Data Link Layer protocols: simplex protocol, Simplex stop and wait, Simplex protocol for Noisy Channel. Sliding window protocol: One bit, Go back N, Selective repeat-Stop and wait protocol, Data link layer in HDLC: configuration and transfer modes, frames, control field, point to point protocol (PPP): framing transition phase, multiplexing, multi-link PPP.

Unit-III: **08 hours**

Media Access Control: Random Access: ALOHA, Carrier sense multiple access (CSMA), CSMA with Collision Detection, CSMA with Collision Avoidance, Controlled Access: Reservation, Polling, Token Passing, Channelization: frequency division multiple Access(FDMA), time division multiple access(TDMA), code division multiple access(CDMA). Wired LANs: Ethernet, Ethernet Protocol, Standard Ethernet, Fast Ethernet(100 Mbps), Gigabit Ethernet, 10 Gigabit Ethernet.

Unit-IV **12 hours**

The Network Layer Design Issues – Store and Forward Packet Switching-Services Provided to the Transport layer- Implementation of Connectionless Service-Implementation of Connection Oriented Service- Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms-The Optimality principle-Shortest path, Flooding, Distance vector, Link state, Hierarchical, Congestion Control algorithms-General principles of congestion control, Congestion prevention polices, Approaches to Congestion Control-Traffic Aware Routing- Admission Control-Traffic Throttling-Load Shedding. Traffic Control Algorithm-Leaky bucket & Token bucket. Internet Working: How networks differ- How networks can be connected- Tunnelling, internetwork routing-, Fragmentation, network layer in the internet – IP protocols-IP Version 4 protocol-IPV4 Header Format, IP addresses, Class full Addressing, CIDR, NAT-, Subnets-IP Version 6-The main IPV6 header, Transition from IPV4 to IPV6, Comparison of IPV4 & IPV6- Internet control protocols- ICMP-ARPDHCP

Unit-V: **10 hours**

The Transport Layer: Transport layer protocols: Introduction-services- port number-User data gram protocol-User datagram-UDP services-UDP applications-Transmission control protocol: TCP services features- Segment- A TCP connection- windows in TCP- flow control-Error control, Congestion control in TCP. Application Layer –- World Wide Web: HTTP, Electronic mail-Architecture- web based mail-email security- TELENET-local versus remote Logging-Domain Name System: Name Space, DNS in Internet, - Resolution-Caching- Resource Records- DNS messages-

Text Books:

1. Computer Networks — Andrew S Tanenbaum, Fifth Edition. Pearson Education/PHI
2. Data Communications and Networks – Behrouz A. Forouzan, Fifth Edition TMH

Reference Books:

1. Data Communications and Networks- Achut S Godbole, Atul Kahate
2. Computer Networks, Mayank Dave, CENGAGE

SOFTWARE PROJECT MANAGEMENT

(Professional Elective-II)

	L	T	P	C
III-B.Tech-II-Sem.				
SubjectCode:21L6160	**1**	**3**	**0**	**3**

Pre-Requisite: Nil

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

1. apply the process to be followed in the software development life-cycle models
2. apply the concepts of project management & planning
3. implement the project plans through managing people, communications and change
4. conduct activities necessary to successfully complete and close the Software projects
5. implement communication, modeling, and construction & d eployment practices in softwaredevelopment.

Unit-I: **12 hours**

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. **The old way and the new**: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Unit-II: **12 hours**

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts

Unit-III: **08 hours**

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. **Iterative Process Planning**: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

Unit-IV: **12 hours**

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
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.

Unit-V: **12 hours**

Agile Methodology, ADAPTing to Scrum, Patterns for Adopting Scrum, Iterating towards Agility.
Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of applications, DevOps delivery pipeline, DevOps eco system. DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

Text Books:

1. Software Project Management, Walker Royce, PEA, 2005.
2. Succeeding with Agile: Software Development Using Scrum, Mike Cohn, Addison Wesley.
3. 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.

Reference Books:

1. Software Project Management, Bob Hughes,3/e, Mike Cotterell, TMH
2.Software Project Management, Joel Henry, PEA
3. Software Project Management in practice, Pankaj Jalote, PEA, 2005,
4. Effective Software Project Management, Robert K.Wysocki, Wiley,2006
5. Project Management in IT, Kathy Schwalbe, Cengage.

DISTRIBUTED SYSTEMS

(Professional Elective-II)

III-B.Tech-II-Sem. **L T P C**
Subject Code:21L61602 **3 0 0 3**
Pre-Requisite: Nil

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

1. elucidate the foundations and issues of distributed systems
2. illustrate the various synchronization issues and global state for distributed systems
3. illustrate the Mutual Exclusion and Deadlock detection algorithms in distributed systems
4. describe the agreement protocols and fault tolerance mechanisms in distributed systems
5. describe the features of peer-to-peer and distributed shared memory systems

Unit-I: **10 hours**

Distributed Systems: Definition, Relation to computer system components, Motivation, Relation to parallel systems, Message-passing systems versus shared memory systems, Primitives for distributed communication, Synchronous versus asynchronous executions, Design issues and challenges.
A model of distributed computations: A distributed program, A model of distributed executions, Models of communication networks, Global state, Cuts, Past and future cones of an event, Models of process communications.
Logical Time: A framework for a system of logical clocks, Scalar time, Vector time, Physical clock synchronization: NTP.

Unit-II: **08 hours**
Message Ordering & Snapshots: Message ordering and group communication: Message ordering paradigms, Asynchronous execution with synchronous communication, Synchronous program order on an asynchronous system, Group communication, Causal order (CO), Total order.
Global state and snapshot recording algorithms: Introduction, System model and definitions, Snapshot algorithms for FIFO channels.

Unit-III: **10 hours**
Distributed Mutex & Deadlock: Distributed mutual exclusion algorithms: Introduction, Preliminaries, Lamport‘s algorithm, Ricart-Agrawala algorithm, Maekawa‘s algorithm, Suzuki–Kasami‘s broadcast algorithm.
Deadlock detection in distributed systems: Introduction, System model, Preliminaries, Models of deadlocks, Knapp‘s classification, Algorithms for the single resource model, the AND model and the OR model.

Unit-IV: **08 hours**
Recovery & Consensus: Check pointing and rollback recovery: Introduction, Background and definitions, Issues in failure recovery, Checkpoint-based recovery, Log-based rollback recovery, coordinated check pointing algorithm, Algorithm for asynchronous check pointing and recovery.
Consensus and agreement algorithms: Problem definition, Overview of results, Agreement in a failure, free system, Agreement in synchronous systems with failures.

Unit-V: **10 hours**
Peer-to-peer computing and overlay graphs: Introduction, Data indexing and overlays, Chord – Content addressable networks, Tapestry. Distributed shared memory: Abstraction and advantages, Memory consistency models, Shared memory Mutual Exclusion.

Text Books:

1. Distributed Systems Concepts and Design, George Coulouris, Jean Dollimore and Tim Kindberg, Fifth Edition, Pearson Education, 2012.
2. Distributed computing: Principles, algorithms, and systems, Ajay Kshemkalyani and Mukesh Singhal, Cambridge University Press, 2011.

Reference Books:

1. Distributed Operating Systems: Concepts and Design, Pradeep K Sinha, Prentice Hall of India, 2007.
2. Advanced concepts in operating systems. Mukesh Singhal and Niranjan G. Shivaratri, McGrawHill, 1994.
3. Distributed Systems: Principles and Paradigms, Tanenbaum A.S., Van Steen M.,Pearson Education, 2007..

INTERNET OF THINGS

(Professional Elective-II)

III-B.Tech-II-Sem. **L T P C**
Subject Code:21L61603 **3 0 0 3**
Pre-Requisite: Nil

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

1. review Internet of Things (IoT).
2. demonstrate various business models relevant to IoT
3. construct designs for web connectivity
4. organize sources of data acquisition related to IoT, integrate to enterprise systems
5. describe IoT with Cloud technologies.

Unit-I: **10 hours**

The Internet of Things- An Overview of Internet of things, Internet of Things Technology, behind IoTs Sources of the IoTs, Examples OF IoTs, Design Principles for Connected Devices, Internet connectivity.

Application Layer Protocols- HTTP, HTTPS, FTP

Unit-II: **08 hours**

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations, Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

Unit-III: **10 hours**

Design Principles for the Web Connectivity for connected-Devices, Web Communication protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Unit-IV: **08 hours**

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications/ Services/Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet Of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

Unit-V: **10 hours**

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively (Pachube/COSM), Nimbits and other platforms Sensor, Participatory Sensing, Actuator, Radio Frequency Identification, and Wireless, Sensor Network Technology, Sensors Technology, Sensing the World.

Text Books:

1. Internet of Things: Architecture, Design Principles And Applications, Rajkamal, McGraw Hill Higher Education
2. Internet of Things, A.Bahgya and V.Madisetti, Univesity Press, 2015

Reference Books:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley
2. Getting Started with the Internet of Things, CunoPfister , Oreilly

COMPUTER NETWORKS LABORATORY

	L	T	P	C
III-B. Tech-II-Sem.				
Subject Code:21P05612	**0**	**0**	**3**	**1.5**

Pre-Requisite: Nil

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

1. know how reliable data communication is achieved through data link layer.
2. suggest appropriate routing algorithm for the network.
3. provide internet connection to the system and its installation
4. work on various network management tools
5. study of Network devices in detail

LIST OF EXPERIMENTS

1. Study of Network devices in detail and connect the computers in Local Area Network.
2. Write a Program to implement the data link layer farming methods such as i) Character stuffing ii)bit stuffing.
3. Write a Program to implement data link layer farming method checksum.
4. Write a program for Hamming Code generation for error detection and correction.
5. Write a Program to implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
6. Write a Program to implement Sliding window protocol for Goback N.
7. Write a Program to implement Sliding window protocol for Selective repeat.
8. Write a Program to implement Stop and Wait Protocol.
9. Write a program for congestion control using leaky bucket algorithm
10. Write a Program to implement Dijkstra‘s algorithm to compute the Shortest path through a graph.
11. Write a Program to implement Distance vector routing algorithm by obtaining routing table at each node (Take an example subnet graph with weights indicating delay between nodes).

DEEP LEARNING WITH TENSOR FLOW LABORATORY

	L	T	P	C
III-B.Tech-II-Sem.				
Subject Code:21P61612	**0**	**0**	**3**	**1.5**

Pre-Requisite: Nil

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

1. implement deep neural networks to solve real world problems
2. choose appropriate pre-trained model to solve real time problem
3. interpret the results of two different deep learning models
4. implement one hot encoding of words or characters
5. implement word embeddings for IMDB dataset

Software Packages required:

- Keras
- Tensorflow
- PyTorch

LIST OF EXPERIMENTS

1. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6. Build a Convolution Neural Network for simple image (dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image classification.
8. Implement one hot encoding of words or characters.
9. Implement word embeddings for IMDB dataset.
10. Implement a Recurrent Neural Network for IMDB movie review classification problem

Text Books:

1. Reza Zadeh and BharathRamsundar, “Tensorflow for Deep Learning”, O’Reilly publishers, 2018

DATA MINING LAB

III-B.Tech-II-Sem.	**L**	**T**	**P**	**C**
Subject Code :21P61613	**0**	**0**	**3**	**1.5**
Pre-Requisite: Nil				

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

1. apply preprocessing techniques on real world datasets
2. apply apriori algorithm to generate frequent item sets.
3. apply Classification and clustering algorithms on different datasets
4. build a model using linear regression algorithm on any dataset.
5. build a classification model using Decision Tree algorithm on iris dataset

LIST OF EXPERIMENTS

1. Demonstrate the following data preprocessing tasks using python libraries.
    a) Loading the dataset
    b) Identifying the dependent and independent variables
    c) Dealing with missing data
2. Demonstrate the following data preprocessing tasks using python libraries.
    a) Dealing with categorical data
    b) Scaling the features
    c) Splitting dataset into Training and Testing Sets
3. Demonstrate the following Similarity and Dissimilarity Measures using python
    a) Pearson's Correlation
    b) Cosine Similarity
    c) Jaccard Similarity
    d) Euclidean Distance
    e) Manhattan Distance
4. Build a model using linear regression algorithm on any dataset.
5. Build a classification model using Decision Tree algorithm on iris dataset
6. Apply Naïve Bayes Classification algorithm on any dataset
7. Generate frequent itemsets using Apriori Algorithm in python and also generate association rules for any market basket data.
8. Apply K- Means clustering algorithm on any dataset.
9. Apply Hierarchical Clustering algorithm on any dataset.
10. Apply DBSCAN clustering algorithm on any dataset.

EMPLOYABILITY SKILLS-II

III-B.Tech-II-Sem. **L T P C**
Subject Code : 21S616111 **1 0 2 2**
Pre Requisite: Employability Skills-I

Course Outcomes: At the end of the course, the students will be able to
1.solve various Basic Mathematics problems by following different methods
2.follow strategies in minimizing time consumption in problem solving Apply shortcut methods to solve problems
3.confidently solve any mathematical problems.
4.utilize these mathematical skills both in their professional as well as personal life.
5.analyze, summarize and present information in quantitative forms including table, graphs and formulas

UNIT I: **5hours**
Numerical ability l: Number system, HCF & LCM, Average, Simplification, Problems on numbers
Numerical ability II: Ratio & Proportion, Partnership, Percentages, Profit & Loss

UNIT II: **4hours**
Arithmetical ability l: Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.
Arithmetical ability ll: Time & Distance, Problems on boats &Steams, Problems on Trains

UNIT III: **5hours**
Arithmetical ability lll: Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,
Logical ability: Permutations and Combination and Probability.

UNIT IV: **2hours**
Mensuration: Geometry, Areas, Volumes

UNIT V: **2hours**
Data interpretation: Tabulation, Bar graphs, Pie charts, line graphs

Text Books And Reference Books:
1. R. S. Aggarwal “Quantitative Aptitude”, Revised ed., S Chand publication, 2017
ISBN:8121924987
E- resources:
1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_aptitude/
3. https://www.careerbless.com/aptitude/qa/home.php

INTELLECTUAL PROPERTY RIGHTS & PATENTS

(Mandatory Course)

	L	T	P	C
III-B.Tech-II-Sem.				
SubjectCode:21M00601	**2**	**0**	**0**	**0**

Pre-Requisite: Nil

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

1. outline basics of intellectual property law
2. identify the various trademarks
3. analyze patent and copy rights law
4. differentiate trade secret and unfair practice
5. summarize new developments in Intellectual Property Rights

Unit-I: **06hours**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Unit-II: **07 hours**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter,selecting and evaluating trade mark, trade mark registration processes.

Unit-III: **09hours**

Part-A: Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Part-B: Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Unit-IV: **06hours**

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

Unit-V: **06hours**

New development of intellectual property: new developments in trade mark law; copy right law,patent law, intellectual property audits. International overview on intellectual property, international - trade mark law, copy right law,international patent law, and international development in trade secrets law.

Text Books:

1Intellectual property right, Deborah, E. Bouchoux, cengage learning.

2. Intellectual property right - Unleashing the knowledge economy, prabuddha ganguli, TMH.

IV-B.TECH.-I-SEMESTER SYLLABUS

REINFORCEMENT LEARNING

(Professional Elective-III)

IV-B.Tech-I-Sem. **L T P C**
SubjectCode:21P61701 **3 1 0 3**
Pre-Requisite: Nil

Course Outcomes: At the end of the course, the students will be able to
1. understand basic concepts of Reinforcement learning
2. identifying appropriate learning tasks for Reinforcement learning techniques
3. understand various methods and applications of reinforcement learning
4. understand Gradient Bandit Algorithm
5. understand Policy Parameterization for Continuous Actions

UNIT-I **10hours**

Introduction: Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe

Multi-armed Bandits: A k-armed Bandit Problem, Action-value methods, The 10-armed Testbed, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper – Confidence-Bound Action Selection, Gradient Bandit Algorithm

UNIT-II **10 hours**

Finite Markov Decision Process: The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notataion for Episodic and Continuing Tasks, Policies and Value Functions, **Dynamic Programming:** Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming

UNIT-III **10 hours**

Monte Carlo Methods: Monte Carlo Prediction, Monte Carlo Estimation of Action Values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy Prediction via Importance Sampling, Incremental Implementation, Discontinuing-aware Importance Sampling, Per-decision Importance Sampling

n-step Bootstrapping: n-step TD Prediction, n-step Sarsa, n-step Off-policy Learning, Per-decision methods with Control Variables, A Unifying Algorithm: n-step Q(σ)

UNIT-IV **10 hours**

Off-policy Methods with Approximation: Semi-gradient Methods, Examples of Off-policy Divergence, The Deadly Triad, Linear Value-function Geometry, Gradient Descent in the Bellman Error, The Bellman Error is not Learnable, Gradient-TD methods, Emphatic-TD methods, Reducing Variance

Eligibility Traces: The λ-return, TD(λ), n-step Truncated λ-return methods, Online λ –return Algorithm, True Online TD(λ), Dutch Traces in Monte Carlo Learning, Sarsa(λ), Variable λ and γ, Off-policy Traces with Control Variables, Watkins's Q(λ) to Tree-Backup(λ)

UNIT-V **10 hours**

Policy Gradient Methods: Policy Approximation and its Advantages, The Policy Gradient Theorem, REINFOECE: Monte Carlo Policy Gradient, REINFORCE with Baseline, Actor-Critic Methods, Policy Gradient for Continuing Problems, Policy Parameterization for Continuous Actions

Applications and Case Studies: TD-Gammon, Samuel's Checkers Player, Watson's Daily DoubleWagering, Optimizing Memory Control, Personalized Web Services.

Text Books :

1. R. S. Sutton and A. G. Bart,. “Reinforcement Learning - An Introduction,” MIT Press, 2018.

Reference Books:

1. Szepesvári, Csaba, “Algorithms for Reinforcement Learning,” United States: Morgan & Claypool, 2010
2. Puterman, Martin L., “Markov Decision Processes: Discrete Stochastic Dynamic Programming,” Germany: Wiley, 2014.

CRYTOGRAPHY AND NETWORK SECURITY

(Professional Elective-III)

	L	T	P	C
IV-B.Tech-I-Sem.				
Subject Code:21L61702	**3**	**1**	**0**	**3**

Pre-Requisite: Nil

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

1. explain different security threats and countermeasures and foundation course of cryptography mathematics.
2. classify the basic principles of symmetric key algorithms and operations of some symmetric key algorithms and asymmetric key cryptography
3. revise the basic principles of Public key algorithms and Working operations of some Asymmetric key algorithms such as RSA, ECC and some more develop a detailed understanding of computer systems
4. design applications of hash algorithms, digital signatures and key management techniques
5. determine the knowledge of Application layer, Transport layer and Network layer security Protocols such as PGP, S/MIME, SSL,TSL, and IPsec

Unit-I: **10 hours**

Basic Principles: Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography.

Unit-II: **08 hours**

Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

Unit-III: **08 hours**

Asymmetric Encryption: Mathematics of Asymmetric Key Cryptography, Asymmetric Key Cryptograph

Unit-IV: **08 hours**

Data Integrity, Digital Signature Schemes & Key Management: Message Integrity and Message Authentication, Cryptographic Hash Functions, Digital Signature, Key Management

Unit-V: **10 hours**

Network Security-I: Security at application layer: PGP and S/MIME, Security at the Transport Layer: SSL and TLS, Network Security-II: Security at the Network Layer: IPSec, System Security

Text Books:

1. Cryptography and Network Security, 3rd Edition Behrouz A Forouzan, Deb deep Mukhopadhyay, McGraw Hill,2015
2. Cryptography and Network Security,4th Edition, William Stallings, (6e) Pearson,2006
3. Everyday Cryptography, 1st Edition, Keith M.Martin, Oxford,2016 .

Reference Books:

1. Network Security and Cryptography, 1st Edition, Bernard Meneges, Cengage Learning,2018

BLOCK CHAIN TECHNOLOGIES

(Professional Elective - III)

	L	T	P	C
IV-B.Tech-I-Sem.				
Subject Code:21P61703	**3**	**1**	**0**	**3**

Pre-Requisite: Nil

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

1. demonstrate the block chain basics, Crypto currency
2. to compare and contrast the use of different private vs. public block chain and use cases
3. design an innovative Bit coin Block chain and scripts, Block chain Science on varies coins
4. classify Permission Block chain and use cases – Hyper ledger, Corda
5. make Use of Block-chain in E-Governance, Land Registration, Medical Information Systems and others

Unit-I: **10 hours**

Introduction: Introduction, basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts required, Block chain or distributed trust, Currency, Cryptocurrency, How a Cryptocurrency works, Financial services, Bitcoin prediction markets.

Unit-II: **10 hours**

Hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles, Extensibility of Block chain concepts, Digital Identity verification, Block chain Neutrality, Digital art, Block chain Environment

Unit-III: **10 hours**

Introduction to Bitcoin: Bitcoin Block chain and scripts, Use cases of Bitcoin Blockchain scripting language in micropayment, escrow etc Downside of Bit coin mining, Block chain Science: Grid coin, Folding coin, Block chain Genomics, Bit coin MOOCs.

Unit-IV: **10 hours**

Ethereum continued, IOTA, The real need for mining, consensus, Byzantine Generals Problem, and Consensus as a distributed coordination problem, Coming to private or permissioned block chains, Introduction to Hyper ledger, Currency, Token, Campus coin, Coin drop as a strategy for Public adoption, Currency Multiplicity, Demurrage currency

Unit-V: **10 hours**

Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations, Uses of Block chain in E-Governance, Land Registration, Medical Information Systems.

Text Books:

1. Blockchain Blue print for Economy by Melanie Swan

Reference Books:

1. Blockchain Basics: A Non-Technical Introduction in 25 Steps 1st Edition, by Daniel Drescher.

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CLOUD COMPUTING

(Professional Elective - IV)

	L	T	P	C
IV-B.Tech-I-Sem.				
Subject Code:21L61704	**3**	**1**	**0**	**3**

Pre-Requisite: Nil

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

1. illustrate the key dimensions of the challenge of Cloud Computing
2. classify the Levels of Virtualization and mechanism of tools
3. analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
4. create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
5. assess control storage systems and cloud security, the risks involved its impact and develop cloud application

UNIT-1 **10 hours**

Systems Modeling, Clustering and Virtualization: Scalable Computing over the Internet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT-II **8 hours**

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 **8 hours**

Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT-IV **8 Hours**

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.

UNIT-V **8 Hours**

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system.

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

Reference Books:

1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH.

ROBOTIC PROCESS AUTOMATION

(Professional Elective - IV)

	L	T	P	C
IV-B.Tech-I-Sem.				
Subject Code:21L61705	**3**	**1**	**0**	**3**

Pre-Requisite: Nil

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

1. describe RPA, where it can be applied and how it's implemented
2. describe the different types of variables, Control Flow and data manipulation techniques
3. identify and understand Image, Text and Data Tables Automation
4. describe how to handle the User Events and various types of Exceptions and strategies
5. understand the Deployment of the Robot and to maintain the connection.

Unit-I: **10 hours**

Introduction to Robotic Process Automation: Scope and techniques of automation, Robotic process automation, What can RPA do, Benefits of RPA, Components of RPA, RPA platforms, The future of automation.

RPA Basics: History of Automation, What is RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated, Types of Bots, Workloads which can be automated, RPA Advanced Concepts, Standardization of processes, RPA Development methodologies, Difference from SDLC, Robotic control flow architecture, RPA business case, RPA Team, Process Design Document/Solution Design Document, Industries best suited for RPA, Risks & Challenges with RPA, RPA and emerging ecosystem..

Unit-II: **10 hours**

RPA Tool Introduction and Basics:

Introduction to RPA Tool: The User Interface, Variables, Managing Variables, Naming Best Practices, The Variables Panel, Generic Value Variables, Text Variables, True or False Variables, Number Variables, Array Variables, Date and Time Variables, Data Table Variables, Managing Arguments, Naming Best Practices, The Arguments Panel, Using Arguments, About Imported Namespaces, Importing New Namespaces, Control Flow, Control Flow Introduction, If Else Statements, Loops, Advanced Control Flow, Sequences, Flowcharts, About Control Flow, Control Flow Activities, The Assign Activity, The Delay Activity, The Do While Activity, The If Activity, The Switch Activity, The While Activity, The For Each Activity, The Break Activity, Data Manipulation, Data Manipulation Introduction, Scalar variables, collections and Tables, Text Manipulation, Data Manipulation, Gathering and Assembling Data

Unit-III: **10 hours**

Advanced Automation Concepts & Techniques: Recording Introduction, Basic and Desktop Recording, Web Recording, Input/ Output Methods, Screen Scraping, Data Scraping, Scraping advanced techniques, Selectors, Defining and Assessing Selectors, Customization, Debugging, Dynamic Selectors, Partial Selectors, RPA Challenge, Image, Text & Advanced Citrix Automation, Introduction to Image & Text Automation, Image based automation, Keyboard based automation, Information Retrieval, Advanced Citrix Automation challenges, Best Practices, Using tab for Images, Starting Apps, Excel Data Tables & PDF, Data Tables in RPA, Excel and Data Table basics, Data Manipulation in excel, Extracting Data from PDF, Extracting a single piece of data, Anchors, Using anchors in PDF

Unit-IV: **10 hours**

Handling User Events & Assistant Bots, Exception Handling: What are assistant bots, Monitoring system event triggers, Hotkey trigger, Mouse trigger, System trigger, Monitoring imageand element triggers, An example of monitoring email, Example of monitoring a copying event andblocking it, Launching an assistant bot on a keyboard event.

Exception Handling: Debugging and Exception Handling, Debugging Tools, Strategies for solving issues, Catching errors.

Unit-V: **10hours**

Deploying and Maintaining the Bot: Publishing using publish utility, Creation of Server, Using Server to control the bots, creating a provision Robot from the Server, connecting a Robot to Server, Deploy the Robot to Server, Publishing and managing updates, managing packages, uploading packages, Deleting packages

Text Books:

1. Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.
2. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation:a Primer", Institute of Robotic Process Automation,1st Edition 2015
3. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate RepetitiveTasks & Become An RPA Consultant", Independently Published, 1 stEdition 2018

Reference Books:

1. Srikanth Merianda," Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1 st Edition 2018.
2. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots andautomate business processes", Packt Publishing, 1 st Edition 2018.

BIG DATA ANALYTICS

(Professional Elective - IV)

IV-B.Tech-I-Sem. **L T P C**
SubjectCode:21L61706 **3 1 0 3**
Pre-Requisite: Nil

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

1. illustrate big data challenges in different domains including social media, transportation, finance and medicine
2. use various techniques for mining data stream
3. design and develop Hadoop
4. identify the characteristics of datasets and compare the trivial data and big data for various applications
5. explore the various search methods and visualization techniques.

Unit-I: **10 hours**

Introduction: Introduction to big data: Introduction to Big Data Platform, Challenges of Conventional Systems, Intelligent data analysis, Nature of Data, Analytic Processes and Tools, Analysis vs Reporting.

Unit-II: **10 hours**

Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Oneness in a Window, Decaying Window, Real time Analytics Platform (RTAP) Applications, Case Studies - Real Time Sentiment Analysis - Stock Market Predictions.

Unit-III: **10 hours**

Introduction to Hadoop: Hadoop: History of Hadoop, the Hadoop Distributed File System, Components of Hadoop Analysing the Data with Hadoop, Scaling Out, Hadoop Streaming, Design of HDFS, Java interfaces to HDFS Basics, Developing a Map Reduce Application, How Map Reduce Works, Anatomy of a Map Reduce Job run, Failures, Job Scheduling, Shuffle and Sort, Task execution, Map Reduce Types and Formats, Map Reduce Features Hadoop environment.

Unit-IV: **10 hours**

Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive,Data processing operators in Pig, Hive services, HiveQL, Querying Data in Hive, fundamentals of HBase and ZooKeeper.

Unit-V: **10hours**

Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application

Text Books:

1. Tom White, “Hadoop: The Definitive Guide”, Third Edition, O’reilly Media, Fourth Edition, 2015
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, “Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data”, McGrawHill Publishing, 2012.
3. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, CUP, 2012.
4 Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge DataStreams with Advanced Analytics”, John Wiley& sons, 2012

Reference Books:

1. Paul Zikopoulos, DirkdeRoos, Krishnan Parasuraman, Thomas Deutsch, James Giles, David Corrigan, "Harness the Power of Big Data:The IBM Big Data Platform", Tata McGraw Hill Publications, 2012.
2. Arshdeep Bahga and Vijay Madisetti, "Big Data Science & Analytics: A Hands On Approach ", VPT, 2016.
3. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications (WILEY Big Data Series)", John Wiley & Sons, 2014.

SOCIAL NETWORK ANALYSIS

(Professional Elective - V)

IV-B.Tech-I-Sem. **L T P C**
SubjectCode:21L61707 **3 1 0 3**
Pre-Requisite: Nil

Course Outcomes: At the end of the course, the students will be able to
1. know basic notation and terminology used in network science
2. be able to visualize, summarize and compare networks
3. illustrate basic principles behind network analysis algorithms
4. develop practical skills of network analysis in R programming language
5. be capable of analyzing real work networks

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Unit-I: **10 hours**
Social Network Analysis: Preliminaries and definitions, Erdos Number Project, Centrality measures, Balance and Homophily**.**

Unit-II: **10hours**
Random graph models: Random graphs and alternative models, Models of network growth, Navigation in social Networks, Cohesive subgroups, Multidimensional Scaling, Structural equivalence, roles and positions.

Unit-III: **10 hours**
Net work topology and diffusion, Contagion in Networks, Complex contagion, Percolation and information, Navigation in Networks Revisited

Unit-IV: **10 hours**
Small world experiments, small world models, origins of small world, Heavy tails, Small Diameter, Clustering of connectivity, The Erdos Renyi Model, Clustering Models.

Unit-V: **10 hours**
Network structure -Important vertices and page rank algorithm, towards rational dynamics in networks, basics of game theory, Coloring and consensus, biased voting, network formation games, network structure and equilibrium, behavioral experiments, Spatial and agent-based models

Text Books:

1. S. Wasserman and K. Faust. “Social Network Analysis: Methods and Applications”, Cambridge University Press.
2. D. Easley and J. Kleinberg, “Networks, Crowds and Markets: Reasoning about a highly connected world” , Cambridge University Press, 1st edition,2010.

Reference Books:

1. Maarten van Steen. “Graph Theory and Complex Networks. An Introduction”, 2010
2. Reza Zafarani, Mohammed Ali Abbasi, Huan Liu. “Social Media Mining: An Introduction”. Cambridge University Press 2014.
3. Maksim Tsvetovat and Alexander Kouznetsov. “Social Network Analysis for Startups”. O’Reilly Media, 2011.

OBJECT ORIENTED ANALYSIS AND DESIGN

(Professional Elective - V)

IV-B.Tech-I-Sem. **L T P C**
SubjectCode:21L61708 **3 1 0 3**
Pre-Requisite: Nil

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

1. analyze the nature of complex system and its solutions.
2. illustrate & relate the conceptual model of the UML, identify & design the classes and relationships
3. analyze &Design Class and Object Diagrams that represent Static Aspects of a Software System and apply basic and Advanced Structural Modeling Concepts for designing real time applications.
4. analyze & Design behavioral aspects of a Software System using Use Case, Interaction and Activity Diagrams.
5. analyze & Apply techniques of State Chart Diagrams and Implementation Diagrams to model behavioral aspectsand Runtime environment of Software Systems.

Unit-I: **10 hours**

Introduction: The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems. Case Study: System Architecture: Satellite-Based Navigation

Unit-II: **10 hours**

Introduction to UML: Importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture, and Software Development Life Cycle. Basic Structural Modeling: Classes, Relationships, common Mechanisms, and diagrams. Case Study: Control System: Traffic Management.

Unit-III: **10 hours**

Class & Object Diagrams: Terms, concepts, modeling techniques for Class & Object Diagrams. Advanced Structural Modeling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Case Study: AI: Cryptanalysis.

Unit-IV: **10 hours**

Basic Behavioral Modeling-I: Interactions, Interaction diagrams Use cases, Use case Diagrams, Activity Diagrams. Case Study: Web Application: Vacation Tracking System.

Unit-V: **10 hours**

Advanced BehavioralModeling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modeling: Component, Deployment, Component diagrams and Deployment diagrams Case Study: Weather Forecasting

Text Books:

1. Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston , “Object- Oriented Analysis and Design with Applications”, 3rd edition, 2013, PEARSON

2. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modeling Language User Guide,Pearson Education.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object Oriented Design in UML, Pearson Education.

2. Pascal Roques: Modeling Software Systems Using UML2, WILEY- Dreamtech India Pvt. Ltd.

3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.

4. Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design andUnified Process, Craig Larman, Pearson Education.

AI CHAT BOTS

(Professional Elective - V)

IV-B.Tech-I-Sem. **L T P C**
SubjectCode:21L61709 **3 1 0 3**
Pre-Requisite: Nil

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

1. develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality.
2. know the General Data Protection Regulation
3. know the Natural Language Processing
4. design, build, test, and iterate a fully-functional, interactive chatbot using a commercial platform.
5. deploy the finished chatbot for public use and interaction.

Unit-I: **10 hours**

Introduction: Benefits from Chatbots for a Business, A Customer-Centric Approach in Financial Services, Chatbots in the Insurance Industry, Conversational Chatbot Landscape, Identifying the Sources of Data: Chatbot Conversations, Training Chatbots for Conversations, Personal Data in Chatbots, Introduction to the General Data Protection Regulation (GDPR).

Unit-II: **10hours**

Chatbot Development Essentials: Customer Service-Centric Chatbots, Chatbot Development Approaches, Rules-Based Approach, AI-Based Approach, Conversational Flow, Key Terms in Chatbots, Utterance, Intent, Entity, Channel, Human Takeover, Use Case: 24x7 Insurance Agent

Unit-III: **10 hours**

Building a Chatbot Solution: Business Considerations, Chatbots Vs Apps, Growth of Messenger Applications, Direct Contact Vs Chat, Business Benefits of Chatbots, Success Metrics, Customer Satisfaction Index, Completion Rate, Bounce Rate, Managing Risks in Chatbots Service, Generic Solution Architecture for Private Chatbots.

Unit-IV: **10 hours**

Natural Language Processing, Understanding, and Generation: Chatbot Architecture, Popular Open Source NLP and NLU Tools, Natural Language Processing, Natural Language Understanding, Natural Language Generation, Applications.

Unit-V: **10 hours**

Introduction to Microsoft Bot, RASA, and Google Dialog flow: Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialog flow Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise Data Store, Integration Module

Text Books:

1. Abhishek Singh, Karthik Ramasubramanian, Shrey Shivam, “Building an Enterprise Chatbot:Work with Protected Enterprise Data Using Open Source Frameworks”, ISBN 978-1-4842- 5034-1, Apress,2019
2. Janarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots andvoice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
3. Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019.ISBN 978-303004298

Reference Books:

1. Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitivecomputing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.

2. Abhishek Singh, Karthik Ramasubramanian and Shrey Shivam, Building an Enterprise Chatbot (1ed.), Springer, 2019. ISBN 978-1484250334.

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MEAN STACK TECHNOLOGIESLAB

(Skill Oriented Course)

IV-B.Tech-I-Sem. **L T P C**

LIST OF EXERCISES

1. a Course Name: HTML5 - The Language
Module Name: Case-insensitivity, Platform-independency, DOCTYPE Declaration, Types of Elements, HTML Elements - Attributes, Metadata Element
Include the Metadata element in Homepage.html for providing description as "IEKart's is an online shopping website that sells goods in retail. This company deals with various categories like Electronics, Clothing, Accessories etc.
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_28320667711144660000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

1. b Course Name: HTML5 - The Language
Module Name: Sectioning Elements
Enhance the Homepage.html of IEKart's Shopping Application by adding appropriate sectioning elements.
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_6372291347110857000_shared?collectionId=lex_1773973283484081000 0_shared&collectionType=Course
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_6372291347110857000_shared?collectionId=lex_1773973283484081000 0_shared&collectionType=Course

1. c Course Name: HTML5 - The Language
Module Name: Paragraph Element, Division and Span Elements, List Element
Make use of appropriate grouping elements such as list items to "About Us" page of IEKart's Shopping Application
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_32785192040894940000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

1.d Course Name: HTML5 - The Language
Module Name: Link Element
Link "Login", "SignUp" and "Track order" to "Login.html", "SignUp.html" and "Track.html" page respectively. Bookmark each category to its details of IEKart's Shopping application.
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_15515105953273338000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

1. e Course Name: HTML5 - The Language
Module Name: Character Entities
Add the © symbol in the Home page footer of IEKart's Shopping application.
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_547667376938096260_shared?collectionId=lex_17739732834840810000 _shared&collectionType=Course

1.f Course Name: HTML5 - The Language

Module Name: HTML5 Global Attributes

Add the global attributes such as contenteditable, spellcheck, id etc. to enhance the Signup Page functionality of IEKart's Shopping application.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_28723566050321920000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

2. a Course Name: HTML5 - The Language.

Module Name: Creating Table Elements, Table Elements : Colspan/Rowspan Attributes, border, cellspacing, cellpadding attributes

Enhance the details page of IEKart's Shopping application by adding a table element to display the available mobile/any inventories

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_013168035284033536113_shared?collectionId=lex_177397328348 40810000_shared&collectionType=Course

2.b Course Name: HTML5 - The Language

Module Name: Creating Form Elements, Color and Date Pickers, Select and Datalist Elements

Using the form elements create Signup page for IEKart's Shopping application.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_13975270903118459000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

2. c Course Name: HTML5 - The Language.

Module Name: Input Elements - Attributes

Enhance Signup page functionality of IEKart's Shopping application by adding attributes to input Elements

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_14048414537062347000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

2. d Course Name: HTML5 - The Language.

Module Name: Media, Iframe

Add media content in a frame using audio, video, iframe elements to the Home page of IEKart's Shopping application

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_30738402225794945000_shared?collectionId=lex_177397328348408100 00_shared&collectionType=Course

3. a Course Name: Javascript

Module Name: Type of Identifiers

Write a JavaScript program to find the area of a circle using radius (var and let - reassign and observe the difference with var and let) and PI (const)

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_auth_013053264414818304732_shared?collectionId=lex_181096983663 32810000_shared&collectionType=Course

3. b Course Name: Javascript

Module Name: Primitive and Non Primitive Data Types

Write JavaScript code to display the movie details such as movie name, starring, language, and ratings. Initialize the variables with values of appropriate types. Use template literals wherever necessary.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_21528322245232402000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course

3. c Course Name: Javascript

Module Name: Operators and Types of Operators

Write JavaScript code to book movie tickets online and calculate the total price, considering the number of tickets and price per ticket as Rs. 150. Also, apply a festive season discount of 10% and calculate the discounted amount.

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_13808338384481720000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course

3. d Course Name: Javascript

Module Name: Types of Statements, Non - Conditional Statements, Types of Conditional Statements, if Statements, switch Statements

Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se

https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_16257498471333610000

_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course

3. e Course Name: Javascript
Module Name: Types of Loops
Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed.
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_6238536888292970000_shared?collectionId=lex_181096983663328100 0_shared&collectionType=Course

4. a Course Name: Javascript
Module Name: Types of Functions, Declaring and Invoking Function, Arrow Function, Function Parameters, Nested Function, Built-in Functions, Variable Scope in Functions
Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed.
https://infyspringboard.onwingspan.com/web/en/viewer/webmodule/lex_15455199570613326000_shared?collectionId=lex_181096983663328100 00_shared&collectionType=Course

4. b Course Name: Javascript
Module Name: Working With Classes, Creating and Inheriting Classes
Create an Employee class extending from a base class Person. Hints: (i) Create a class Person with name and age as attributes. (ii) Add a constructor to initialize thevalues (iii) Create a class Employee extending Person with additional attributes role
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_01259981111760512458_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

4. c Course Name: Javascript
Module Name: In-built Events and Handlers
Write a JavaScript code to book movie tickets online and calculate the total price based on the 3 conditions: (a) If seats to be booked are not more than 2, the cost per ticket remains Rs. 150. (b) If seats are 6 or more, booking is not allowed. (c) If se
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_4192188372573027000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

4. d Course Name: Javascript
Module Name: Working with Objects, Types of Objects, Creating Objects, Combining and cloning Objects using Spread operator, Destructuring Objects, Browser Object Model, Document Object
Model If a user clicks on the given link, they should see an empty cone, a different heading, and a different message and a different background color. If user clicks again, they should see a re-filled cone, a different heading, a different message,
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_13197025862804100000_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

5. a Course Name: Javascript
Module Name: Creating Arrays, Destructuring Arrays, Accessing Arrays, Array Methods
Create an array of objects having movie details. The object should include the movie name, starring, language, and ratings. Render the details of movies on the page using the array.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013053270191734784711_shared?collectionId=lex_18109698366332810000_shared&collectionType=Course

5. b Course Name: Javascript
Module Name: Introduction to Asynchronous Programming, Callbacks, Promises, Async and Await, Executing Network Requests using Fetch API
Simulate a periodic stock price change and display on the console Hints: (i) Create a method which returns a random number - use Math.random, floor and other methods to return a rounded value. (ii) Invoke the method for every three seconds and stop when
https://infyspringboard.onwingspan.com/web/en/viewer/web-

module/lex_auth_012599811633905664460_shared?collectionId=lex_1810969836633281000 0_shared&collectionType=Course

5. c Course Name: Node.js
Module Name: How to use Node.js
Verify how to execute different functions successfully in the Node.js platform
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2817733899626781500 0_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

6. a Course Name: Node.js
Module Name: Modular programming in Node.js
Write a Node.js module to show the workflow of Modularization of Node application.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2886539419100400400 0_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

6. b Course Name: Node.js
Module Name: Restarting Node Application
Write a program to show the workflow of restarting a Node application
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_9174073856000159000_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

6. c Course Name: Node.js
Module Name: File Operations
Create a text file src.txt and add the following data to it. Mongo, Express, Angular, Node.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_3337644018024610000 0_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

7. a Course Name: Express.js
Module Name: Defining a route, Handling Routes, Route Parameters, Query Parameters
Implement routing for the AdventureTrails application by embedding the necessary code in the routes/route.js file.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_2939421554214995000 0_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

7. b Course Name: Express.js
Module Name: How Middleware works, Chaining of Middlewares, Types of Middlewares
In myNotes application: (i) we want to handle POST submissions. (ii) display customized error messages. (iii) perform logging.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_1393066131200958000 0_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

7. c Course Name: Express.js
Module Name: Connecting to MongoDB with Mongoose, Validation Types and Defaults
Write a Mongoose schema to connect with MongoDB.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035588775485440691_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

7. d Course Name: Express.js
Module Name: Models
Write a program to wrap the Schema into a Model object
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035593896869888662_shared?collectionId=lex_3240783567194676000 0_shared&collectionType=Course

8. a Course Name: Express.js
Module Name: CRUD Operations
Write a program to perform various CRUD (Create-Read-Update-Delete) operations using Mongoose library functions.

https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035684270129152696_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8. b Course Name: Express.js
Module Name: API Development
In the myNotes application, include APIs based on the requirements provided. (i) API should fetch the details of the notes based on a notesID which is provided in the URL. Test URL - http://localhost:3000/notes/7555 (ii) API should update the details bas
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_auth_013035745250975744755_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8. c Course Name: Express.js
Module Name: Why Session management, Cookies
Write a program to explain session management using cookies
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8. d Course Name: Express.js
Module Name: Why Session management, Cookies
Write a program to explain session management using cookies.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_24299316914857090000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8. e Course Name: Express.js
Module Name: Sessions
Write a program to explain session management using sessions.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_905413034723449100_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

8. f Course Name: Express.js
Module Name: Why and What Security, Helmet Middleware
Implement security features in myNotes application
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_31677453061177940000_shared?collectionId=lex_32407835671946760000_shared&collectionType=Course

9. a Course Name: Typescript
Module Name: Basics of TypeScript
On the page, display the price of the mobile-based in three different colors. Instead of using the number in our code, represent them by string values like GoldPlatinum, PinkGold, SilverTitanium.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_28910354929502245000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

9. b Course Name: Typescript
Module Name: Function
Define an arrow function inside the event handler to filter the product array with the selected product object using the productId received by the function. Pass the selected product object to the next screen.
https://infyspringboard.onwingspan.com/web/en/viewer/web-module/lex_10783156469383723000_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

9. c Course Name: Typescript
Module Name: Parameter Types and Return Types
Consider that developer needs to declare a function - getMobileByVendor which accepts string as input parameter and returns the list of mobiles
https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_012712912427057152901_shared?collectionId=lex_9436233116512678000_shared

&collectionType=Course

9. d Course Name: Typescript
Module Name: Arrow Function
Consider that developer needs to declare a manufacturer's array holding 4 objects with id and price as a parameter and needs to implement an arrow function - myfunction to populate the id parameter of manufacturers array whose price is greater than or equ
https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291087550054490 4_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

9. e Course Name: Typescript
Module Name: Optional and Default Parameters
Declare a function - getMobileByManufacturer with two parameters namely manufacturer and id, where manufacturer value should passed as Samsung and id parameter should be optional while invoking the function, if id is passed as 101 then this function shoul
https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271291494064128090 6_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

10. a Course Name: Typescript
Module Name: Rest Parameter
Implement business logic for adding multiple Product values into a cart variable which is type of string array.
https://infyspringboard.onwingspan.com/web/en/viewer/hands-on/lex_auth_01271292186091520090 9_shared?collectionId=lex_9436233116512678000_shared&collectionType=Course

10. b Course Name: Typescript
Module Name: Creating an Interface
Declare an interface named - Product with two properties like productId and productName with a number and string datatype and need to implement logic to populate the Product details.
https://infyspringboard.onwingspan.com/web/en/viewer/handson/lex_auth_012712925244276736910_shared?collectionId=lex_9436233116512678 000_shared&collectionType=Course

10. c Course Name: Typescript
Module Name: Duck Typing
Declare an interface named - Product with two properties like productId and productName with the number and string datatype and need to implement logic to populate the Product details.
https://infyspringboard.onwingspan.com/web/en/viewer/handson/lex_auth_012712925995458560912_

10. d Course Name: Typescript
Module Name: Function Types
Declare an interface with function type and access its value.
https://infyspringboard.onwingspan.com/web/en/viewer/handson/lex_auth_012712948945346560918_shared?collectionId=lex_9436233116512678 000_shared&collectionType=Course

IV-B.TECH.-II-SEMESTER SYLLABUS

MINOR COURSES TO BE OFFERED BY THE CSE FOR OTHER BRANCHES

CLOUD COMPUTING
(Minor Course)

	L	T	P	C
III-B.Tech-I-Sem.				
SubjectCode:21R61501	**3**	**0**	**0**	**4**

Pre-Requisite: Nil

Course Outcomes: At the end of the course, student will be able to
1. illustrate the key dimensions of the challenge of Cloud Computing
2. classify the Levels of Virtualization and mechanism of tools.
3. analyze Cloud infrastructure including Google Cloud and Amazon Cloud.
4. create Combinatorial Auctions for cloud resource and design scheduling algorithms for computing cloud
5. assess control storage systems and cloud security, the risks involved its impact and develop cloud Application

UNIT I: **10hours**

Systems Modeling, Clustering and Virtualization: Scalable Computing over the I nternet-The Age of Internet Computing, Scalable computing over the internet, Technologies for Network Based Systems, System models for Distributed and Cloud Computing, , Performance, Security and Energy Efficiency

UNIT II: **10hours**

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: **8hours**

Cloud Platform Architecture: Cloud Computing and Service Models, Public Cloud Platforms, Service Oriented Architecture, Programming on Amazon AWS and Microsoft Azure

UNIT IV: **10hours**

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.

UNIT V: **7hours**

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system**.**

Text Books:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.

Reference Books:

1. Cloud Computing, A Hands on approach, ArshadeepBahga, Vijay Madisetti, University Press
2. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter,TMH
3. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammaraiselvi, TMH

MOBILE COMPUTING
(Minor Course)

	L	T	P	C
III-B.Tech-II-Sem.				
SubjectCode:21R61601	**3**	**0**	**0**	**4**

Pre-Requisite: Nil

Course Outcomes: Upon completion of the course, the students will be able to:
1. develop a strong grounding in the fundamentals of mobile Networks
2. apply knowledge in MAC, Network, and Transport Layer protocols of Wireless Network
3. comprehend, design, and develop a lightweight network stack
4. analyze the Mobile Network Layer system working
5. explain about the WAP Mode

UNIT I: **10hours**

Introduction to Wireless Networks: Applications, History, Simplified Reference Model, Wireless transmission, Frequencies, Signals, Antennas, Signal propagation, Multiplexing, Modulation, Spread spectrum, Cellular Systems: Frequency Management and Channel Assignment, types of hand-off and their characteristics.

UNIT II: **10hours**

MAC – Motivation, SDMA, FDMA, TDMA, CDMA, Telecommunication Systems, GSM: Architecture Location tracking and call setup, Mobility management, Handover, Security, GSM, SMS, International roaming for GSM, call recording functions, subscriber and service data management, DECT, TETRA, UMTS, IMT-2000.

UNIT III: **10hours**

Wireless LAN: Infrared vs. Radio transmission, Infrastructure, Adhoc Network, IEEE 802.11WLAN Standards, Architecture, Services, HIPERLAN, Bluetooth Architecture & protocols.

UNIT IV: **8hours**

Mobile Network Layer: Mobile IP, Dynamic Host Configuration Protocol, Mobile Transport Layer, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/Fast recovery, Transmission/Time-out freezing, Selective retransmission, Transaction Oriented TCP.

UNIT V: **10hours**

Support for Mobility: Wireless Application Protocol: Architecture, Wireless Datagram Protocol, Wireless Transport Layer Security, Wireless Transaction Protocol, Wireless Session Protocol, Wireless Application Environment, Wireless Markup Language, WML Scripts, Wireless Telephone Application.

Text Books:

1. Jochen Schiller, “Mobile Communication”, Second Edition, Pearson Education, 2008.

Reference Books:

1. William Stallings, “Wireless Communications and Networks”, Second Edition, Pearson Education, 2004.
2. C. Siva Ram Murthy, B. S. Manoj, “Adhoc Wireless Networks: Architectures and Protocols”, Second Edition, Pearson Education,2008.

SOFTWARE ENGINEERING
(Minor Course)

	L	T	P	C
IV-B.Tech-I-Sem.				
SubjectCode:21R61701	**3**	**0**	**0**	**4**

Pre-Requisite: Nil

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

1. understand the different software process models and their significance.
2. distinguish various requirements gathering procedures and architectural views.
3. analyze various aspects of the system such as functionality, object and user Interface.
4. identify the testing strategies for conventional and object oriented applications.
5. plan and implement various software project management activities

UNIT-I: **10 hours**

Software and Software Engineering: The nature of Software, Software Engineering, Software process, Software Engineering Practice, Software myths

Process models: A Generic Process model, Process assessment and improvement, Prescriptive Process models, specialized process models, The Unified Process

UNIT-II: **10 hours**

Software Requirement analysis and Specification: Software Requirements, Problem analysis, Requirements specification, Functional Specification with use cases, validation.

Software Architecture: Role of Software Architecture, Architecture views, Component and Constructor views, Architecture styles for C&C Views.

UNIT-III: **10 hours**

Function Oriented Design: Design Principles, Module level concepts, Design notation and specifications, structure Design methodology

Object Oriented Design: Object Oriented Analysis and design, Object Oriented Concepts, Design Concepts, UML, A Design methodology

User Interface Design: Interface analysis, Interface design steps.

UNIT-IV: **10 hours**

Testing Conventional applications: Software testing fundamentals, Internal and external views of testing, White Box testing, Basis path testing, Control structure testing, Black-Box testing, Model based testing.

Testing Object Oriented Applications: Testing OOA and OOD models, Object Oriented Testing strategies, Object Oriented Testing Methods, Testing methods applicable at class level

Estimation, Project Scheduling and StaffingSoftware Configuration Management Plan, Quality Plan, Risk Management, Project Monitoring Plan

UNIT-V: **10 hours**

Agile Development: Agility, Agility and the Cost of Change, Agile Process, Extreme Programming (XP), Other Agile Process Models, A Tool Set for the Agile Process

Planning a Software Project: Process Planning, Effort

Text Books:

1. Software Engineering: A Practitioner's approach, Roger S Pressman, 7th edition.

2. An integrated Approach to Software Engineering, PankajJalote, 3rd edition

Reference Books:

1. Fundamentals of Software Engineering, Rajibmall, 3rd edition.
2. Software Engineering, Ian Sommerville, 9th edition.

DATABASE MANAGEMENT SYSTEMS
(Minor Course)

	L	T	P	C
IV-B.Tech-II-Sem.				
SubjectCode:21R61801	**3**	**0**	**0**	**4**

Pre-Requisite: Nil

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

1. identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
2. use Structured Query Language (SQL) for database manipulation
3. design and build simple database systems
4. develop application to interact with databases.
5. interact with database using Structured Query Language Commands

UNIT-I: **10 hours**

Introduction to Database: Introduction, File Systems versus a DBMS, the Data Model, Levels of Abstraction in a DBMS, Data Independence, Structure of a DBMS

Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture, data independence, database languages.

UNIT-II: **10 hours**

Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints, Weak entity types, ER diagrams, examples, Specialization and Generalization.

Introduction to the Relational Model: Relational Model Concepts,Unary and Binary relational operations, Integrity constraint over relations, enforcing integrity constraints

UNIT-III: **10 hours**

SQL: QUERIES, CONSTRAINTS, TRIGGERS: Specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE and UPDATE statements in SQL, Introduction to Nested Queries, Correlated Nested Queries, Set –Comparison Operators, Aggregate Operators, NULL values, Logical connectives – AND, OR and NOT, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Databases.

UNIT-IV: **10 hours**

Normalization: Schema refinement ,Problems Caused by redundancy , reasoning about FDS ,FIRST, SECOND, THIRD Normal forms, BCNF, Lossless join Decomposition, Dependency preserving Decomposition, Multi valued Dependencies, FORTH, Fifth Normal Form

UNIT-V: **10 hours**

Transaction Processing: Transaction Concept, Transaction States, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability,

Concurrency Control in Databases: Lock Based Protocols, Two-phase locking techniques for Concurrency control, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity, Recovery and Atomicity, Log Based Recovery, Recovery with Concurrent Transactions.

Text Books:

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, TMH.
.2. Database System Concepts, 6th Edition, SilberschatzKorth and Sudharshan, Mc-GrawHill, 2013.
1. Introduction to Database Systems, C.J.Date Pearson Education.
2. Data base Management System, ElmasriNavrate Pearson Education

Reference Books:

3. Data base Management System,Raghuram
4. Introduction to Data base Management System,.Professional Publications

FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

(Minor Course)

	L	T	P	C
IV-B.Tech-II-Sem.				
SubjectCode:21R61802	**3**	**0**	**0**	**4**

Pre-Requisite: Nil

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

1. enumerate the history and foundations of Artificial Intelligence x
2. apply the basic principles of AI in problem solving
3. choose the appropriate representation of Knowledge
4. enumerate the Perspectives and Issues in Machine Learning

UNIT-I: **10 hours**

Introduction: What Is AI? The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT-II: **10 hours**

Problem Solving: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, Informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions**.**

UNIT-III: **10 hours**

Knowledge Representation: Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT-IV: **10 hours**

Introduction to Machine Learning: Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning. Concept Learning and The General-to- Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND- S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate-Elimination, Inductive Bias

UNIT-V: **10 hours**

Decision Tree Learning: Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

Text Books:

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A Modern Approach” , 3rd Edition, Pearson
2. Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013

Reference Books:

1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2011
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill
3. David Poole and Alan Mackworth, “Artificial Intelligence: Foundations for Computational Agents”, Cambridge University Press 2010.

CYBER SECURITY FORENSICS
(Minor Course)

IV-B.Tech-II-Sem. **L T P C**
Subject Code: 21R61803 **3 0 0 4**
Pre Requisite: Nil

Course Outcomes: At the end of the course, student will be able to
1. explain the Cybercrime Fundamentals
2. describe the types of attacks on networks
3. analyze various tools available for Cybercrime Investigation
4. explain the Computer Forensics and Investigation Fundamentals and tools
5. analyze the legal perspectives of Cybercrime

UNIT I: **10hours**
Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyberstalking, Cybercafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones, Network and Computer Attacks.

UNIT II: **10hours**
Tools and Methods : Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer over flow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identity Theft (ID Theft), Foot Printing and Social Engineering, Port Scanning, Enumeration.

UNIT III: **10hours**
Cyber Crime Investigation: Introduction, Investigation Tools, eDiscovery, Digital Evidence Collection, Evidence Preservation, E-Mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Hands on Case Studies. Encryption and Decryption Methods, Search and Seizure of Computers, Recovering Deleted Evidences, Password Cracking.

UNIT IV: **10hours**
Computer Forensics and Investigations: Understanding Computer Forensics, Preparing for Computer Investigations. Current Computer Forensics Tools: Evaluating Computer Forensics Tools, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software, Face, Iris and Fingerprint Recognition, Audio Video Analysis, Windows System Forensics, Linux System Forensics, Graphics and Network Forensics, E-mail Investigations, Cell Phone and Mobile Device Forensics.

UNIT V: **10hours**
Cyber Crime Legal Perspectives: Introduction, Cybercrime and the Legal Landscape around the World, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment, Cyberlaw, Technology and Students: Indian Scenario

Text Books:

1. SUNIT Belapure Nina Godbole “Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives”, WILEY, 2011.
2. Nelson Phillips and Enfinger Steuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009.

Reference Books:

1. Michael T. Simpson, Kent Backman and James E. Corley, “Hands on Ethical Hacking and Network Defence”, Cengage, 2019.
2. Computer Forensics, Computer Crime Investigation by John R. Vacca, Firewall Media, New Delhi.
3. Alfred Basta, Nadine Basta,Mary Brown and Ravinder Kumar “Cyber Security and Cyber Laws” , Cengage,2018.

E-Resources:

1. CERT-In Guidelines- http://www.cert-in.org.in/
2. https://www.coursera.org/learn/introduction-cybersecurity-cyber-attacks [Online Course]
3. https://computersecurity.stanford.edu/free-online-videos [Free Online Videos]
4. Nickolai Zeldovich. 6.858 Computer Systems Security. Fall 2014. Massachusetts Institute of Technology: MIT OpenCourseWare, https://ocw.mit.edu License: Creative Commons BY-NC-SA.

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OPEN ELECTIVES OFFERED TO AIML BY THE OTHER BRANCHES

BASICS OF CIVIL ENGINEERING
(OPEN ELECTIVE - I)

III-B.Tech-I-Sem. | **L T P C**
Subject Code: 21N01501 | **3 0 0 3**
Pre Requisite: Nil

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

1. illustrate the fundamental aspectsof Civil Engineering
2. plan and set out a building
3. explain the concepts of surveying formaking horizontal and vertical measurements.
4. illustrate the uses of various building materials and explain the method of construction of differentcomponents of a building.
5. discuss about various services in abuilding.

Unit-I: **9 hours**

General introduction to Civil Engineering - Introduction to types of buildings, Components of a residential building, Introduction to industrial buildings; Introduction to planning of residential buildings - Simple building plans.

Unit-II: **9 hours**

Introduction to the various building area terms; Setting out of a building; Surveying – Principles, Objectives, Horizontal measurements with tapes, Ranging.

Unit-III: **9 hours**

Levelling – Instruments, Reduction of levels; Modern surveying instruments; Building materials – Bricks, cement blocks, Cement, Cement mortar, Steel.

Unit-IV: **9 hours**

Building construction – Foundations, Brick masonry, Roofs, Floors, Decorative finishes, Plastering, Paints and Painting.

Unit-V: **9 hours**

Basic infrastructure and services – Elevators, Escalators, Ramps, Air conditioning, Sound proofing, Towers, Chimneys, Water Tanks; Intelligent buildings.

Textbooks:

1. Chudley, R., Construction Technology, Vol. I to IV, Longman Group, England
2. Chudley, R. and Greeno, R., Building Construction Handbook, Addison Wesley, Longman Group, England

References:

1. Gopi, S., Basic Civil Engineering, Pearson Publishers
2. Kandya, A. A., Elements of Civil Engineering, Charotar Publishing house
3. Mamlouk, M. S., and Zaniewski, J. P., Materials for Civil and Construction Engineering, Pearson Publishers.

FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY
(OPEN ELECTIVE –I)

	L	T	P	C
Subject Code: 21N02501	**3**	**0**	**0**	**3**

Pre Requisite: Power Systems-I, Electrical Machines-I

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

1.know the various sources of electrical energy and its generation technologies for conventional and non-conventional energy sources.
2.know various types of illumination equipment, illumination measurement and illumination techniques.
3.learn about various methods used for electrical energy based heating and welding applications.
4.know about the mechanisms, equipment and technology used in the electric traction.
5.understand the importance of electrical earthing, earthing equipment and electrical earthing measurement methods.

Unit-I: Sources of Electrical Energy **9 hours**

Conventional Sources: Schematic & description of components of thermal power plant - hydro electric power station and nuclear power plants.
Non-conventional sources: schematic and description of components - Solar power generation - Wind power generation – Tidal - Geo-Thermal - Bio energy - Fuel cells technology.

Unit-II: Illumination **9 hours**

Introduction, source of light, term used in illumination - Lux meter - Discharge lamp - MV and SV lamps - types and design of light as flood light - LED light - shed lighting and domestic light-conservation of energy.

Unit-III: Heating and Welding **9 hours**

Advantages of Electric heating - types of electric heating - Resistance Heating - properties of heating element - direct heating - indirect heating - Induction heating - Factors effecting heat – Characteristics – application - description of direct core - vertical core - indirect core and core less type of Induction heating - Dielectric heating – applications of dielectric heating. Advantages of heating – arc furnace – direct arc furnace – indirect arc furnace. Welding: Introduction - Resistance welding – Spot welding – Projection welding –Seam welding– Butt welding – Arc welding – Metal arc welding – Helium arc welding – carbon arc welding –Hydrogen arc welding.

Unit – IV: Traction **8 hours**

Introduction – Advantages and disadvantages - systems of traction – classification – speed-timecurve for different service – various factors affecting the energy consumption – components of electric locomotive (for collecting and discharging) – description of each component.

Unit-V: Grounding **8 hours**

Introduction – earth and safety – nature of an electrode system – earth conductor sizes – designof earthing electrodes – earthing system – substation earthing mats – earthing practices – earth testing: methodology - earth tester and use

Textbooks:

1. Electrical Power Systems (Generation, Transmission, Distribution, Protecection and Utilization of Electrical Energy) – Dr. S.L.Uppal and Prof. Sunil S.Rao – Khanna Publisher, 15th edition, 1987.

2. Electric Power Distribution – A S Pabla – McGrawHill.

Reference Books:

1. Generation Distribution and Utilization of Electrical Energy – C.L.Wadhwa- New Age International Publishers- revised third edition.

NON-CONVENTIONAL ENERGY RESOURCES
(Open Elective - I)

III-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21N03501	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. analyze global and national energy scenarios
2. illustrate the various solar energy systems
3. demonstrate the aspects related to wind energy power plants
4. build the power plants using bio gas
5. estimate the power generation in hydroelectric plants

Unit-I **10 hours**

Global and National Energy Scenario: Over view of conventional & renewable energy sources, need & development of renewable energy sources, types of renewable energy systems, Future of Energy Use, Global and Indian Energy scenario, Renewable and Non-renewable Energy sources, Energy for sustainable development, Potential of renewable energy sources, renewable electricity and key elements, Global climate change, CO_2 reduction potential of renewable energy- concept of Hybrid systems.

Unit-II **09 hours**

Solar Energy: Solar energy system, Solar Radiation, Availability, Measurement and Estimation, Solar Thermal Conversion Devices and Storage, Applications Solar Photovoltaic Conversion solar photovoltaic, solar thermal, applications of solar energy systems.

Unit-III **10 hours**

Wind Energy: Wind Energy Conversion, Potential, Wind energy potential measurement, Site selection, Types of wind turbines, Wind farms, wind Generation and Control. Nature of the wind, power in the wind, factors influencing wind, wind data and energy estimation, wind speed monitoring, classification of wind, characteristics, applications of wind turbines, offshore wind energy.
Hybrid systems, wind resource assessment, Betz limit, site selection, wind energy conversion devices. Wind mill component design, economics and demand side management, energy wheeling, and energy banking concepts. Safety and environmental aspects, wind energy potential and installation in India.

Unit-IV **10 hours**

Biogas: Properties of biogas (Calorific value and composition), biogas plant technology and status, Bio energy system, design and constructional features. Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion, types of biogas Plants, applications.

Unit-V **09 hours**

Hydel Energy: Small hydro Power Plant - Importance of small hydro power plants and their Elements, types of turbines for small hydro, estimation of primary and secondary power.

Textbooks:

1. Non-Conventional Energy Sources by G.D Rai.
2. Twidell, J.W. and Weir, A., Renewable Energy Sources, EFN Spon Ltd., 1986.

PRINCIPLES OF COMMUNICATION
(OPEN ELECTIVE - I)

L	T	P	C
3	0	0	3

Subject Code: 21N04501
Pre Requisite: NIL

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

1. analyze the power and transmission bandwidth of amplitude and frequency modulated signals.
2. familiarize the process of reproduction of base band signal.
3. demonstrate various pulse analog modulation techniques
4. analyze various pulse pulse digital modulation techniques.
5. explain the transmission of binary data in communication systems

Unit-1 Amplitude Modulation: **08 hours**

Introduction to Modulation, Need for Modulation, Ordinary Amplitude Modulation – Modulation index, Side bands, AM Power, Double Side Band Suppressed Carrier Modulation, Single Side Band Modulation, Vestigial Side Band Modulation, AM demodulation, Applications of AM.

Unit-2 Angle Modulation: **08 hours**

Angle Modulation fundamentals, Frequency Modulation – Modulation index and sidebands, Narrowband FM, Wideband FM, Principles of Phase Modulation, Frequency Modulation verses Amplitude Modulation, FM demodulation, Frequency Division Multiplexing, Applications of FM.

Unit-3 Signal Sampling and Analog Pulse Communication: **08 hours**

Ideal Sampling, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation.

Unit-4 Digital Communication Techniques: **08 hours**

Quantization, Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Time Division Multiplexing, Pulse Code Modulation, Delta Modulation.

Unit-5 Transmission of Binary Data in Communication Systems: **08 hours**

Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction.

Text Books:

1. Louis E. Frenzel, Principles of Electronic Communication Systems, 3rd Edition. Tata Mcgraw Hill.
2. Wayne Tomasi, Electronic Communications Systems, 5th Edition, Pearson Education

.**References Books:**

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3 rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004

SUSTAINABILITY CONCEPTS IN CIVIL ENGINEERING
(OPEN ELECTIVE - II)

III-B.Tech-II-Sem. | **L T P C**
Subject Code: 21N01601 | **3 0 0 3**
Pre Requisite: Nil

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

1. able to understand the component of building with their function
2. learn the sustainability concepts; understand the role and responsibility of engineers in sustainable development.
3. quantify sustainability, and resource availability, Rationalize the sustainability based on scientific merits.
4. understand and apply sustainability concepts in construction practices, designs, product developments and processes across various engineering disciplines.
5. make a decision in applying green engineering concepts and become a lifelong advocate of sustainability in society.

Unit-I: **9 hours**

Introduction: Sustainability - Introduction, Need and concept of sustainability, Social-environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Environmental legislations in India - Water Act, Air Act.

Unit-II: **9 hours**

Global Environmental Issue: Resource degradation, Climate change, Regional and Local Environmental Issues. Carbon credits and carbon trading, carbon foot print Carbon sequestration – Carbon capture and storage (CCS). Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) - Scope and Goal, Bio-mimicking.

Unit-III: **9 hours**

Sustainable Design: Basic concepts of sustainable habitat, Green buildings, green materials for building construction, material selection for sustainable design, green building certification- GRIHA & IGBC Certification for buildings, Energy efficient building design- Passive solar design technique, Thermal storage, Cooling strategies, high performance insulation. Sustainable cities, Sustainable transport

Unit-IV: **9 hours**

Clean Technology and Energy: Energy sources: Basic Concepts- Conventional and non-conventional, solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans, Geothermal energy. Rainwater harvesting.

Unit-V: **9 hours**

Green Engineering: Green Engineering concepts, Sustainable Urbanization, industrialization and poverty reduction; Social and technological change, Industrial Processes: Material selection, Pollution Prevention, Industrial Ecology, Industrial symbiosis.

Textbooks:

1. Allen, D.T. and S honnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo, A. O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.

References:

1. Mackenthun, K. M. Basic Concepts in Environmental Management, Lewis Publication.
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications Rating System, TERI Publications - GRIHA Rating System.
3. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.
4. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English

FUNDAMENTALS OF ELECTRICAL MACHINES
(OPEN ELECTIVE – II)

	L	T	P	C
Subject Code :21N02601	**3**	**0**	**0**	**3**

Pre Requisite: Electrical Circuits-I, Electrical Machines-I,II

Course Outcomes: At the end of the course, the student will be able to
1.apply fundamentals in various electrical circuits.
2.explain the operation and characteristics of DC machines.
3.determine the efficiency and regulation of transmission.
4.explain the operation and starting methods of Induction Motors.
5.apply the applications of Synchronous Machines.

Unit-I: Introduction **9 hours**

Active and passive elements- Ohm's Law – Kirchhoff's Laws –Electromagnetic Induction– Faraday's Laws - Series – Parallel circuits- Self and Mutual Inductance-Numerical problems. Purpose of Earthing – Methods of Earthing – Merits of Earthing. Different types of Electrical Machines

Unit-II: DC Machines **9 hours**

Principle of operation of DC generator - Types of DC machines – EMF equation –- Open Circuit Characteristics- Principle of operation of DC Motor- Torque Equation- speed control methods ofDC motor – Losses in DC machines - Swinburne's Test-Brake test on DC shunt motor – Performance Characteristics - Numerical problems.

Unit-III: Transformers **9 hours**

Principle of operation and construction Details – Classification of Transformers - EMF equation – Losses in a Transformer – Open Circuit & Short Circuit Test – Calculation of efficiency and regulation -Numerical Problems.

Unit – IV: InductionMotors **8 hours**

Principle of operation- Constructional Details - Classification – Revolving Magnetic Fields– Starting Methods – Numerical Problems. Principle of operation of Single Phase Induction Motor - Starting Methods- Applications.

Unit-V: Synchronous Machines **8 hours**

Principle of operation and construction of alternators –EMF Equation - Regulation of alternatorby Synchronous Impedance Method – Numerical Problems.
Principle of operation of synchronous motor - Synchronous Condenser – Applications.

Textbooks:
1. Principles of Electrical Machines by V.K. Mehta & Rohit Mehta, S.Chand publications
2. Theory & performance of Electrical Machines by J.B.Guptha, S.K.Kataria & Sons.

Reference Books:
1. Basic Electrical Engineering by M.S.Naidu and S.Kamakshiah,TMH Publications
2. Fundamentals of Electrical Engineering by Rajendra Prasad, PHI Publications,2nd edition
3. Basic Electrical Engineering by Nagsarkar,Sukhija, Oxford Publications,2nd edition
4. Circuit Theory (Analysis and Synthesis) by A. Chakrabarti, Dhanpat Rai & Co.

FUNDAMENTALS OF MANUFACTURING PROCESSES
(Open Elective – II)

III-B.Tech-II-Sem. **L T P C**
Subject Code: 21N03601 **3 0 0 3**

Pre Requisite: Nil

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

1. select materials for patterns.
2. apply welding principles appropriately.
3. explain hot working and cold working methods
4. develop process-maps for metal forming processes using plasticity principles.
5. identify the effect of process variables to manufacture defect free products.

Unit-I **10 hours**

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting and cupola operation – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

Unit-II **10 hours**

Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding. Inert Gas Welding - TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

Unit-III **10 hours**

Hot working, cold working, strain hardening, recovery, recrystallisation, and grain growth. Stamping, forming, and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning. Types of presses and press tools. Forces and power requirement in the above operations.

Unit-IV **10 hours**

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

Unit-V **10 hours**

Forging Processes: Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects –cold forging, swaging, Forces in forging operations.

Text books:

1. Manufacturing Technology / P.N. Rao / Mc Graw Hill
2. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson.

References

1. Metal Casting / T.V Ramana Rao / New Age
2. Métal Fabrication Technology/ Mukherjee/PHI

IC APPLICATIONS
(OPEN ELECTIVE - II)

L	T	P	C
3	0	0	3

Subject Code: 21N04601
Pre Requisite: NIL

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

1. Explain the operational amplifiers with linear integrated circuits.
2. attain the knowledge of functional diagrams and applications of ic 555 and ic 565
3. acquire the knowledge about the data converters.
4. acquire the knowledge of active filters & oscillators:
5. compare of DAC and ADC techniques

Unit-1 Integrated Circuits **08 hours**

Classification, chip size and circuit complexity, basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC Characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Unit-2 Op-amp and Applications **08 hours**

Basic information of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Sample & hold circuits, multipliers and dividers, differentiators and integrators, comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723

Unit-3 Active Filters & Oscillators **08 hours**

Introduction, 1st order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation - RC, Wien and quadrature type, waveform generators - triangular, sawtooth, square wave and VCO.

Unit-4 Timers & Phase Locked Loops: **08 hours**

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

Unit-5 D-A and A-D Converters: **08 hours**

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC dual slope integration type ADC, DAC and ADC specifications.

Text Books:

1. Linear Integrated Circuits, D. Roy Chowdhury, New Age International(p) Ltd.
2. Op-Amps & Linear ICs, Ramakanth A. Gayakwad, PHI

.**References Books:**

1. Operational Amplifiers & Linear Integrated Circuits, R.F. Coughlin & Fredrick F. Driscoll, PHI.

2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications, Denton J. Daibey, TMH
3. Design with Operational Amplifiers & Analog Integrated Circuits, Sergio Franco, McGraw Hill.
4. Digital Fundamentals - Floyd and Jain, Pearson Education.

AIR POLLTION AND CONTROL
(OPEN ELECTIVE – III)

IV-B.Tech-I-Sem. | **L T P C**
Subject Code: 21N01701 | **3 0 0 3**
Pre Requisite: Nil

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

1. identify the major sources of air pollution and understand their effects on health and environment.
2. evaluate the dispersion of air pollutants in the atmosphere and to develop air quality models.
3. ascertain and evaluate sampling techniques for atmospheric and stack pollutants.
4. choose and design control techniques for particulate and gaseous emissions.
5. demonstrates the knowledge about Air pollution control which is essential for environmental protection and it gives a particular solution to the life threating problem.

Unit-I: **9 hours**

Introduction: Definition, Sources, classification and characterization of air pollutants. Effects of air pollution on health, vegetation & materials. Types of inversion, photochemical smog.

Unit-II: **9 hours**

Meteorology: Temperature lapse rate & stability, wind velocity & turbulence, plume behavior, measurement of meteorological variables, wind rose diagrams, Plume Rise, estimation of effective stack height and mixing depths.

Unit-III: **9 hours**

Sampling: Sampling of particulate and gaseous pollutants (Stack, Ambient & indoor air pollution), Monitoring and analysis of air pollutants (PM2.5, PM10, SOX, NOX, CO, NH3). Development of air quality models-Gaussian dispersion model-Including Numerical problems.

Unit-IV: **9 hours**

Air pollution due to automobiles, standards and control methods. Noise pollution- causes, effects and control, noise standards. Environmental issues, global episodes. Environmental laws and acts.

Unit-V: **9 hours**

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

Textbooks:

1. M. N. Rao and H V N Rao,"Air pollution", Tata Mc-G raw Hill Publication.
2. H. C. Perkins, "Air pollution". Tata McGraw Hill Publication.

References:

1. Noel De Nevers, "Air Pollution Control Engineering", Waveland Pr Inc.
2. Anjaneyulu Y, "Text book of Air Pollution and Control Technologies", Allied Publishers.

FUNDAMENTALS OF POWER SYSTEM ENGINEERING
(OPEN ELECTIVE - III)

	L	T	P	C
Subject Code: 21N02701	**3**	**0**	**0**	**3**

Pre Requisite: Power Systems-I

Course Outcomes: At the end of the course, the student will be able to
1.Know the concepts of power generation by various types of power plants.
2.Learn about transmission line concepts and distribution systems schemes.
3.Learn about protection equipments and grounding methods of power system.
4.Know the economic aspects of electrical energy and their importance.
5.Know the importance of power factor improvement and voltage control in power systems.

Unit-I: Power Generation Concepts & Types **9 hours**

Generation and sources of Energy – working principle and Schematic diagram approach of Thermal Power Plant – Hydro Power Plant - Nuclear Power Plant – Gas Power Plants – Comparison between Power Plants.

Unit-II: Transmission and Distribution Concepts **9 hours**

Types of Conductors Materials – Constants of Transmission Line – Classification of OverheadTransmission Lines – Performance of Short Transmission Lines – Simple Problems.
Basic concept of Sub Station – Distribution Systems – Connection Schemes of Distribution Systems – Structure of Cables – Differences between Overhead & Underground systems.

Unit-III: Protection and Grounding **9 hours**

List of Faults – Basic concepts of fuse – Circuit Breakers – Relays – SF_6 Circuit Breakers – Vacuum Circuit Breakers – Operation of Lightning Arrester – Grounding and its advantages - Methods of Neutral Grounding: Resistance - Reactance and Resonant Grounding – Numerical Problems.

Unit – IV: Economic Aspects
8 hours

Definitions of Load - Load & Load Duration Curves - Load Factor - Demand Factor – Utilization Factor– Types of Tariff - Cost of Electrical Energy – Expression for Cost of Electrical Energy – NumericalProblems

Unit-V: Power Factor Improvement and Voltage Control **8 hours**

Power Factor – Effects and Causes of low Power Factor- Shunt & Series Capacitor Compensation - Numerical Problems – Need of Voltage Control – Types of Voltage regulating Devices.

Textbooks:

1.Principles of Power System by V.K.Mehata - Rohit Mehata - S.Chand Publishers.

Reference Books:

1.Electrical Power Systems by C.L.Wadwa - New Age International Publishers.

FUNDAMENTALS OF AUTOMOBILE ENGINEERING
(Open Elective - III)

IV-B.Tech-I-Sem. **L T P C**
Subject Code: 21N03701 **3 0 0 3**

Pre Requisite: Nil

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

1. identify power generation, transmission and control mechanisms in an automobile
2. manipulate the chemical, thermal, mechanical and electrical energies in an automobile
3. infer the interaction between subsystems
4. analyze how transmission system works
5. learn different components of suspension systems.

Unit-I **10 hours**

Introduction: Components of four-wheeler automobile – chassis and body – power unit – power transmission rear wheel drive, front wheel drive, 4-wheel drive – types of automobile engines, engine construction – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation – engine service, re boring, decarburization.

Unit-II **10 hours**

Fuel System: S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pumps – Carburetor – types – air filters – petrol injection. **C.I. Engines:** Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, Alternative fuels for Automobiles-injection, Classification, Properties, Hybrid vehicles injection timing, testing of fuel, pumps.**Cooling System:** Cooling Requirements, Air Cooling, Liquid Cooling and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

Unit-III **10 hours**

Electrical System: Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

Ignition System: Function of an ignition system, battery ignition system, constructional features of storage battery, auto transformer, contact breaker points, condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

Unit-IV **10 hours**

Transmission System: Clutches, principle, types- cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – Gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter.

Propeller shaft – Hoatch – Kiss drive, Torque tube drive universal joint, differential rear axles – types wheels and tyres.

Steering System: Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism

Unit-V **10 hours**

Suspension System: Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system. **Braking System:** Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

Text books

1. Automobile Engineering, Vol. 1 & Vol. 2/ Kripal Singh
2.Automobile Engineering, Vol. 1 & Vol. 2 ,by K.M Gupta,Umesh publication

References

1. A System approach to Automotive Technology by Jack Erjavec YesDee publishing Pvt Ltd.
2. Automobile Engineering / William Crouse

FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS (OPEN ELECTIVE - II)

L	T	P	C
3	0	0	3

Subject Code: 21N04701
Pre Requisite: NIL

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

1. construct the architecture of microprocessor and their operation.
2. demonstrate programming skills in assembly language for processors and controllers.
3. analyze various interfacing techniques and apply them for the design of processor/Controller based systems.
4. construct the architecture of microcontroller and their operation
5. demonstrate micro controller programming & applications

Unit-1: 8085 Processor &8086 Architecture **08 hours**

8085 Processor :Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization— I/O ports and data transfer concepts,Interrupts.

8086 Architecture :Main features, pin diagram/description, 8086 microprocessor family, internal architecture, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

Unit-2: 8086 Programming **08 hours**

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

Unit-3:8086 Interfacing **08 hours**

Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

Unit-4: 8051 Micro Controller **08 hours**

Hardware Architecture, pinouts — Functional Building Blocks of Processor — Memory organization — I/O ports and data transfer concepts– Timing Diagram — Interrupts- Data Transfer, Manipulation, Control Algorithms& I/O instructions, Comparison to Programming concepts with 8085.

Unit-5: Micro Controller Programming & Applications **08 hours**

Simple programming exercises- key board and display interface –Control of servo motor stepper motor control- Application to automation systems.

Text Books:

1. R.S. Gaonkar, Microprocessor Architecture Programming and Application, with 8085, Wiley Eastern Ltd., New Delhi, 2013.
2. A.K Ray, K.M.Bhurchandhi," Advanced Microprocessor and Peripherals", Tata McGraw Hill Publications, 2000..

References Books:

1. The 8051 Microcontrollers and Embedded systems Using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D.McKinlay; Pearson 2-Edition, 2011.
2. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata Mc Graw Hill Education Private Limited,3rdEdition,1994

GREEN BUILDINGS
(OPEN ELECTIVE - IV)

IV-B.Tech-I-Sem. **L T P C**
Subject Code: 21N01702 **3 0 0 3**
Pre Requisite: Nil

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

1. understand the concepts of green buildings
2. explain the sustainability.
3. define renewable energy conservation through material usage.
4. explain the Eco House system
5. designing green buildings.

Unit-I: INTRODUCTION **9 hours**

A historical perspective. General premises and strategies for sustainable and green design, objectives and basis. Bio-mimicry as a design tool based on ecosystem analogy.

Unit-II: GREEN CONSTRUCTION AND ENVIRONMENTAL QUALITY **9 hours**

Sustainable architecture and Green Building: Definition, Green building evaluation systems; LEED Certification; Green Globe Certification; Case studies which look at the environmental approach; Renewable Energy; Controlling the water cycle, Impact of materials on environment; Optimizing construction; Site management; Environmental management of buildings.

Unit-III: PASSIVE DESIGN IN MATERIALS **9 hours**

Passive Design and Material Choice – Traditional Building Materials – Importance of envelope material in internal temperature control – Specification for walls and roofs in different climate –Material and Humidity Control.

Unit-IV: ECO HOUSE **9 hours**

The form of the house, the building as an analogy. Building concepts: energy loss, insulation, passive solar gain, active solar gain, health benefits, and sustainable materials. Small scale wind and hydro power systems. Case study of eco house.

Unit-V: SUSTAINABLE AND GREEN BUILDING DESIGN **9 hours**

This studio will explore collaborative learning to explore, investigate and apply various parameters of sustainability for design development of projected building/ urban scenarios.

Textbooks:

1. Ken Yeang: Eco Design- A manual for Ecological design; WileyAcademy, 2006.
2. Sue Roaf et all: Ecohouse, A design guide; Elsevier ArchitecturalPress, 2007.

References:

1.Thomas E Glavinich: Green Building Construction; Wiley, 2008.
2. Brenda and Robert Vale: Green Architecture, Design for a Sustainable Future; Thames and Hudson, 1996.

Web Reference:

1. https://igbc.in/

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION
(OPEN ELECTIVE - IV)

	L	T	P	C
Subject Code:21N02702	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1.choose right type of instrument for measurement of ac and dc Electrical quantities.
2.choose right type of instrument for measurement of power and power factor.
3.select right type for measurement of R, L,C.
4.understand the effectiveness of Transducer.
5.understand Digital Meters.

Unit-I: Analog Ammeter and Voltmeters **9 hours**

Classification – deflecting, control and damping torques,– PMMC, Moving Iron type andElectrostatic instruments, Construction, Torque equation, advantages and disadvantages.
Instrument transformers: Current Transformer and Potential Transformer-construction, theory, (Without derivation of ratio and phase angle error) - Numerical Problems.

Unit-II: Analog Wattmeters and Power Factor Meters **9 hours**

Electrodynamometer type wattmeter (LPF and UPF), Power factor meters: Dynamometer and M.Itype (Single phase), construction, theory, torque equation, advantages and disadvantages -Numerical Problems.

Unit-III: Measurements of Electrical Parameters **9 hours**

DC Bridges: Method of measuring low, medium and high resistance – Kelvin's double bridge for measurement low resistance, Wheatstone bridge for measurement of medium resistance - Loss of charge method for measurement of high resistance, Megger – measurement of earth resistance - Numerical Problems.
AC Bridges: Measurement of inductance and quality factor, Maxwell's bridge, measurement of capacitance and loss angle, Desauty's bridge, Schering Bridge, Wien's bridge- Numerical Problems

Unit – IV: Transducers **8 hours**

Classification, Resistive, Inductive and Capacitive Transducer, LVDT, Strain Gauge,Thermistors, Thermocouples, Piezo electric and Photo Diode Transducers, Digital shaft encoders, Hall effect sensors- Numerical Problems.

Unit-V: Digital Meters **8 hours**

Digital voltmeter – Successive approximation DVM, – Digital frequency meter, Digitalmultimeter, Digital tachometer, Digital Energy Meter, LCRQ – Meter

Textbooks:

1.Electrical Measurements and measuring Instruments by E.W. Golding and F.C.Widdis, fifthEdition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques by A.D.Helfrick and W.D.Cooper, PHI, 5th Edition, 2002

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai &Co.Publications.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand.
3. Electrical Measurements by Buckingham and Price, Prentice – Hall
4. Electrical Measurements by Foest K. Harris. John Wiley and Sons

INTRODUCTION TO ADDITIVE MANUFACTURING
(Open Elective - IV)

IV-B.Tech-I-Sem.	**L**	**T**	**P**	**C**
Subject Code : 21N03702	**3**	**0**	**0**	**3**

Pre Requisite: Nil

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

1. explain the concepts of AM
2. differentiate liquid and solid based rapid prototyping systems
3. illustrate powder based rapid prototyping and tooling systems
4. apply various data file formats in 3D printing
5. summarize various RP applications

Unit-I **9 hours**

Introduction: Prototyping fundamentals, Historical development, Fundamentals of Rapid Prototyping, Advantages, and Limitations of Rapid Prototyping, commonly used Terms, Classification of RP process, Rapid Prototyping Process Chain: Fundamental Automated Processes, Process Chain.

Unit-II **10 hours**

Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA), Models and specifications, Process, working principle, photopolymers, photo polymerization, layering technology, laser and laser scanning, Applications,

Unit-III **10 hours**

Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM): Models and specifications, Process, working principle, Applications, Case studies.Fused Deposition Modeling (FDM): Models and specifications, Process, working principle, Applications, Case studies.

Unit-IV **9 hours**

Part-A: Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): Models and specifications, Process, working principle, Applications, case studies. Three dimensional Printing (3DP): Models and specifications, Process, working principle, Applications, Case studies. **Rapid Tooling:** Introduction to Rapid Tooling (RT), Conventional Tooling Vs RT, need for RT. Rapid Tooling Classification; Indirect Rapid Tooling Methods: Spray Metal Deposition,

Unit-V **10 hours**

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution,

RP Applications: Application - Material Relationship, Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture. RP Medical and Bioengineering Applications: Planning and simulation of complex surgery, Customized Implants & Prosthesis, Design and Production of Medical Devices, Forensic Science and Anthropology, Visualization of Biomolecules.

Textbooks:

1. Rapid prototyping; Principles and Applications, Chua C.K., Leong K.F. and LIM C.S, WSP.
2. Rapid Manufacturing, D.T. Pham and S.S. Dimov/Springer.

References:

1. Terry Wohlers, Wholers Report 2000, Wohlers Associates.
2. Rapid Prototyping and Manufacturing, PaulF.Jacobs, ASME.

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(OPEN ELECTIVE -IV)

	L	T	P	C
Subject Code: 21N04702	**3**	**0**	**0**	**3**

Pre Requisite: NIL

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

1. measure electrical parameters with different meters and understand the basic definition of measuring parameters
2. use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
3. operate an Oscilloscope to measure various signals.
4. measure various physical parameters by appropriately selecting the transducers.
5. identify the usage of Various types of bridges

Unit-1: Measuring Instruments **06 hours**

DC Voltmeters, D"Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

Unit-2: Signal Analyzers **08 hours**

AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators.

Unit-3: Signal Generators **08 hours**

AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

Unit-4: Oscilloscopes **08 hours**

CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Unit-5: Special Purpose Oscilloscopes **08 hours**

Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

Text Books:

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W. D. Cooper: PHI 5th Edition 2003.
2. Electronic Instrumentation: H. S. Kalsi – TMH, 2nd Edition 2004.

References Books:

1. Electrical and Electronic Measurement and Measuring Instruments – A K Sawhney, DhanpatRai & Sons, 2013.
2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.