ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

B.Tech Four Year Degree Course

(Applicable for the batches admitted from 2020-21)

GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)

Seshadri Rao Knowledge Village

GUDLAVALLERU - 521 356, Krishna District, Andhra Pradesh

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VISION & MISSION OF THE COLLEGE

Vision

To be a leading institution of engineering education and research, preparing students for leadership in their fields in a caring and challenging learning environment.

Mission

- To produce quality engineers by providing state-of-the-art engineering education.
- To attract and retain knowledgeable, creative, motivated and highly skilled individuals whose leadership and contributions uphold the college tenets of education, creativity, research and responsible public service.
- To develop faculty and resources to impart and disseminate knowledge and information to students and also to society that will enhance educational level, which in turn, will contribute to social and economic betterment of society.
- To provide an environment that values and encourages knowledge acquisition and academic freedom, making this a preferred institution for knowledge seekers.
- To provide quality assurance.
- To partner and collaborate with industry, government, and R and D institutes to develop new knowledge and sustainable technologies and serve as an engine for facilitating the nation's economic development.
- To impart personality development skills to students that will help them to succeed and lead.
- To instil in students the attitude, values and vision that will prepare them to lead lives of personal integrity and civic responsibility.
- To promote a campus environment that welcomes and makes students of all races, cultures and civilizations feel at home.
- Putting students face to face with industrial, governmental and societal challenges.

VISION & MISSION OF THE DEPARTMENT

Vision

To be a Centre of Excellence in Computer Science and Engineering education and training to meet the challenging needs of the industry and society.

Mission

- To impart quality education through well-designed curriculum in tune with the growing software needs of the industry.
- To serve our students by inculcating in them problem solving, leadership, teamwork skills and the value of commitment to quality, ethical behavior & respect for others.
- To foster industry-academia relationship for mutual benefit and growth.

III. PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

- Analyze, design, develop and optimize engineering solutions and work productively as engineers, including supportive and leadership roles in multidisciplinary teams.
- Apply knowledge, skills and innovative ideas in the field of Artificial Intelligence and Data Science to solve the issues in real world and engage in research.
- Develop automated systems with significant technical, legal, ethical, social, environmental and economic considerations.

IV. PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

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

modeling to complex engineering activities with an understanding of the limitations.

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

V. PROGRAM SPECIFIC OUTCOMES (PSOs)

Students will be able to

- Process, interpret the real world data to formulate the model for predicting and forecasting.
- Apply machine learning techniques to design and develop automated systems to solve real world problems.

VI. ACADEMIC REGULATIONS

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

1. UG – B.Tech. Programs

The following B.Tech. Programs are offered at present

i. Civil Engineering (CE)
ii. Electrical and Electronics Engineering (EEE)
iii. Mechanical Engineering (ME)
iv. Electronics and Communication Engineering (ECE
v. Computer Science and Engineering (CSE)
vi. Information Technology (IT)
vii. Artificial Intelligence and Data Science (AI&DS)
viii. Internet of Things (IoT)

2. Duration of the Program

The duration of the program is four academic years consisting of eight semesters. However, a student is permitted to complete the course work of B.Tech. program in the stipulated time frame of **EIGHT** years from the date of joining. Students admitted into third semester of B.Tech. program directly, through Lateral Entry (LE), shall have to complete the course work of B.Tech. program in the stipulated time frame of **SIX** years from the date of joining.

3. Minimum Instruction Days

Each semester consists of a minimum of ninety instruction days.

4. Award of B.Tech. Degree

i) Each discipline of the B.Tech. program is designed to have a total of **160** credits and the student shall have to complete the four year course work and earn all the **160** credits for the award of B.Tech. Degree.

il) Students, who fail to complete their four years' course of study within eight years from the year of their admission or fail to acquire the **160** credits within this period shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

iii) Students joining the B.Tech. program into the II year 1st semester directly through Lateral Entry (LE) Scheme shall have to complete the three year course work and earn **120** credits for the award of B.Tech. degree.

iv) Students, who fail to complete their three years course of study within six years from the year of their admission or fail to acquire the **120** credits for the award of degree within this period shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

v) **Award of B. Tech. (Honors) / B. Tech. (Minor):** B. Tech. with Honors or a B.Tech. with a Minor will be awarded if a student earns 20 additional credits as per the regulations/guidelines. Registering for Honors / Minor degree is optional.

5. Duration and Pattern of the Program

i) The duration of the program is four academic years consisting of eight semesters for regular students and three academic years consisting of six semesters for lateral entry students.

ii) Each semester consists of a minimum of ninety instructional days.

iii) Three week induction program is mandatory for all the first year UG students and shall be conducted as per AICTE/UGC/APSCHE guidelines.

iv) A student has to register for all the courses in a semester.

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

vi) Award of division shall be based on the CGPA acquired.

vii) A pool of interdisciplinary, skill development courses, industry internship, socially relevant projects etc., which are relevant to the industry are integrated into the curriculum of the branch of engineering concerned.

viii) As a mandatory rule, all the students shall be registered for the mandatory non-credit courses as per AICTE/UGC/APSCHE guidelines.

6. Attendance Regulations

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

ii) Condoning of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester will be considered for genuine reasons, such as on medical grounds and participation in co-curricular and extra-curricular activities and shall be granted only after the approval by a committee duly appointed by the college. For medical reasons, the student should submit application for medical leave along with medical certificate from a registered medical practitioner within three days from the day of reporting to the classwork after the expiry of the Medical Leave. In the case of participation in co-curricular and extra-curricular activities, either within the college or in other colleges, students must take prior permission in the written form from HoD concerned and should also submit the certificate of participation from the organizers of the event within three days after the completion of the event. Only such cases will be considered for condoning attendance shortage.

iii) A student shall be eligible to claim for condonation of attendance shortage for a maximum of two times during the four year (eight semesters) course work of B.Tech. (Regular) / three year (six semesters) course work of B.Tech. (Lateral).

iv) A student will not be promoted to the next semester unless he satisfies the attendance requirement of the current semester. He may seek re-admission for that semester when offered within 4 weeks from the date of commencement of classwork.

v) Shortage of Attendance below 65% in aggregate shall in *NO* case be condoned.

vi) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end-examinations of current semester and their registration shall stand cancelled.

vii) A fee stipulated by the college shall be payable towards condonation of attendance shortage.

viii) A student is required to put up a minimum of 75% of attendance in the mandatory non-credit courses for getting the satisfactory grade. However, condonation of the shortage of attendance upto 10% shall be applicable for all mandatory non credit courses and a fee stipulated by the college shall be payable towards condonation fee.

7. Distribution and Weightage of marks - Evaluation

The distribution of Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) marks for each course is given in the table:

Sl.No.	Components	Internal	External	Total
1	Theory / Integrated Theory and Laboratory/ Project Based Theory	30	70	100
2	Engineering Graphics/ Design/ Drawing	30	70	100
3	Practical / Skill Development Courses	15	35	50
4	Community Service Project / Internship	-	100	100
5	Project Work	60	140	200
6	Mandatory Non-Credit Courses			
	i) Environmental Studies and Constitution of India	30	70	100
	ii) Sports & Games/ Cultural and NSS/Fine Arts /Yoga /Self Defence	100	-	100

(i) Continuous Internal Evaluation

Theory Courses:

a) For theory subjects, during a semester, there shall be two mid-term examinations. Each mid-term examination consists of (i) one online objective examination(OE) consisting of 20 multiple choice questions for 10 marks for a duration of 20 minutes (ii) one descriptive examination(DE) consisting of 3 descriptive questions for 5 marks each a total of 15 marks for a duration of 90 minutes and (iii) one assignment(AT) for 5 marks.

b) First mid-term examination(Mid-I) shall be conducted from first 50% of the syllabus and second mid-term examination(Mid-II) shall be conducted from the rest of the 50% of syllabus.

c) The total marks secured by the student in each mid-term examination are evaluated for 30 marks. The final marks of each mid-term examination shall be displayed in the respective department notice boards within 10 days of completion of last examination.

d) Internal marks can be calculated with the sum of the 80% marks of better scored mid-term examination and 20% marks of less scored mid-term examination .

Example:

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

Mid-2 marks = Marks secured in (online 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)

e) *For subjects like Functional English and Professional Communication, the pattern of mid-term examination is given along with the syllabus of the respective subject.*

Integrated Theory and Lab Courses

For the integrated theory and laboratory course, the distribution of 30 marks for internal evaluation shall be, 15 marks for theory based on two descriptive examinations and 15 marks for laboratory. The pattern for the descriptive examination is as same as the pattern for the regular theory courses. Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered. Of the 15 marks for the laboratory, 5 marks for the day-to-day performance, 5 marks for record and 5 marks for the semester end internal examination.

Project Based Theory Courses

For the project based theory course, the distribution of 30 marks for internal evaluation shall be, 15 marks for the theory based on two descriptive examinations and 15 marks for project. The pattern for descriptive examination is as same as the pattern for the regular theory courses. Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered. 15 marks for project shall be awarded by the department review committee based on the project report and the performance in oral presentation.

Drawing / Design Courses

For the subjects such as Engineering Graphics, Engineering Drawing, Building Planning and Drawing, Estimation, Costing & Valuation, Design & Drawing of Steel Structures etc., the distribution of 30 marks for internal evaluation shall be,

15 marks for day-to-day work, and 15 marks based on two descriptive examinations. The pattern for the descriptive examination is as same as the pattern for regular theory courses. Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered.

Practical Courses

For the practical courses the distribution of 15 internal marks shall be, 5 marks for day-to-day performance, 5 marks for record and 5 marks for an internal laboratory test conducted at the end of a semester.

Skill Development Courses

Each student shall register for seven skill development courses (total 10 credits) offered by the department concerned. The distribution of 15 internal marks shall be 10 marks for day-to-day performance, and 5 marks for an internal examination conducted at the end of a semester.

For courses like Logic Building and Basic Coding Principles, Logic Building and Algorithmic Programming and Programming for corporate distribution of 15 internal marks shall be 10 marks for day-to-day performance(these marks will be awarded by taking no. of assignments completed, no. of quizzes attempted and amount of time spent in learning each topic on the LMS prescribed) and 5 marks for an internal laboratory test (internal Lab examination will be conducted on the assessment portal) conducted at the end of a semester.

Project Work

Of the 60 internal marks for a project work, 30 marks shall be awarded by the supervisor based on the student's involvement and 30 marks shall be awarded by the project review committee consisting of a supervisor, a senior faculty member and the HoD concerned based on the performance in Viva-Voce examination at the end of the semester.

Mandatory Non-Credit Courses

a) Each student shall register for four mandatory non-credit courses like Environmental Studies, Constitution of India, Sports & Games/Cultural and NSS/Fine arts/Yoga/Self Defense offered by the respective departments as per the course structure.

b) For courses like Environmental Studies and Constitution of India, two descriptive examinations shall be conducted for 30 marks each along with the mid-term examinations of regular theory courses.

c) Each descriptive examination consists of 3 descriptive questions for 10 marks each with a total of 30 marks for a duration of 90 minutes.

d) Sum of the 80% marks of better scored descriptive examination and 20% marks of less scored descriptive examination are considered.

e) For courses like Sports & Games/Cultural and NSS/Fine arts/Yoga/Self Defense, 100 marks for continuous internal evaluation shall be awarded by the respective class teacher based on the day-to-day participation and performance in the activities organized under each event.

II) Semester End Examinations – Evaluation:

Theory/ Drawing/ Integrated theory and laboratory/ Project based theory Courses

i) For all Theory/Drawing/Integrated theory and laboratory/Project based theory Courses, the semester end examination shall be conducted for 70 marks consisting of five internal choice questions (i.e "either" "or" choice), carrying 14 marks each. There will be two questions from each unit and the student should answer either of the two questions.

ii) There will not be any external assessment for laboratory and project components for integrated theory and laboratory course and project based theory course respectively.

iii) For design courses like Estimating, Costing & Valuation, Design of steel structures, Design of RC structures, Design of Irrigation structures, etc., the pattern for the semester end examination is given along with the syllabus of the respective subject.

iv) *For subjects like Functional English, Professional Communication, etc, the pattern of semester end examination is given along with the syllabus of the respective subject.*

Practical Courses:

The semester end examination shall be conducted for 35 marks by the teacher concerned and an external examiner appointed by the controller of examinations.

Skill Development Courses:

The semester end examination shall be conducted for 35 marks along with the practical examinations in the presence of an external and an internal examiner (course instructor or mentor).

For courses like Logic Building and Basic Coding Principles, Logic Building and Algorithmic Programming and Programming for corporate, semester end examination paper shall consists of 3 sets of questions and student has to choose any one set of Questions. Each set shall have three questions with three levels of complexity and evaluated for a total of 35 marks.

Community Service Project

i) Every student should put in a minimum of **180 hours** for the community service project during the summer vacation.
ii) Each class/section shall be assigned with a mentor.
iii) Departments shall concentrate on their major areas of respective departments concerned. For example, Dept. of Computer Science can take up activities related to computer Literacy to different sections of people like - youth, women, housewives, etc
iv) A log book to record the activities undertaken / involved shall be maintained by every student.
v) The log book has to be countersigned by the mentor concerned.
vi) A report shall be submitted by each student at the end of the semester.
vii) Based on the report and active participation of the student the semester end examination for 100 marks shall be awarded by a committee consisting of a mentor and a senior faculty member of the department.

Internship:

i) It shall be completed in collaboration with local industries, Govt. Organizations, construction agencies, Industries, Hydel and thermal power projects and also in software MNCs in the area of specialization of the UG programme.
ii) Students shall pursue this course during summer vacation just before it is offered as per course structure. The minimum duration of this course is at least 6 weeks.
iii) A supervisor shall be allotted to each batch of students to guide and for taking up the summer internship. The supervisor shall monitor the attendance of the students during the internship. Attendance requirements are as per the norms of the college.
iv) After successful completion, students shall submit a summer internship technical report to the department concerned.
v) A certificate from industry / skill development centre shall be included in the report.
vi) Semester end examination for 50 marks shall be conducted by a committee consisting of an external examiner, head of the department and supervisor for the internship. The report and the oral presentation shall carry 40% and 60% weightage respectively.

Project Work:

i) The major project work shall be carried out during the IV year 2nd semester.
ii) The project evaluation and semester end Viva–Voce examination for 140 marks shall be awarded by the committee consisting of an external examiner, head of the department and the supervisor of the project based on the report submitted and performance in Viva-Voce examination.

iii) The evaluation of project work shall be conducted at the end of the fourth year second semester.

Mandatory Non-Credit Courses:

i) For courses like Environmental Studies and Constitution of India, semester end examination shall be conducted by the respective departments internally for 70 marks.

ii) The pattern for examination is same as the regular theory courses.

iii) There is no semester end examination for courses, such as Sports & Games/ Cultural and NSS/Fine arts/Yoga/Self Defense.

Massive Open Online Courses (MOOCs):

i) Each student shall register for one Massive Open Online Course (MOOC) as per the course structure.

ii) A student shall register for MOOC offered by NPTEL, CISCO, MICROSOFT and SAYLOR or any other agency with a prior approval from the departmental committee.

iii) The duration of the course shall be a minimum of 12 weeks.

iv) The Head of the Department shall appoint one mentor for each course.

v) The courses should be other than those offered under regular curriculum and are to be approved by the departmental committee consisting of the head of the department, mentor and one/two senior faculty members before the commencement of each semester.

vi) During the course, the mentor monitors the students' assignment submissions given by the agency.

vii) Students need to submit all the assignments given and need to take final exam at the proctor centre.

viii) The required credits shall be awarded on submission of certificate from the approved agency.

ix) In case if student does not qualify in the chosen subject, the same or an alternative equivalent subject may be registered again in the next semester with the recommendation of the HoD concerned and shall pass.

8. Criteria for Passing a Course, Award of Grades and Award of Division:

i) Criteria for Passing a Course:

a) A candidate shall be declared to have passed in individual theory / integrated theory and laboratory / project based theory / drawing course/design course/ practical/ mini project/main project, if he/she secures a minimum of 40% aggregate marks (continuous internal evaluation & semester end examination marks put together), subject to securing a minimum of 35% marks in the semester end examination.

b) A candidate shall be declared to have passed in skill development courses/ industrial internship/socially relevant project if he/she secures a minimum of 40% marks in the semester end examination.

c) For non-credit mandatory courses, like environmental studies and constitution of India, the student has to secure minimum 40% aggregate marks (continuous internal evaluation & semester end examination marks put together) for passing the course. For courses like Sports & Games/Cultural and NSS/Fine arts/ Yoga/Self Defense, student shall be declared to have passed in the courses if he/she secures a minimum 40% of marks in continuous internal evaluation. No marks or letter grade shall be printed in the grade cards for all mandatory non-credit courses, but only Completed (Y)/Not-completed (N) will be specified. A student has to repeat the course whenever it is offered; if he does not get satisfactory grade or does not fulfill the attendance requirements in each non-credit course for getting the degree awarded.

d) On passing a course of a program, the student shall earn the credits assigned to that course.

ii) Method of Awarding Letter Grade and Grade Points for a Course:

a) A student shall be considered to have completed a course successfully and earned the credits if he/she secures an acceptable letter grade in the range A+ to E as given below.

b) Letter grade 'F' in any course implies failure of the student in that course and no credits earned. Absent is also treated as no credits earned.

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

Marks Range Theory (Max - 100)	Marks Range Lab (Max. - 50)	Level	Letter Grade	Grade Points
≥ 90	≥ 45	Outstanding	A+	10
≥ 80 & ≤ 89	≥ 40 & 44	Excellent	A	9
≥ 70 & 79	≥ 35 & 39	Very Good	B	8
≥ 60 & 69	≥ 30 & 34	Good	C	7
≥ 50 & 59	≥ 25 & 29	Above Average	D	6
≥ 40 & 49	≥ 20 & 24	Average	E	5
< 40	< 20	Fail	F	0
		Absent	AB	0

iii) Calculation of Semester Grade Point Average (SGPA)* for Semester:

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

SGPA = $\frac{\sum CR \times GP}{\sum CR}$ for each semester.

where CR = Credits of a course
GP = Grade Points awarded for a course

* SGPA is calculated for a candidate who passed all the courses in that semester.

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

Course	Credits (CR)	Grade Point (GP)	CR x GP
Subject 1	3	8	24
Subject 2	2	9	18
Subject 3	4	7	28
Subject 4	3	6	18
Subject 5	3	9	27
	∑CR=15		**∑CR x GP = 115**

$$SGPA = \frac{\sum CRxGP}{\sum CR} = \frac{115}{15} = 7.67$$

iv) Calculation of Cumulative Grade Point Average (CGPA) for Entire Program:

The CGPA is calculated as given below:

CGPA = $\frac{\sum CRxGP}{\sum CR}$ for entire program.

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

Illustration of CGPA:

Semester1	Semester2	Semester3	Semester4	Semester5	Semester6	Semester7	Semester8
Credits:15	Credits:22	Credits:24	Credits:22	Credits:23	Credits:21	Credits:20	Credits:20
SGPA:7.67	SGPA:7.86	SGPA:7.87	SGPA:8.67	SGPA:8.78	SGPA:8.50	SGPA:8.60	SGPA:9.00

$$CGPA = \frac{(15x7.67) + (22x7.86) + (24x7.87) + (22x8.67) + (23x8.78) + (21x8.50) + (20x8.60) + (20x9.00)}{(15 + 22 + 24 + 22 + 23 + 21 + 20 + 20)} = 8.38$$

v) Award of Division:

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of B.Tech. Degree and shall be placed in one of the following grades:

Class of Award	CGPA to be Secured	Remarks
First Class with Distinction	≥ 7.75 (Without any Supplementary Appearance)	From the CGPA secured from 160 Credits
First Class	≥ 6.75	
Second Class	≥ 5.75 & < 6.75	
Pass Class	≥ 5.00 & < 5.75	

9. Grade Card and Consolidated Grade Card

i) A grade card shall be issued for each semester separately both for regular and supplementary examinations irrespective of passing the examination.

ii) A grade card consists of a letter grade and credits earned for all courses of that semester along with SGPA and CGPA.

iii) A consolidated grade card consisting of all semesters' courses with the letter grade and credits secured for each course, CGPA and award of division shall be issued if he/she fulfills the academic regulations B.Tech. program.

10. Supplementary Examinations

Supplementary examinations will be conducted twice in a year at the end of odd and even semesters.

11. Conditions for Promotion

i) A student shall be eligible for promotion to next Semester of B.Tech. program, if he satisfies the conditions as stipulated in Regulation 6.

ii) The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in Regulation 6 for promotion into III Year I semester and IV year I semester.

a) 4 Year B.Tech Program:

i) A student shall be promoted from II year to III year only if he acquires the academic requirement of a minimum of 40% credits up to second year second semester as shown below.

1.Two regular and two supplementary examinations of I year I semester,

2.Two regular and one supplementary examinations of I year II semester,

3.One regular and one supplementary examinations of II year I semester

4.One regular examination of II year II semester,

irrespective of whether the candidate takes the examination or not.

ii) A student shall be promoted from III year to IV year only if he acquires the academic requirement of a minimum of 40% credits upto third year second semester as shown below.

1. Three Regular and three supplementary examinations of I year I sem.,

2. Three Regular and two supplementary examinations of I year II sem.,

3.Two Regular and two supplementary examinations of II year I semester,

4.Two Regular and one supplementary examinations of II Year II semester,

5.One Regular and one supplementary examinations of III Year I semester,

6.One regular examination of III Year II semester,

irrespective of whether the candidate takes the examination or not.

b) 3 Year B.Tech Program under Lateral Entry Scheme:

i) A student shall be promoted from III to IV year only if he acquires the academic requirement of a minimum of 40% credits up to third year second semester as shown below.

1. Two regular and two supplementary examinations of II year I semester,
2. Two Regular and one supplementary examinations of II year II semester,
3. One regular and one supplementary examinations of III year I semester
4. One regular examination of III year II semester,

irrespective of whether the candidate takes the examination or not.

12. Revaluation

i) Students can apply for revaluation of his/her answer script(s) of theory course(s) as per the notification issued by the Controller of Examinations.

ii) The Controller of Examinations shall arrange for revaluation of such answer script(s).

iii) An examiner, other than the first examiner, shall revaluate the answer script(s).

iv) If the variation in marks of two evaluations is less than 15% of total marks, the best mark of two evaluations shall be taken into consideration.

v) If the variation in marks of two evaluations is more than 15% of total marks, there shall be third evaluation by an examiner other than the first two examiners. The best marks of two evaluations (which are nearer) shall be taken into consideration.

vi) There is no revaluation for practical/ Mini Project/ Skill Development Courses/ Social relevant Project/ Main Project courses.

13. Re-admission Criteria

i) A candidate, who is detained in a semester due to the lack of attendance has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling the required norms stipulated by the college and by paying the required tuition fee and special fee in addition to paying an administrative fee of Rs.1,000/-.

ii) A candidate who is not promoted either to III year or IV year due to lack of required credits can seek admission into III / IV year in subsequent years after obtaining the required credits as stipulated in regulation 11 by paying the required tuition fee & special fee in addition to paying an administrative fee of Rs.1000/-

14. Break in Study

Student, who discontinues the studies for what-so-ever reason, can get readmission into appropriate semester of B.Tech program only with the prior permission of the Principal of the College, provided such candidate shall follow the transitory regulations applicable to the batch he joins. An administrative fee

of Rs.2,000/- per each year of break in study in addition to the prescribed tuition fee and special fees should be paid by the candidate to condone his break in study.

15. Transitory Regulations

When a student is detained due to lack of credits or shortage of attendance, he/she may be readmitted into the same semester in which he/she has been detained. However, the academic regulations under which the detained student was first admitted shall continue to be applicable to him/her.

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 only be permitted to be transferred to this college. A student who is transferred from the other Autonomous colleges to this college in second year first 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 shall be equal to 160 for regular students and 120 for lateral entry students.

16. Withholding of Results

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

17. Malpractices and Punishments

i) Every student appearing for the Examinations is liable to be charged with committing malpractice(s), if he/she is observed as committing any one or more of the acts mentioned in of examination malpractices and punishments.

ii) The Principal shall refer the cases of malpractices in internal assessment tests and semester end examinations to a malpractice enquiry committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the erring students based on the recommendations of the committee.

iii) Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder.

DISCIPLINARY ACTION FOR MALPRACTICES/IMPROPER CONDUCT IN EXAMINATIONS

	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 candidates 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. The hall ticket of the candidate shall be cancelled.

3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for the examinations of the remaining subjects of that semester. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the impostor 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 takes out or arranges to send out the question paper during the examination or answer book during or after the examination.	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. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of performance in that subject.

6.	Refuses to obey the orders of the Chief Superintendent/Assistant Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in or around the examination hall or organises a walkout or instigates others to walkout or threatens the officer-in-charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the Officer-in-charge or any person on duty in or outside the examination hall of any of his relations or indulges in any other act of misconduct or mischief which results in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the Officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	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 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. The candidate is also debarred for two consecutive semesters from class work and all university examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that semester. The candidate is also debarred and forfeits the seat.

9	If student of the college who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	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. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to the police and a police case is registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester.
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 examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be referred to the Chief Superintendent of Examinations for future action towards suitable punishment.	

iv) Malpractices identified at spot centre during valuation

The involvement of the staff, who are in charge of conducting examinations, valuing examination papers and preparing / keeping records of documents related to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned at the examination shall be viewed seriously and appropriate disciplinary action will be taken after thorough enquiry.

18. Other Matters

i) Physically challenged candidates who have availed additional examination time and a scribe during their Intermediate/EAMCET examinations will be given similar concessions on production of relevant proof/documents. Students who are suffering from contagious diseases are not allowed to appear either for internal or semester end examinations.

ii) The students who participated in coaching / tournaments held at State / National / International levels through University / Indian Olympic Association during semester end external examination period will be promoted to subsequent semesters as per the guidelines of University Grants Commission Letter No. F.1-5/88 (SPE/PES), dated 18-08-1994.

iii) The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the Departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the Departments shall be reported to the Academic Council for ratification.

18. General

i) The Academic Council may, from time to time, revise, amend or change the regulations, schemes of examination and /or syllabi.

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

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

iv) Wherever the word he, him or his occurs, it will also include she, her and hers.

Honors Degree Guidelines

I. Introduction

The goal of introducing B.Tech. (Honors) is to facilitate the students to choose additionally the specialized courses of their choice and build their competence in a specialized area in the UG level. The programme is a best choice for academically excellent students having good academic record and interest towards higher studies and research. All the students pursuing regular B.Tech. with prerequisite CGPA are eligible to register Honors degree course. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the B.Tech. Honors degree. The additional courses shall be advanced subjects in the concerned department/discipline. The department concerned will determine required courses for award of Honor degree. The subjects in the Honor degree would be a combination of core (theory and lab) and some electives.

II. Objectives

The objectives of initiating the B.Tech. (Honors) degree certification are:

a) To encourage the under graduates towards higher studies and research
b) To prepare the students to specialize in core Engineering streams
c) To attain the high-level competence in the specialized area of under graduate programme
d) To learn the best educational and professional skills in the specialized area after the completion of his under graduate courses.
e) To provide the opportunity to learn the post graduate level courses in the specified under graduate programme

III. Eligibility

a) The following departments are offering B.Tech. (Honors);
   - Civil Engineering
   - Electrical and Electronics Engineering
   - Mechanical Engineering
   - Electronics and Communication Engineering
   - Computer Science and Engineering

b) B. Tech students (both Regular and Lateral Entry) pursuing a major degree programme can register for Honors degree at their choice in the same department offering major degree from IV semester onwards.

c) Students registering for Honors degree shall select the subjects from same branches/department based on the recommendations of BoS committee. For example, if a student pursuing major degree in Electrical and Electronics Engg. shall the selects subjects in Electrical and Electronics Engg. only and he/she will get major and Honors degree in Electrical and Electronics Engineering.

d) Students registered for honors shall not be permitted to register for B. Tech (Minor).

e) Students who have a CGPA of 8.00 or above, without any backlogs, up to III semester for regular students and only III semester for lateral entry students will be permitted to register for honors degree.

f) CGPA of more than 8.00 has to be maintained in the subsequent semesters of regular degree and also 8.00 GPA has to be maintain in Honors degree to keep the Honor degree registration active.

g) Student registered for Honors degree in a discipline must register and pass in all subjects with a minimum CGPA of 8.0 that constitute requirement for award of Honors degree.

h) The subjects completed under Honors degree programme shall not be considered as equivalent subjects in case the student fails to complete the major degree programme.

IV. Registering for Honor degree

a) Total number of seats offered for a Honors programme shall be a maximum of 35% of sanctioned intake of major degree programme.

b) There is no fee for registration of subjects for Honors degree programme

c) The department offering the honors degree will declare courses offered before the start of the semester.

d) The eligible list of students shall be displayed in the respective department notice board before the start of the semester.

e) The eligible interested students shall submit a registration form to the HoD of concerned department and the department shall maintain the record of students pursing the Honors degree. The process of registration should be completed within one week before the start of every semester.

f) If the student wishes to withdraw, he/she shall inform the same to HoD of concerned department within two weeks after registration of the Honors degree.

V. Attendance Requirements

a) The overall attendance in each semester of regular B. Tech courses and Honors courses shall be computed separately.

b) A student shall maintain an overall attendance of 75% in all registered courses of Honors to be eligible for attending semester end examinations. However, condonation for shortage of attendance up to 10% may be given as per college norms. On the recommendations of College Academic Committee, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.

c) Student having less than 65% attendance in Honors courses shall not be permitted for end semester examinations.

d) A student detained due to lack of attendance in major B. Tech programme shall not be permitted to continue Honors programme.

e) If a student is detained due to lack of attendance in Honors degree courses, he/she shall not be permitted to continue Honors programme.

VI. Credits requirement

a) Honors degree shall not be awarded at any circumstances without completing the regular major B.Tech. programme in which a student got admitted.

b) A Student will be eligible to get Honors degree along with major degree engineering, if he/she gets an additional 20 credits offered through Honors degree courses.

c) Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of Honors degree, with four courses(both theory and lab), each carrying 4 credits. The remaining 4 credits must be acquired with two courses through online from platforms like NPTEL, etc., which shall be domain specific, each with 2 credits and with a minimum duration of 12 weeks as recommended by the Board of Studies.

d) Students shall produce a certificate issued by the online platforms like NPTEL, etc. as a proof of credit attainment.

e) Transfer of credits from a particular Honors to regular B.Tech. and Vice-Versa shall not be permitted.

f) If a student fails in any registered course of the Honors degree, he/she shall not be eligible to continue the B.Tech. Honors degree. However, the additional credits and grades thus far earned by the student shall be included in the separate grade card but shall not be considered to calculate the CGPA.

VII. Examinations

a) The examination for the Honors courses offered shall be conducted along with regular B.Tech. programme.

b) The pattern of internal and semester end examinations for Honors degree courses will be similar to regular B.Tech. courses.

c) A separate grade card shall be issued for the Honors subjects passed in each semester.

d) There is no supplementary examination for the failed subjects in a Honors programme.

e) Examination Fee to be paid will be as per the college norms.

Note: ***In the event of any tie during the seat allotment for a Honors degree, the concerned major degree department offering Honors shall conduct a test on the prerequisite subjects of Honors degree and final decision shall be taken.***

Minor Degree Guidelines

I. Introduction

Looking to global scenario, engineering students should have knowledge of subjects from other branches and some advanced subjects of their respective branch in which they are perusing the degree. To complement the same college has decided to take an initiative from 2020-21 in academics by introducing minor degree to the undergraduate students enrolled in the B.Tech. This gives a provision to the students to pursue minor other than the discipline in which student got admitted. An aspiring student can choose the courses and laboratories in any other discipline and can get a minor degree in the chosen specialization in addition to regular major B.Tech. degree. This way undergraduates are not restricted to learn about courses only in the discipline they get admitted to, but can choose courses of their interest to later on take up a career path of their liking. The students taking up a minor degree course will get additional credits. A student has to acquire 20 more credits, in addition to 160 credits required, for the award of the minor degree. The department concerned will determine the required courses for award of minor degree. The subjects in minor programme would be a combination of mostly core and some electives.

II. Objectives

The objectives of initiating the minor degree certification are:

a) To diversify the knowledge of the undergraduates.
b) To make the undergraduates more employable.
c) To have more educational and professional skills after the completion of his undergraduate courses.
d) To give a scope to specialize students in other streams of engineering in addition to the ones they are currently pursuing.

III. Eligibility

a) The following departments are offering B.Tech. (Minor);
   - Civil Engineering
   - Electrical and Electronics Engineering
   - Mechanical Engineering
   - Electronics and Communication Engineering
   - Computer Science and Engineering
   - Information Technology

b) The B.Tech. students (both Regular and Lateral Entry) pursuing a major degree programme can register for minor degree at their choice in any other department offering minor from IV semester onwards.

c) Student pursuing major degree in any engineering branch is eligible to register for minor in any other engineering branch. For example, if a student pursuing major degree in Electrical and Electronics Engineering shall complete minor in Civil Engineering and he/she will get major degree of Electrical and Electronics Engineering with minor of Civil Engineering.

d) However, students pursuing major degree in a particular engineering branch are not allowed to register for minor in the same branch.

e) The students are permitted to opt for only a single minor degree in his/her entire tenure of B.Tech. programme.

f) The students registered for minor degree shall not be permitted to register for B.Tech. (Honors.)

g) Students who have a CGPA of 7.75 or above, without any backlogs, up to III semester for regular students and only III semester for lateral entry students will be permitted to register for a minor.

h) CGPA of more than 7.75 has to be maintained in the subsequent semesters of regular degree and also 7.75 GPA has to be maintain in Minor degree to keep the Minor degree registration active.

i) A student registered for minor in a discipline must register and pass in all subjects with a minimum CGPA of 7.75 that constitute requirement for award of minor.

j) The subjects completed under minor degree shall not be considered as equivalent subjects in case the student fails to complete the major degree programme.

IV. Registering for Minor Degree

a) Total number of seats offered for a minor degree programme shall be a maximum of 35% of sanctioned intake of major degree programme.

b) There is no fee for registration of subjects for minor degree programme

c) The department offering the minor will declare courses offered before the start of the semester.

d) The eligible list of students shall be displayed in the respective department notice board before the start of the semester.

e) The eligible interested students shall apply to the HoD offering the minor degree through HoD of his/her parent department and after scrutiny the department offering minor will announce the final list of the selected students for the minor degree.

f) The selected students shall submit a registration form to the HoD offering the minor degree through HoD of his/her parent department. The process of registration should be completed within one week before the start of every semester.

g) Both parent department and department offering minor shall maintain the record of students pursing the minor degree.

h) If the student wishes to withdraw, he/she shall inform the same to HoD of department offering minor degree through HoD of parent department within two weeks after registration of the minor degree.

V. Attendance Requirement

a) The overall attendance in each semester of regular B.Tech. courses and minor courses shall be computed separately.

b) A student shall maintain an overall attendance of 75% in all registered courses of minor degree to be eligible for attending semester end examinations. However, condonation for shortage of attendance up to 10% may be given as per college norms. On the recommendations of College Academic Committee, the student concerned will be permitted to take the semester end examinations, on payment of condonation fee of Rs. 500/-.

c) Student having less than 65% attendance in minor courses shall not be permitted for end semester examinations.

d) A student detained due to lack of attendance in major B.Tech. programme shall not be permitted to continue minor degree programme

e) If a student is detained due to lack of attendance in minor degree courses, he/she shall not be permitted to continue minor programme

VI. Credits requirement

a) Minor degree shall not be awarded at any circumstances without completing the regular major B.Tech programme in which a student got admitted.

b) A Student will be eligible to get minor degree along with major degree engineering, if he/she gets an additional 20 credits offered through minor degree courses.

c) Of the 20 additional credits to be acquired, 16 credits shall be earned by undergoing specified courses of minor degree, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired with two courses through online platforms like NPTEL, etc., which shall be domain specific, each with 2 credits and with a minimum duration of 12 weeks as recommended by the Board of Studies.

d) Students shall produce a certificate issued by the online platforms like NPTEL, etc. as a proof of credit attainment.

e) Transfer of credits from a minor to regular B.Tech and Vice-Versa shall not be permitted.

f) If a student fails in any registered course of the minor degree, he/she shall not be eligible to continue the B.Tech. minor degree. However, the additional credits and grades thus far earned by the student shall be included in the separate grade card but shall not be considered to calculate the CGPA.

VII. Examinations

a) The examination for the minor courses offered shall be conducted along with regular B.Tech. programme.

b) The pattern of internal and semester end examinations for minor degree courses will be similar to regular B.Tech. courses.

c) A separate grade card shall be issued for the minor degree subjects passed in each semester.

d) There is no supplementary examination for the failed subjects in a minor degree programme.

e) Examination Fee to be paid will be as per the College norms.

Note: ***In the event of any tie during the seat allotment for a Minor degree, the concerned department offering Minor degree shall conduct a test on the prerequisite subjects of Minor degree and final decision shall be taken.***

COURSE STRUCTURE

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SYLLABUS

COURSE STRUCTURE

I Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	EG3501	Functional English	3	-	-	3
2	MA3502	Descriptive Statistics	2	1	-	3
3	MA3504	Engineering Calculus	2	1	-	3
4	CT3502	Programming for Problem Solving	3	-	-	3
5	UH3501	Universal Human Values 2: Understanding Harmony	2	1	-	3
6	EG3502	Functional English Lab	-	-	2	1
7	MA3503	Statistics Using R Lab	-	-	2	1
8	CT3503	C Programming Lab	-	-	4	2
		Total	**12**	**3**	**8**	**19**
9	BA3501	Constitution of India (Mandatory Non-Credit Course)	2	-	-	-

I Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	EG3503	Professional Communication	2	-	-	2
2	MA3505	Integral Transforms and Vector Calculus	3	1	-	4
3	MA3507	Linear Algebra	2	1	-	3
4	CT3504	Python Programming	3	-	-	3
5	CT3505	Data Structures	3	-	-	3
6	EG3504	Professional Communication Lab	-	-	4	2
7	CT3506	Python Programming Lab	-	-	4	2
8	CT3507	Data Structures Lab	-	-	4	2
		Total	**13**	**2**	**12**	**21**
9	EN3501	Environmental Studies (Mandatory Non-Credit Course)	2	-	-	-

L : Lecture **T : Tutorial** **P : Practical**

II Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	BA3502	Managerial Economics and Financial Analysis	3	-	-	3
2	MA3512	Advanced Statistics	3	-	-	3
3	CT3510	Digital Logic Design	2	1	-	3
4	CT3511	Object Oriented Programming through Java	3	-	-	3
5	CT3512	Database Management Systems	3	-	-	3
6	CT3513	Formal Languages and Automata Theory	2	1	-	3
7	CT3514	Java Programming Lab	-	-	4	2
8	CT3515	Database Management Systems Lab	-	-	4	2
9	SD3502	Logic Building and Algorithmic Programming	-	-	2	1
		Total	**16**	**2**	**10**	**23**
10	SG3501	Sports and Games / Cultural (Mandatory Non-Credit Course)	-	-	2	-

* **Integrated Course with Theory and Laboratory**

II Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	MA3511	Discrete Mathematical Structures	2	1	-	3
2	CT3518	Computer Organization	3	-	-	3
3	CT3520	Compiler Design	2	1	-	3
4	CT3521	Artificial Intelligence	3	-	-	3
5	CS3502	Software Engineering *	3	-	2	4
6		**Open Elective - I**	3	-	-	3
7	AD3501	Artifical Intelligence Lab	-	-	2	1
8	CT3524	Game Programming	1	-	2	2
9	SD3503	Programming for Corporate	-	-	2	1
		Total	**17**	**2**	**8**	**23**
10	NS3501	NSS / Fine Arts / Yoga / Self Defense (Mandatory Non-Credit Course)	-	-	2	-

* **Integrated Course with Theory and Laboratory**

L : Lecture T : Tutorial P : Practical

III Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CT3519	Operating Systems	3	-	-	3
2	CT3527	Computer Networks	3	-	-	3
3	CT3528	Full Stack Application Development	3	-	-	3
4	CS3501	Design and Analytics of Algorithms	2	1	-	3
5		**Professional Elective - I**	3	-	-	3
6		**Open Elective - II**	3	-	-	3
7	CT3538	Computer Networks Lab	-	-	2	1
8	CT3539	Web Application Development Using Full Stack	-	-	4	2
9	SD3505	Competitive Coding	-	-	2	1
10	AD3503	Community Service Project	-	-	8	4
		Total	**17**	**1**	**16**	**26**

III Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CT3544	Image Processing	3	-	-	3
2	CT3545	Data Science	3	-	-	3
3	CT3546	Machine Learning**	2	-	2	3
4		**Professional Elective - II**	3	-	-	3
5		**Open Elective - III**	3	-	-	3
6	AD3507	Data Science Lab	-	-	2	1
7	CT3552	MEAN Stack Technologies	-	-	4	2
8	SD3506	Linguistic Competency Building	-	-	2	1
		Total	**14**	**-**	**10**	**19**

** **Project base Theory Course**

L : Lecture T : Tutorial P : Practical

IV Year - I Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	CT3553	Big Data Analytics	3	-	-	3
2	CT3548	Deep Learning	3	-	-	3
3		**Professional Elective - III**	3	-	-	3
4		**Professional Elective - IV**	3	-	-	3
5		**Professional Elective - V**	3	-	-	3
6	CT3565	Big Data Analytics Lab	-	-	2	1
7	AD3510	Internship/ Industrial Training/ Practical Training	-	-	6	3
8	AD3511	MOOCs	-	-	-	2
		Total	**15**	**-**	**8**	**21**

IV Year - II Semester

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1	AD3512	Major Project	-	-	16	8
		Total	**-**	**-**	**16**	**8**

Open Elective - I

Sl. No.	Course Code	Name of the Course / Laboratory	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE3513	Elements of Civil Engineering (other than CE)	CE	3	-	-	3
2	CE3514	Environment Laws and Policies (other than CE)	CE	3	-	-	3
3	EE3513	Electrical Materials (other than EEE)	EEE	3	-	-	3
4	EE3514	Control Systems Engineering(other than EEE&ECE)	EEE	3	-	-	3
5	ME3517	Automotive Engineering (other than ME)	ME	3	-	-	3
6	ME3518	Elements of Mechanical Transmission (other than ME)	ME	3	-	-	3
7	EC3520	Introduction to Embedded Systems (other than ECE/IoT)	ECE	3	-	-	3
8	EC3521	Fundamentals of Communication Systems (other than ECE/IoT)	ECE	3	-	-	3
9	CS3503	Information Retreival Systems (Other than CSE & AI&DS)	CSE	3	-	-	3
10	CT3522	Computer Graphics (Other than CSE, IT & AI&DS)	CSE	3	-	-	3
11	IT3504	System Software (Other than IT)	IT	3	-	-	3
12	IT3505	Free & Open Source Software (Other than IT)	IT	3	-	-	3
13	MA3516	Fuzzy Mathematics	BS&H	3	-	-	3

Open Elective - II

Sl. No.	Course Code	Name of the Course / Laboratory	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE3524	Remote Sensing & GIS (other than CE)	CE	3	-	-	3
2	CE3525	Green Building Technology (other than CE)	CE	3	-	-	3
3	EE3524	Modeling & Simulation of Engineering Systems (other than EEE)	EEE	3	-	-	3
4	EE3525	Power Systems Engineering (other than EEE)	EEE	3	-	-	3
5	ME3528	Renewable Energy Sources (other than ME)	ME	3	-	-	3
6	ME3529	Venture Development (other than ME)	ME	3	-	-	3
7	EC3535	Automotive Electronics (other than ECE & IoT)	ECE	3	-	-	3
8	EC3536	Introduction to Signal Processing (other than ECE&IoT)	ECE	3	-	-	3
9	CS3504	Network Programming (Other than CSE)	CSE	3	-	-	3
10	CT3529	Social Network Analysis(Other than CSE/CSE(AI&ML))	CSE	3	-	-	3
11	CT3530	Cyber Security (Other than IT)	IT	3	-	-	3
12	IT3508	E-Commerce (Other than IT)	IT	3	-	-	3
13	AD3502	Intelligent Systems (Other than AI&DS)	AI&DS	3	-	-	3
14	CT3531	Recommender Systems(Other than CSE, IT, CSE(AI&ML) & AI&DS)	AI&DS	3	-	-	3
15	IN3514	Introduction to IoT Architecture (Other than IoT)	IoT	3	-	-	3
16	IN3515	Introduction to Smart Sensors (Other than IoT)	IoT	3	-	-	3

Open Elective - III

Sl. No.	Course Code	Name of the Course / Laboratory	Department Offering the Subject	No.of Periods per week			No.of Credits
				L	T	P	
1	CE3538	Basics of Environmental Engineering (other than CE)	CE	3	-	-	3
2	CE3539	Disaster Preparedness, Planning & Management (other than CE)	CE	3	-	-	3
3	EE3535	Principles of Special Electric Machines (other than EEE)	EEE	3	-	-	3
4	EE3536	Electrical Instrumentation (other than EEE)	EEE	3	-	-	3
5	ME3541	Green Engineering (other than ME)	ME	3	-	-	3
6	ME3542	3D Printing Technologies (other than ME)	ME	3	-	-	3
7	EC3548	Assistive Technologies(other than ECE)	ECE	3	-	-	3
8	EC3549	Introduction to Bio-Medical Engineering (other than ECE&IoT)	ECE	3	-	-	3
9	CS3511	DevOps (Other than CSE and IT)	CSE	3	-	-	3
10	CS3512	Object Oriented Analysis & Design (Other than CSE)	CSE	3	-	-	3
11	IT3515	Scripting Languages (Other than IT)	IT	3	-	-	3
12	IT3516	Fundamentals of Software Project Management(Other than CSE&IT)	IT	3	-	-	3
13	AD3505	Web Mining (Other than AI&DS)	AI&DS	3	-	-	3
14	AD3506	AI Chatbots (Other than AI&DS and CSE (AI&ML))	AI&DS	3	-	-	3
15	IN3521	Trends in IoT (Other than IoT)	IoT	3	-	-	3
16	EG3505	Academic Communication	ENG	3	-	-	3

Professional Electives

Sl. No.	Course Code	Name of the Course / Laboratory	No.of Periods per week			No.of Credits
			L	T	P	
1		**Professional Elective - I**	3	-	-	3
	CT3532	i) UML and Design Patterns				
	CT3535	ii) Knowledge Representation and Ontology				
	CT3536	iii) Data Warehousing and Data Mining				
	CT3537	iv) Virtual and Augmented Reality				
2		**Professional Elective - II**	3	-	-	3
	AD3504	i) Statistical Learning				
	CT3549	ii) Internet of Things				
	CT3550	iii) Ethical Hacking				
	CT3551	iv) Pattern Recognition				
3		**Professional Elective - III**	3	-	-	3
	CT3547	i) Cryptography and Network Security				
	CT3555	ii) Cloud Computing				
	CT3556	iii) Natural Language Processing				
	CT3559	iv) Enterprise Chatbots				
4		**Professional Elective - IV**	3	-	-	3
	CT3558	i) Introduction to Recommender Systems				
	CT3561	ii) Blockchain Technologies				
	CT3563	iii) Video Processing				
	CT3564	iv) Reinforcement Learning				
5		**Professional Elective - V**	3	-	-	3
	CT3543	i) Soft Computing Techniques				
	CT3560	ii) Data Visualization Techniques				
	AD3508	iii) NoSQL Databases				
	AD3509	iv) Robotic Process Automation				

L : Lecture **T : Tutorial** **P : Practical**

SYLLABUS

FUNCTIONAL ENGLISH
(Common to All Branches)

I Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To equip the students for their present and future academic pursuits involving the following:
  - listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately;
  - speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture;
  - reading a wide range of informational and functional texts, including course books and reference materials, from print and non-print sources and using them for a variety of purposes; and
  - writing for academic purposes (e.g. assignments, examination answers) in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately; and
- To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English.

Course Outcomes

Upon successful completion of Functional English, the students will be able to

- speak with a reasonable degree of fluency using communication strategies (i.e. using language appropriately to carry out functions such as greeting, requesting information, seeking confirmation, disagreeing) as well conventions of politeness and courtesy
- speak with a reasonable degree of fluency and accuracy in contexts requiring tasks such as narrating and describing
- listen to short audio and video clips
  - in standard Indian accent with understanding of the types listed in D (1) (a) below; and
  - in native English accent (British and American), especially clips in which the speakers or voice actors speak slowly, and gain both understanding of messages and sensitivity to native-speaker accents
- read fluently comprehending texts of different kinds using multiple strategies to understand explicitly-stated information as well as underlying meanings

- write coherent paragraphs with attention to elements of writing such as content, organization, language, style, and mechanics and the conventions of academic writing
- write survey reports with attention to conventions of report writing
- guard against mistakes Indians typically make in their speech and writing in English

Course Content

UNIT – I:

Listening : Listening Comprehension – Task 1 (IWE - Chapt II)
Speaking : Communication Functions – Conversation between Raghu and Sridhar (IWE - Chapt II)
Reading : Reading Comprehension – Task 1 (DPM)
Vocabulary: (a) GRE Words – 1.1, (b) Collocations – 2.1 (VB)
Grammar : Tenses – Simple Present and Present Continuous (IWE - Chapt II)
Writing : Paragraph-Writing (IWE - Chapt II)

UNIT – II:

Listening : Listening comprehension – Task 2 (WR)
Speaking : Communication Functions – Exercise (DPM)
Reading : Reading Comprehension – Task 2 (DPM)
Vocabulary : (a) Words Often Confused–3.1, (b) One-Word Substitutes–4.1 (VB)
Grammar : (a) Indianism and (b) *Have to* (IWE - Chapt II)
Writing : Paragraph-Writing (IWE - Chapt II)

UNIT – III:

Listening : Listening Comprehension – Task 3 (IWE - Chapt III)
Speaking : Communication Functions – Conversation between Shreya and Kalpana (IWE - Chapt III)
Intensive Reading : Reading Comprehension Task – 3 (DPM)
Extensive Reading : *The Adventures of Huckleberry Finn* by Mark Twain
Vocabulary: (a)Idioms – 5.1, (b) Phrasal Verbs – 6.1 (VB)
Grammar : Tenses – Simple Past and Present Perfect (IWE - Chapt III)
Writing : Paragraph-Writing – Coherence (IWE - Chapt III)

UNIT – IV:

Listening : Listening Comprehension – Task 4 (IWE - Chapt IV)
Speaking : Communication Functions – Conversation between professor and Mayur (IWE - Chapt IV)
Reading : Reading Comprehension – Task 4 (DPM)
Vocabulary: (a) GRE words–1.2, (b) Collocations–2.2, (c) Words Often Confused–3.2(VB)
Grammar : Expressing Futurity (IWE - Chapt IV)
Writing : Clutter-Free Writing (IWE - Chapt IV)

UNIT – V:

Listening : Listening comprehension – Task 5 (WR)

Speaking : (a) Communication Functions and (b) Telephone Etiquette – Exercises (IWE - Chapt IV)

Intensive Reading : Reading Comprehension – Task 5 (DPM)

Extensive Reading : *More Tales from Shakespeare* by Charles and Mary Lamb

Vocabulary: (a) One-Word Substitutes – 4.2, (b) Idioms – 5.2, (c) Phrasal verbs – 6.2 (VB)

Grammar : Structure – *Going to* (IWE - Chapt IV)

Writing : Technical Report Writing (DPM)

- IWE – *Innovate with English* by T Samson (Foundation)
- Chapt – Chapter
- DPM – Department-produced materials (handouts)
- WR – Web-resources
- VB – *Vocabulary Builder for Students of Engineering and Technology* by Vijaya Lakshmi et al (Maruthi)

Text books

1. T. Samson, Innovate with English, First Edn., Cambridge University Press India Pvt. Ltd. under the imprint of Foundation Books, Hyderabad, 2010.
   - Units TWO, THREE and FOUR only
2. M. Vijaya Lakshmi, et al., Vocabulary Builder for Students of Engineering and Technology, Second Edn., Maruthi Publications, Hyderabad, 2017.
3. The following simplified classics, one for each mid-semester, from the series, Great Stories in Easy English, published by S. Chand & Company Limited:
   - The Adventures of Huckleberry Finn by Mark Twain
   - More Tales from Shakespeare
4. Audio and video clips carefully selected by the Department in order to sensitize the students to native-speaker accents
5. Department-produced material on survey report writing

Testing Pattern

First Mid-Term Examination

The paper consists of four questions. All questions are compulsory; there is no choice.

I. Reading an unseen passage and answering two sets of questions on it:

a) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set. Four of the eight questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 8 x ½ = 4**

b) Writing a discussion either on an aspect related to the ideas expressed in the passage but not explicitly dealt with in it, or on an idea not fully dealt with, allowing scope for discussion. **Marks: 1 x 4 = 4**

II. Twelve contextualized questions of the following from *Vocabulary Builder*: GRE Words: 1.1; Collocations: 2.1; Commonly confused words: 3.1; One-word substitutes: 4.1; Idioms: 5.1; and Phrasal verbs: 6.1 **Marks: 12 x ½ = 6**

III.

a) Correction of grammatical errors: Eight sentences with grammatical errors of the following types (dealt with in Units 2 and 3 of *Innovate with English*) will be given: simple present, present continuous, use of *have to* structure and Indianism **Marks: 8 x ½ = 4**

b) Eight objective-type questions based on one retold classic: *The Adventures of Huckleberry Finn*. **Marks: 8 x ½ = 4**

IV.

a) Completing a conversation (in which informational and interactional functions are performed) with appropriate expressions. **Marks: 8 x ½ = 4**

b) Reading two poorly-written paragraphs and performing the following tasks:

i. Identifying the topic sentence of paragraph (a) and the sentences that do not support the topic sentence, and writing in the answer book the topic sentence and the irrelevant sentences. **Marks: 4 x ½ = 2**

ii. Re-writing paragraph (b), which is poorly organized, into a coherent paragraph choosing appropriate sequence signals or connectives. **Marks: 4 x ½ = 2**

Second Mid-Term Examination

The paper consists of four questions All questions are compulsory; there is no choice.

I.a) Eight contextualized questions on the following from *Vocabulary Builder*: GRE Words: 1.1; Collocations: 2.1; Commonly confused words: 3.1; One- word substitutes: 4.1; Idioms: 5.1; and Phrasal verbs: 6.1 **Marks: 8 x ½ = 4**

b) Analyzing a service encounter – an interaction, either a direct personal one, or over the telephone (e.g. *making enquires at the reception counter in a hotel, an interaction with a salesman at a mall, asking for information on the telephone)* – and

i. identifying the reasons for the failure or breakdown of communication in the conversation **Marks: 4 x ½ = 2**

ii. rewriting the conversation making the communication successful. In the rewritten conversation, the partners in the conversation must sound polite and positive, using the communication strategies listed in the question.**Marks: 4 x ½ = 2**

II. Reading an unseen passage and answering two sets of questions on it:

a) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set. Four of the Eight questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 8 x ½ = 4**

b) Writing a discussion either on an aspect related to the ideas expressed in the passage but not explicitly dealt with in it, or on an idea not fully dealt with, allowing scope for discussion. **Marks: 1 x 4 = 4**

III.

a) Writing a technical report on the given situation. The report must:
follow the conventions of technical report writing
use language and style appropriate to technical report writing
Marks: 1 x 4 = 4

b) Writing a paragraph of 100 - 150 words on the given topic (e.g. *Should there be a dress code in colleges?*). The paragraph must have:
adequate and relevant ideas on the topic with the ideas properly organized using strategies such as coherence and cohesion;
a topic sentence; and
proper choice of vocabulary and grammatical accuracy. **Marks: 1 x 4 = 4**

IV.

a) Correction of grammatical errors: six sentences with grammatical errors of the following types (dealt with in Unit 4 of *Innovate with English*) will be given: futurity and Indianism. **Marks: 6 x ½ = 3**

b) Six objective-type questions based on one retold classic: *More Tales from Shakespeare.* **Marks: 6 x ½ = 3**

Semester End Examination

Answer any five questions. Question one is compulsory.

I. Reading an unseen (unfamiliar) passage, preferably one taken from a newspaper or a magazine, on a topical event or situation and answering three sets of questions on it:

a. Seven comprehension questions:
- Critical questions requiring analysis, inference, prediction, evaluation, etc. are to be set; 'information' questions involving a mere reproduction of the content should be avoided.
- Three of the seven questions should be multiple-choice questions.
- In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 7 x 1 = 7**

b. Finding four one-word substitutes in the passage for the expressions given. **Marks: 4 x ½ = 2**

c. Writing a discussion either on an aspect related to the ideas expressed in the passage but not explicitly dealt with in it, or on an idea not fully dealt with, allowing scope for discussion. **Marks: 1 x 5 = 5**

II. Reading an incomplete conversation that takes place in an academic or social or professional context (where informational and interactional functions are performed) and answering the following questions on it:

a. Completing the conversation with appropriate expressions. The expressions are to be chosen from among the ones given in a box. In the answer book, the examinee is expected to number the blanks as 1, 2, 3, etc., and write against each the expression he/she has chosen. **Marks: 7 x 1 = 7**

b. Writing a dialogue extending the scope of the original conversation following the instructions given in the question on how it should be extended. The instructions must include five communication strategies/functions, and the examinee is expected to use them in his/her dialogue. **Marks: 1 x 7 = 7**

III. Analyzing a service encounter – an interaction, either a direct personal one, or over the telephone, e.g. *making enquiries at the reception counter in a hotel, an interaction with a salesman at a mall, asking for information on the telephone* – and

a. identifying the reasons for the failure or breakdown of communication in the conversation **Marks: 1 x 7 = 7**

b. rewriting the conversation making the communication successful. In the rewritten conversation, the partners in the conversation must sound polite and positive, using the communication strategies listed in the question. **Marks: 1 x 7 = 7**

IV. Reading two badly-written paragraphs and performing the following tasks:

a. Identifying the topic sentence of paragraph (a) and the sentences that do not support the topic sentence, and writing in the answer book the topic sentence and the irrelevant sentences. **Marks: 1 x 7 = 7**

b. Re-writing paragraph (b), which is poorly organized, into a cohesive paragraph choosing appropriate sequence signals. **Marks: 1 x 7 = 7**

V.

a. Writing a paragraph of 150 words on the given topic (e.g. *Should there be a dress code in colleges?*). The paragraph must have:

- adequate and relevant ideas on the topic with the ideas properly organized using strategies such as coherence and cohesion;
- a topic sentence; and
- proper choice of vocabulary and grammatical accuracy. **Marks: 1 x 7 = 7**

b. Writing a survey report using the data on the table(s)/graph(s) given. The report must:

- indicate acquaintance with the conventions of academic writing; and
- the ability to interpret data intelligently.

However, high standards of performance need not be expected as the students are in the first year of their course. It also follows that complex tables/graphs should be avoided. **Marks: 1 x 7 = 7**

VI. Contextualized vocabulary questions with two items on each one of the following from *Vocabulary Builder* (listed as 2 under F. TEXTBOOKS above):

- GRE Words (Units 1.1 and 1.2)
- Collocations (Units 2.1 and 2.2)
- Commonly Confused Words (Units 3.1 and 3.2)
- One-Word Substitutes (Units 4.1 and 4.2)
- Idioms (Units 5.1 and 5.2)
- Phrasal Verbs (Units 6.1 and 6.2)

For example, in the question on idioms, two sentences/contexts with an idiom in each may be given, and the examinee will have to identify the most appropriate meaning of the idiom from among the four options given. **Marks: 14 x 1 = 14**

VII. Correction of grammatical errors:

- Either a conversation with fourteen grammatical errors of the types dealt within the Textbook 1 (*Innovate with English*), or isolated sentences with fourteen grammatical errors will be given.
- The errors will include at least seven typical instances of Indianism widely believed to be inappropriate in standard English.
- If isolated sentences with errors are given, they are not to be given in isolation from their contexts; a conversation with errors of the kind specified above will serve the purpose better.
- The examinees are expected to rewrite the sentences in the answer book, correcting them. **Marks: 14 x 1 = 14**

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DESCRIPTIVE STATISTICS

I Year – I Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

Course Objectives

- To understand the significance of statistics in our day to day life and its use.
- To emphasize the use of various statistical methods like measures of central tendency, dispersion, correlation and graphical representation of bi-variate data.
- To explore the concept of probability in real time engineering problems.

Course Outcomes

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

- demonstrate different types of data
- measure central tendency of the given data and draw useful conclusions.
- compute correlation in bi-variate data and find linear regression equation for predicting y values from the x values in a set of correlation data.
- describe different types of attributes and methods of measures of association between the attributes.
- explain the probability and the underlying assumption of random sampling.

Course Content

UNIT– I: Statistical Methods

Definition and scope of Statistics, concepts of statistical population and sample. Classification and ategorization of data, Measurements of scales. Presentation of data.

UNIT– II: Measures of Central Tendency and Dispersion

Measures of Central Tendencies: Mean, Median, Mode, Geometric mean and Harmonic mean. Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Sheppard's corrections.

UNIT– III: Bi-variate data

Definition, scatter diagram, Simple correlation, Partial and Multiple correlations (3 variables only), Rank correlation. Simple linear regression.

UNIT– IV: Curve Fittting and Attributes

Principle of least squares and fitting of polynomials and exponential and power curves.

Theory of attributes: Independence and association of attributes, consistency of data, measures of association and contingency, Yule's coefficient of colligation.

UNIT– V: Probability

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability. Conditional Probability, addition and multiplication laws of probability, independent events – applications. Baye's theorem and its applications.

Text Books

1. Feller, W. (2014): An Introduction to Probability theory and application, Wiley.
2. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & 11, 8thEdn. The World Press, Kolkata.

Reference Books

1. S.P.Gupta, (2014): Statistical Methods, 43rd Edition, Sultan Chand & Sons.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7thEdn.), Pearson Education, Asia.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rdEdn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New D

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ENGINEERING CALCULUS

I Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To understand the procedure of solving exact and non-exact differential equations.
- To familiarize with Higher order linear differential equations.
- To understand the concepts of partial derivatives and know the procedure to find the maxima and/or minima for a given surface.
- To familiarize with linear and non-linear partial differential equations.
- To know the concepts of multiple integrals.

Course Outcomes

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

- solve exact and non- exact differential equations and to use them in various practical situations.
- apply 1st & 2nd order differential equations to solve various engineering problems.
- evaluate maxima and/or minima for a given surface.
- solve first order linear & non-linear partial differential equations.
- evaluate areas, volumes using double and triple integrals.

Course Content

UNIT – I: 1st Order Linear ODEs

Exact and non-exact differential equations, Applications – Law of natural growth and decay, Newton's Law of cooling.

UNIT – II: Higher Order Linear ODE

Solving Homogeneous differential equations, and Non-Homogeneous differential equations when RHS terms are of the form e^{ax} *sin ax, cos ax, polynomial in x,* $e^{ax}v(x)$*, xv(x)* . Method of variation of parameters. Overview of Cauchy's and Legendre equations.

UNIT – III: Partial Differentiation

Total derivative, chain rule, Jacobians, Application- finding maxima and minima of a function of two or three variables.

UNIT – IV: First order PDE

Overview of formation of PDEs by eleminatingaribitrary constants and functions. Solutions of first order linear PDE – Linear (Lagrange's Equation) and Non-Linear PDE by Charpit's method.

UNIT – V: Multiple Integrals

Areas, volumes using double integrals and triple integrals (Polar and Cartesian Coordinates), Changeof Order of integration..

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th edition, MaitreyPrintech Pvt. Ltd, Noida, 2009.
2. B.S. Grewal, Higher Engineering Mathematics, 42 nd edition, Khanna Publishers, New Delhi, 2012.

Reference Books

1. Schaum's Series, Differential Equations, Tata-McGraw Hill Company Limited.
2. Bali &Iyengar,Text Book of Engineering Mathemtics, Laxmi Publications (P) Ltd.

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PROGRAMMING FOR PROBLEM SOLVING
(Common to CSE, AI&DS & IT)

I Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To emphasize the use of algorithm and flowchart in problem solving.
- To apply C language in problem solving.

Course Outcomes

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

- outline problem solving steps and solve sample problems
- use control statements for writing the programs.
- apply the concepts of arrays and strings in problem solving.
- decompose a problem into functions to develop modular reusable code.
- utilize user- defined data types and text I/O operations for efficient handling of data.

Course Content

UNIT – I: Problem Solving Steps and Basics of C

Problem Solving Steps: Understanding problem, developing algorithm, flowchart, coding, debugging and testing.

General form of a C program, Identifiers, Data Types, Variables, Constants, Operators, I/O statements, Expressions, Precedence and Associativity, Type Conversion.

Problem Solving: Sample problems such as evaluating formulae.

UNIT – II: Control Statements

Selection: Making Decisions – Single-way, Two-Way Selection, Multi-way Selection, Dangling else Problem.

Repetition: Concept of loop, Loops in C: while, do-while and for.

Jump Statements: Return, goto, break, exit and continue.

Problem Solving: Factorial computation, generation of Fibonacci sequence, reversing digits of an integer, generating prime numbers.

UNIT – III: Arrays and Strings

Arrays: Arrays Concepts, Using Arrays in C, Array Applications, Two-Dimensional Arrays and Multidimensional arrays.

Strings: Strings Concepts, C Strings, String Input / Output Functions, Arrays of Strings, String Handling Functions.

Problem Solving: Computing mean and variance of a set of numbers, reverse the elements in an array, addition and multiplication of two matrices, insert sub-string into main-string, reverse of given string without using string handling functions.

UNIT – IV: Pointers and Functions

Pointers: Declarations, initialization, Pointer Arithmetic, Memory allocation Functions, Arrays and Pointers, Lvalue and Rvalue.

Functions: Designing Structured Programs, User-Defined Functions, Standard Functions, Parameter Passing Techniques, Passing Array to Functions, Passing Pointers to Function, Recursion, storage classes.

Problem Solving: Using functions print the sum of all elements of the array using pointers, convert decimal number to binary number using function, calculate the GCD of two non-negative integers using recursion.

UNIT – V: User Defined Data Types and File Handling

User Defined Data Types: The Type Definition (typedef), Enumerated Types, Structure: Declaration, Initialization, accessing structures, Operations on Structures, Nested Structures, Structure Containing Arrays, Pointers and Structures, Arrays of Structures, Unions.

File Handling: Files, Streams, Standard Library Input / Output Functions, Formatting Input/ Output Functions, Character Input / Output Functions and random access to files.

Problem Solving: To implement a structure to read and display the name, salary and address of an Employee (Use nested structure for address),Copy the contents of one file to another, count the number of characters, words and lines in a file.

Text Books

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, Cengage, 2020.
2. Programming in C, 2nd Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.

Reference Books

1. Programming in C, Reema Thareja, OXFORD.
2. C Programming, E Balaguruswamy, 3rd edition, TMH
3. How to Solve it by Computer, R G Dromey, Prentice-Hall of India, 1999.

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UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY
(Common to EEE, ECE, CSE & AI&DS)

I Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To help students understand the need, basic guidelines, content and process of value education.
- To help students initiate a process of dialog with in themselves to know what they really want to be in their life and profession.
- To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
- To understand the harmony in nature and existence.
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Course Outcomes

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

- be aware of themselves and surroundings
- be responsible in life
- develop personality to be happy continuously and prosper
- handle the problems with sustainable solutions.
- possess human nature in mind
- apply what they have learnt to their own self in real life situations

Course Content

UNIT – I : Value Education

Significance of Universal human values, Value Education – Importance, content, Process. Self-exploration, Basic human aspirations, Right understanding, Natural acceptance.

Suggested topics for Tutorial/Practice sessions:

Learning HVLS from the Inspiring Life Sketches of great personalities:

Isaac Newton, Michael Faraday, JJ Thomson, Einstein, Madam Curie, Mahatma Gandhi, Abraham Lincoln, JF Kennedy, Martin Luther King, BR Ambedkar, Charles Darwin, Karl Marx, Helen Keller, Sam Pitroda, Mark Zuckerberg, SudhaMurty, Leonardo Davincy, Michelangelo, The eternal 3: Socrates, Plato, Aristotle, Alexander, Swami Vivekananda, Abdul Kalam, AB Vajapayee, Sergei Bubka.

UNIT – II: Harmony In Myself

Co-existence of the self and the Body, Understanding the needs of Self (I') and Body'-Sukh and Suvidha, Body as an instrument of 'I', Harmony in 'I' - Sanyam and Svasthya, correct appraisal of our Physical needs.

Suggested topics for Tutorial/Practice sessions:

Leadership through Literature: ValmikiRamayan, Vyasa MahaBharath- Bhagavad Gita, Answers of Yudhistir to Questions by Yaksha, Kaalidas- Raghu Vamsam, Abhignyana Saakuntalam and Maalavika Agnimitram, Homer- Iliad and Odyssey, Professionalism- Learning from the Jews, Buddha, The Bible- Jesus Christ, Solomon's wisdom, The Koran- Prophet Mohammad, Guru Nanak, John Milton, Shakespeare, Sigmond Freud, Robin Sharma, Ravindranath Tagore, Sadguru Jaggi Vasudev, War and Peace by Leo Tolstoy, Unto the Last by Ruskin, Social Contracts by Rousseu, If by Rudyard Kipling, The 7 Habits of highly effective people by Stephen R Covey. Art of Rhetoric by Aristotle.

UNIT – III: Harmony in the Family and Society

Family as the basic unit of human interaction, Harmony in the family, Justice, Trust, Respect, Intention vs competence, Respect is Differentiation.Extending relationship from family to society.Comprehensive human goal – identification, programs for achievement of the goal.Dimensions of Human endeavour, Harmony from family order to world family order.

Suggested topics for Tutorial/Practice sessions:

Ideal Home: Characteristics of Happy families, Personal hygiene and habits, Harmony, Health and happiness, Advantages of combined families.Vasudhaika Kutumbam- Universalism.Vilasa Vidya- Importance of hobbies, Music therapy. Influence of friends and peer groups- ideal friend, Friendship and faith, Avoiding vices, Advance Crime detection technologies, Law and legislation pertaining to students.

UNIT – IV: Harmony in the Nature and Existence

Harmony in the nature – orders in nature, existence as co-existence, co-existence of units in space, holistic perception of harmony at all levels of existence.

Suggested topics for Tutorial/Practice sessions:

Leadership through languages: Atleast 5 poems / rhymes and 10 Sentences of each among atleast 10 of the following languages: Sanskrit, Telugu, Tamil, Malayalam, Kannada, Oriya, Bengali, Hindi, Urdu, Punjabi, Maratthi, Gujarati, Latin, Greek, Chinese, Japanese, Italian, Spanish, French and German. Bionics: Technology from animals. Interpretation of Paintings.

UNIT – V: Implications of the Right Understanding

Values in different dimensions of Human living,definitiveness of ethical human conduct,development of Human consciousness ,implications of value based living. Identification of comprehensive Human goal, Humanistic Education,

humanistic constitution,humanistic universal order and its implications. Competence in professional Ethics, Holistic technologies and systems.

Suggested topics for Tutorial/Practice sessions:

Personality Traits: Ich Bin- Who am I? Know thyself. Self esteem, Sanyam: Self learning, self motivation, self control and self discipline, Thinking aloud, Team work, Discipline, Courage, Creativity, Sense of humour, Equanimity- love for animals and nature, Gratitude, Time and money management, Leadership skills, Importance of sports and games, Importance of Swimming, Writing and Public speaking skills, Quotable quotations: Those who quote only are quoted. Mpemba Effect – The Rags to riches concept. Commonalities of great personalities. Estimation of value of a person and his habits. SWOT Analysis.

Text Books

1. R.R Gaur, R.Sangal and G.P.Bagaria; "A Foundation Course in Human Values and Professional Ethics", 2011, Excel Books, New Delhi.

Reference Books

1. A N Tripathy, 2003, Human Values, New Age International Publishers.
2. KVSG Murali Krishna, Mastering LIFE SKILLS ,Environmental Protection Society, Kakinada, 2015.
3. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Note: Tutorial/Practice sessions may be conducted with reference to Many Historical aspects, having relevance to the topic of discussion. Few of such topics are suggested.

Methodology Suggested for Instruction:

- Teacher is a mentor or guide or Supervisor
- Student –Teacher interactive sessions in the class.
- Student must be made to think and express his views boldly.
- Every student has to present individual PPT about the content of the subject
- Assignments need to be submitted by students and evaluated by teacher into dedication specifying critical review.

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FUNCTIONAL ENGLISH LAB
(Common to All Branches)
I Year – I Semester

Practical	: 2	Internal Marks	: 30
Credits	: 1	External Marks	: 70

Course Objectives

- Functional English (Lab) seeks to develop in the students the communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English; and
- It seeks to develop in them a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility.

Course Outcomes

Upon successful completion of Functional English (Lab), the students will be able to

- give short impromptu speeches with confidence and fluency.
- take part in conversations in different functional contexts using English following appropriate communication strategies.
- use conventions of politeness and courtesy in speech and enhance the effectiveness of their communication in English.
- articulate the sounds of English (vowels, consonants, and diphthongs) with accuracy.
- check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
- pause at appropriate places in their speech in English, enhancing thereby the comprehensibility of their communication.
- speak English with adequate attention to stress, rhythm, and intonation.
- speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English.
- read out texts of different kinds fluently with appropriate pauses, stress, and intonation.

Course Content

UNIT – I: a.Greeting, introducing and taking leave b. Pure vowels

UNIT – II: a.Giving information and asking for information b. Diphthongs

UNIT – III: a. Inviting, accepting and declining invitations b. Consonants

UNIT – IV: a. Commands, instructions and requests b. Accent and rhythm

UNIT – V: a. Suggestions and opinions b. Intonation

Text Books

1. Hari Prasad, et al., *Strengthen Your Communication Skills*, First Edn., Maruthi Publications, Hyderabad, 2014.
2. Handouts produced by the Department on "difficult sounds," consonant clusters, the other problems of Telugu learners of English, listening comprehension, and oral reading.
3. The following pieces of software:
   - 'Multimedia Language Lab' provided by K-Van Solution, Hyderabad
   - 'Foundation Course in Communication Skills' provided by the Andhra Pradesh State Council of Higher Education (APSCHE), Government of Andhra Pradesh.
4. Audio and video clips such as 'BBC English'

Testing Pattern

I. Internal **30 marks**

a. Regular performance in the Language/Communications Lab 15 marks

b. Completing the tasks in the lab manual 05 marks

c. Testing of listening : Listening to a short audio clip of a speech/conversation in British accent and answering questions at the 'information' level. 05 marks

d. Test of reading: Role-playing a dialogue with proper pronunciation and with reasonable attention to tone groups, stress, rhythm and intonation. 05 marks

II. External **70 marks**

a. Test of writing

Writing a dialogue on the situation set 10 marks

Answering 'Yes/No' questions on pronunciation 05 marks

Marking sentence stress and intonation 05 marks

Writing English word for the word in phonetic transcription 05 marks

b. Test of speaking 25 marks

Role-playing a situational dialogue (e.g. 'At the railway station,' 'At the restaurant') with proper pronunciation and with reasonable attention to tone groups, stress, rhythm, and intonation

c. Viva voce (with an external examiner) 20 marks

Speaking for one minute on a given topic

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STATISTICS USING R LAB

I Year – I Semester

Practical	: 2	Internal Marks	: 30
Credits	: 1	External Marks	: 70

Course Objectives

- To understanding of descriptive statistics by practical application of quantitative reasoning and data visualization
- To familiarize with problem solving using R.

Course Outcomes

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

- Represent the data in graphical form to and make sense of it
- Compute measures of central tendency
- Compute measures of dispersion
- Implement characteristics of a distribution
- Implement regression analysis

List of Experiments

Write R Programming for the following

1. Graphical representation of data.
2. Problems based on measures of central tendency.
3. Problems based on measures of dispersion.
4. Problems based on combined mean and variance and coefficient of variation.
5. Problems based on moments, skewness and kurtosis.
6. Fitting of polynomials, exponential curves.
7. Karl Pearson's correlation coefficient.
8. Correlation coefficient for a bivariate frequency distribution.
9. Lines of regression, angle between two lines of regression and estimated values of variables.
10. Spearman rank correlation with and without ties.
11. Partial and multiple correlations.
12. Planes of regression and variances of residuals for given simple correlations.

Reference Books

1. R for everyone: Advanced Analytics and Graphics(Addison-Wesley Data & Analytics Series) 2nd Edition

2. BeginningR the Statistical Programming Language, Dr. Mark Gardener.
3. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7thEdn.), Pearson Education, Asia.
4. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rdEdn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
5. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New D

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C PROGRAMMING LAB
(Common to CSE, AI&DS & IT)
I Year – I Semester

Practical	: 4	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

- To design algorithms and flowcharts for problem solving.
- To develop C programs using arrays, strings, pointers and functions.

Course Outcomes

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

- apply problem solving steps to solve a problem.
- develop C programs using selection and iterative statements.
- decompose a problem into functions to develop modular reusable code.
- apply structures and unions to solve a problem.
- implement file operations on a given file.

List of Exercises

Exercise 1: Basics of C

a) Write a C program to compute the perimeter and area of a rectangle with a length of 7cms and breadth of 5 cms.

b) The area of a triangle is given by Area = $\sqrt{p(p-a)(p-b)(p-c)}$, where p is half of the perimeter, i.e., (a + b + c) / 2. Let a, b, c be the lengths of the sides of the given triangle. Write a C program to calculate the area of triangle using this Heron's Formula.

Exercise 2: Selection Statements

a) A triangle is a polygon with three edges and three vertices. It is one of the basic shapes in geometry. A triangle with vertices A, B, and C is denoted ΔABC. Triangles can be classified according to the lengths of their sides, an equilateral triangle has all sides the same length, an isosceles triangle has two sides of equal length and a scalene triangle has all its sides of different lengths. Write a Menu-Driven Program to display various geometrical shapes of a triangle.

b) Write a C program to find maximum and minimum of three numbers using ternary operator.

c) Read two integer operands and one operator form the user, perform the operation and then print the result. (Consider the operators +, -, *, /, % and use Switch Statement).

Exercise 3: Iterative Statements-I

Develop a C program for the following:

a) Reversing digits of an integer.

b) An Armstrong number is a number that is sum of its own digits each raised to the power of number of digits. Write a C program to check whether the given number is Armstrong number or not.

for example:

$9=9^1=9$

$371=3^3+7^3+1^3=27+343+1=371$

$8208=8^4+2^4+0^4+8^4=4096+16+0+4096=8028$

Exercise 4: Iterative Statements-II

Develop a C program for the following:

a) Display the n terms of harmonic series and their sum. 1 + 1/2 + 1/3 + 1/4 + 1/5 +...+ 1/n terms.

b) To print following Inverted half pyramid using numbers.

1 2 3 4 5

1 2 3 4

1 2 3

1 2

1

c) To print the Pascal triangle based on given number of rows.

Exercise 5: Arrays

Design a C program for the following:

a) To print all unique elements in an array.

b) Computing mean and variance of a set of numbers.

c) To perform matrix multiplication using two dimensional arrays.

Exercise 6: Strings

Develop a C program for the following:

a) To check whether the given string is a palindrome (Without using String Handling functions).

b) To insert sub-string into main string.

Exercise 7: Functions

Implement a C program for the following:

a) To convert decimal number to binary number.

b) To get the n^{th} largest element of an array.

c) GCD of two non-negative integers using recursion.

Exercise 8: Pointers

Implement a C program for the following:

a) To print the sum of all elements of the array.
b) To count the number of vowels and consonants in a string.
c) To find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.

Exercise 9: Structures-I

Develop a C program for the following:

a) To implement a structure to read and display the name, salary and address of an Employee (Use nested structure for address).
b) To display the Name, Marks in five subjects and total marks of given number of students. (Using array of structures).

Exercise 10: Structures-II

Develop a C program that uses functions to perform the following operations using Structure:

a) Addition of two complex numbers
b) Subtraction of two complex numbers
c) Multiplication of two complex numbers.
d) Division of two complex numbers.

Exercise 11: Files

Implement a C program for the following:

a. To copy contents of one file to another.
b. To count the number of characters, words and lines in agiven text file.

References

1. Programming for Problem Solving, Behrouz A. Forouzan, Richard F.Gilberg, Cengage, 2020.
2. Programming in C, 2nd Edition Pradip Dey and Manas Ghosh, OXFORD Higher Education.
3. C Programming, E Balaguruswamy, 3rd edition, TMH
4. R G Dromey, How to Solve it by Computer, Prentice-Hall of India, 1999.

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CONSTITUTION OF INDIA
(Common to EEE, ECE, CSE & AI&DS)
I Year – I Semester

Lecture	: 2	Internal Marks	: 30
Credits	: -	External Marks	: 70

Course Objectives

- To impart knowledge on basic engineering applications.
- To enable the student to understand the importance of constitution.
- To understand the structure of Executive, Legislature and Judiciary.
- To understand Philosophy of fundamental rights and duties.
- To understand the autonomous nature of constitution bodies like Supreme Court and High Court Controller and Auditor General of India and Election Commission of India.
- To understand the Central and State relation, financial and administrative.

Course Outcomes

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

- understand history and philosophy of constitution with reference to Preamble, Fundamental Rights and Duties
- understand the concept of Unitary and Federal Government along with the role of President, Prime Minister and Judicial System.
- structure of the state government, Secretariat, Governor and Chief Minister and their functions.
- learn local administration viz. Panchayat, Block, Municipality and Corporation.
- learn about Election Commission and the process and about SC, ST, OBC and women.

Course Content

UNIT – I:

Introduction to Indian Constitution: 'Constitution' meaning of the term, Indian Constitution – Sources and Constitutional History, Features – Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT – II:

Union Government and its Administration Structure of the Indian Union: Federalism Centre – State relationship, President: Role, Power and Position. Prime Minister (PM) and Council of Ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha. The Supreme Court and High Court: Powers and Functions.

UNIT – III:

State Government and its Administration Governor – Role and Position – Chief Minister (CM) and Council of Ministers. State Secretariat: Organisation, Structure and Functions.

UNIT – IV:

A Local Administration – District's Administration Head – Role and Importance, Municipalities – Mayor and Role of Elected Representative – Chief Executive Officer (CEO) of Municipal Corporation Panchayati Raj : Functions Panchayati Raj Institution (PRI), Zilla Panchayat, Elected Officials and their roles, CEO Zilla Panchayat: Block level orgnisational Hierarchy – (Different Departments), Village level – Role of Elected and Appointed officials – Importance of grass root democracy.

UNIT – V:

Election Commission: Election Commission – Role of Chief Election Commissioner and Election Commissionerate State Election Commission: Functions and Commissions for the welfare of SC/ST/OBC and Women.

Reference Books

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt.Ltd., New Delhi.
2. Subash Kashyap, Indian Constitution, National Book Trust.
3. J.A. Siwach, Dynamics of Indian Government and Politics.
4. D.C. Gupta, Indian Government and Politics.
5. H.M.Sreevai. Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication).
6. J.C. Johari, Indian Government and Politics Hans.
7. J.Raj, Indian Government and Politics.
8. M.V. Pylee, Indian Constitution, Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd., New Delhi.
9. Noorani, A.G. (South Asia Human Rights Documentation Centre), Challenges to Civil Right). Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

E-Resources:

1. nptel.ac.in/courses/109104074/8.
2. nptel.ac.in/courses/109104045.
3. nptel.ac.in/courses/101104065.
4. www.hss.iitb.ac.in/en/lecture-details.
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution.

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PROFESSIONAL COMMUNICATION
(Common to All Branches)

I Year – II Semester

Lecture	: 2	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

- To equip the students with common employability skills (the skills required for gaining employment and performing successfully in different careers) which can enable them to perform communication tasks of increasing length and complexity.
- To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication.

Course Outcomes

Upon successful completion of Professional Communication, the students will be able to

- speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephone conversation)
- add to the effectiveness of their oral communication by using communication strategies, conventions of politeness and courtesy, and stress and intonation.
- listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native-speaker accents
- read fluently, comprehending texts of different kinds using multiple strategies and higher-order skills
- produce written discourses of different kinds (e.g. texts expressing opinions and making a convincing case for one's standpoint, professional emails, and summaries of lengthy texts) with attention to elements of writing such as content, organization, language, style, and mechanics
- guard against grammatical errors Indians typically make in their speech and writing in English

Course Content

UNIT – I:

Listening : Listening comprehension – Task 1 (IWE – Chapt VII)
Speaking : Communication Strategies: Conversation Amith& Mahesh (IWE – Chap VII)
Reading : Reading Comprehension – Task 1 (IWE – Chapt VII)
Vocabulary: (a) GRE words – 1.3, (b) Collocations – 2.3 (VB)
Grammar : *If* Clause (IWE – Chapt VII)
Writing : Email writing (IWE – Chapt VII)

UNIT – II:

Listening : Listening comprehension – Task 2 (WR)
Speaking : Exercise on Communication Strategies (IWE – Chapt VII)
Reading : Reading Comprehension – Task 2 (DPM)
Vocabulary: Words often confused – 3.3, One-word substitutes – 4.3 (VB)
Grammar : Modal verbs (IWE – Chap VII)
Writing : Email writing and Argumentative Essay (IWE – Chapt VII)

UNIT – III:

Listening : Listening comprehension – Task 3 (WR)
Speaking : Communication Strategies – Exercise (DPM)
Intensive Reading : Reading Comprehension – Task 3 (DPM)
Extensive Reading: *Pride and Prejudice* by Jane Austen
Vocabulary: (a) Idioms – 5.3, (b) Phrasal verbs – 6.3 (VB)
Grammar : Indianism (IWE – Chapt VII)
Writing : Argumentative Essay (DPM)

UNIT – IV:

Listening : Listening comprehension – Task 4 (IWE – Chapt VIII)
Speaking : Communication Strategies and Presentation: Conversation between Suchitra, Lakshmi, Guhan and Karan ((IWE – Chapt VIII)
Reading : Reading Comprehension – Task 4 (DPM)
Vocabulary: (a) GRE Words – 1.4, (b) Collocations – 2.4, (c) Words Often Confused – 3.4 (VB)
Grammar : Indefinite Articles (IWE – Chapt VIII)
Writing : Presentation – Analysis (DPM)

UNIT – V:

Listening : Listening comprehension – Task 5 (WR)
Speaking : Communication Strategies – Exercise (IWE – Chapt VIII)
Intensive Reading : Reading Comprehension Task – 5 (DPM)
Extensive Reading : *Gulliver's Travels* by Jonathan Swift
Vocabulary: (a) One-Word Substitutes – 4.4, (b) Idioms – 5.4, (c) Phrasal-verbs – 6.4 (VB)
Grammar : Definite Articles (IWE – Chapt VIII)
Writing : Presentation – Rewriting

- IWE – *Innovate with English* by T Samson (Foundation)
- Chapt - Chapter
- DPM – Department-produced materials (handouts)
- WR – Web-resources
- VB– *Vocabulary Builder for Students of Engineering and Technology* by Vijaya Lakshmi et al (Maruthi)

Textbooks

1. T. Samson, *Innovate with English*, First Edn., Cambridge University Press India Pvt. Ltd. under the imprint of Foundation Books, Hyderabad, 2010.
   - Unit SEVEN and EIGHT only
2. M. Vijaya Lakshmi, et al., *Vocabulary Builder for Students of Engineering and Technology, Second Edn.,* Maruthi Publications, Hyderabad, 2017.
3. The following simplified classics, one for each mid-semester, from the series, *Great Stories in Easy English*, published by S. Chand & Company Limited:
   - *Pride and Prejudice* by Jane Austen
   - *Gulliver's Travels* by Jonathan Swift
4. Audio and video clips carefully selected by the Department in order to sensitize the students to native-speaker accents.
5. Department-produced materials on reading comprehension.

Testing Pattern

First Mid-Term Examination

The paper consists of four questions. All questions are compulsory; there is no choice.

I. Reading an unseen passage and answering two sets of questions on it:

a) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer's ideas, etc. are to be set. Four of the Eight questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks: 8 x ½ = 4**

b) Writing an essay expressing a point of view on one or more of the issues flagged up in the question and making a convincing case for the standpoint. Length: 100 – 150 words. **Marks: 1 x 4 = 4**

II. Reading a poorly-written e-mail message and doing the following tasks:

a) Analyzing the reasons for the e-mail failing to meet the standards of professional e-mail communication. The analysis must identify and discuss at least five reasons. (Length: 100 – 150 words) **Marks: 1 x 3 = 3**

b) Rewriting the e-mail using the standards of professional e-mail communication. **Marks: 1 x 3 = 3**

III.

a) Eight contextualized questions on the following from *Vocabulary Builder*: GRE Words: 1.3; Collocations: 2.3; Commonly confused words: 3.3; One- word substitutes: 4.3; Idioms: 5.3; and Phrasal verbs: 6.3 **Marks: 8 x ½ = 4**

b) Correction of grammatical errors: Eight sentences with grammatical errors of the following types (dealt with in Unit 7 of *Innovate with English*) will be given: *if*-clause and Indianism **Marks: 8 x ½ = 4**

IV.

a) Completing a conversation (where informational and interactional functions are performed) with suitable expressions. **Marks: 8 x ½ = 4**

b) Answering eight 'true-or-false' questions on communication strategies and functions given in form of short dialogues. **Marks: 8 x ½ = 4**

Second Mid-Term Examination

The paper consists of four questions. All questions are compulsory; there is no choice.

I. Reading a poorly-written e-mail message and doing the following

a) Analyzing the reasons for the e-mail failing to meet the standards of professional e-mail communication. The analysis must identify and discuss at least five reasons. (Length: 100 – 150 words) **Marks: 1 x 4 = 4**

b) Rewriting the e-mail using the standards of professional e-mail communication **Marks: 1 x 4 = 4**

II. Reading an unseen passage and answering two sets of questions on it.

a) Eight comprehension questions. Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer's ideas, etc. are to be set. Four of the Eight questions will be multiple-choice questions. In case of non-multiple-choice questions, the length of each answer should not exceed 50 words. **Marks 8 x ½ = 4**

b) Writing an essay expressing a point of view on one or more of the issues flagged up in the question and making a convincing case for the standpoint. Length: 100 – 150 words. **Marks: 1 x 4 = 4**

III.

a) Eight contextualized questions on the following from *Vocabulary Builder*: GRE Words: 1.4; Collocations: 2.4; Commonly confused words: 3.4; One- word substitutes: 4.4; Idioms: 5.4; and Phrasal verbs: 6.4 **Marks: 8 x ½ = 4**

b) Correction of grammatical errors: Eight sentences with grammatical errors of the following types (dealt with in Unit 8 of *Innovate with English*) will be given: articles and Indianism. **Marks: 8 x ½ = 4**

IV. Reading an expository text and doing two tasks:

a) Making notes (identifying the main points of the text and writing them down in note form) **Marks: 1 x 3 = 3**

b) Summarizing the text using the notes already made **Marks: 1 x 3 = 3**

Semester End Examination

Answer any five questions: **Question I is compulsory.**

I. Reading a poorly-writen e-mail message and doing the following task: (Compulsory)

a. Analyzing the reasons for the email failing to meet the standards of professional email communication. The analysis must identify and discuss at least seven reasons. (Length: 100-150 words) **Marks: 1 x 7 = 7**

b. rewriting the email using the standards of professional email communication. **Marks: 1 x 7 = 7**

II. Reading the text of a presentation made in a professional context and answering the following questions:

a. Analysing the passage from the point of view of language and style and identifying the reasons for the presentation falling short of the standards of professional presentations (Length of the answer: 100 – 150 words) **Marks: 1 x 7 = 7**

b. Rewriting the text of the presentation in the light of the analysis made in (a) above and following the conventions of professional presentations as far as language and style are concerned. **Marks: 1 x 7 = 7**

III. Reading an unseen (unfamiliar) passage on an issue related to engineering and technology or on a professional issue or situation and answering two sets of questions on it:

a. Seven comprehension questions: **Marks: 7 x 1 = 7**

- Critical questions requiring analysis, inference, prediction, evaluation, interpretation of the writer's ideas, pinpointing the writer's attitude/bias, etc. are to be set; 'information' questions involving a *mere* reproduction of the content should be avoided.
- At least three of the seven questions should be multiple-choice questions.
- In case of non-multiple-choice questions, the length of each answer should not exceed 50 words.

b. Writing an essay expressing a point of view on one or more of the issues flagged up in the question and making a convincing case for the standpoint. Length: 200 – 250 words. **Marks: 1 x 7 = 7**

IV. Filling in blanks in sentences using GRE words, collocations, one-word substitutes, commonly-confused words, idioms, and phrasal verbs. The contexts will be clearly given for each expression, and the questions will be multiple-choice ones. **Marks: 14 x 1 = 14**

- GRE Words (Units 1.3 and 1.4)
- Collocations (Units 2.3 and 2.4)
- Commonly Confused Words (Units 3.3 and 3.4)
- One-Word Substitutes (Units 4.3 and 4.4)
- Idioms (5.3 and 5.4)
- Phrasal Verbs (Units 6.3 and 6.4)

V. Reading a on a professional or semi-professional issue and answering two questions on it:

a. Matching suitable expressions selected from the dialogue with the given communication strategies. **Marks: 7 x 1 = 7**

b. Extending the scope of the dialogue using at least five of the given communication strategies/functions. **Marks: 1 x 7 = 7**

VI. Correction of grammatical errors:

- Either a conversation with twelve grammatical errors (in the areas of articles, modal verbs, prepositions, phrasal verbs, and Indianism), or isolated sentences with twelve grammatical errors will be given.
- If isolated sentences with errors are given, they are not to be given in isolation from their contexts; a conversation with errors of the kind specified above will serve the purpose better.

The examinees are expected to rewrite the sentences in the answer book, correcting hem. **Marks: 14 x 1 = 14**

VII. Reading an expository text and doing two tasks:

a. Making notes (identifying the main points of the text and writing them down in note form) **Marks: 6 x 1 = 6**

b. Summarizing the text using the notes already made. **Marks: 1 x 8 = 8**

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INTEGRAL TRANSFORMS AND VECTOR CALCULUS
(Common to All Branches)

I Year – II Semester

Lecture : 3	Tutorial : 1	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To gain the knowledge of Laplace and inverse transforms.
- To understand the concepts of Fourier series and Fourier Transforms.
- To know about vector differentiation and integration.

Course Outcomes

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

- evaluate improper integrals using Laplace transforms.
- apply Laplace transforms to find the solutions of initial and boundary value problems.
- find the Fourier series representation of a function in one variable and apply Fourier transform in various engineering problems.
- apply the concepts of vector differentiation in their engineering fields.
- verify the relation between line, surface and volume integrals using integral theorems.

Course Content

UNIT – I: Laplace Transforms

Laplace transforms of standard functions – Shifting Theorems - Multiplication and division by t, transforms of derivatives and Evaluation of Improper Integrals - Unit step function – Dirac Delta function.

UNIT – II: Inverse Laplace Transforms

Inverse Laplace transforms – by partial fractions –Convolution theorem (without proof).

Application: Solution of Initial value problems and Boundary value problems.

UNIT – III: Fourier Series and Fourier Transforms

Fourier Series: Fourier series in an arbitrary interval, Half-range sine and cosine series.

Fourier integral theorem (only statement). Fourier transforms and inverse Fourier transforms, Fourier sine and cosine transforms and inverses. Properties of Fourier transforms.

UNIT – IV: Vector Differentiation

Gradient – unit normal – angle between surfaces – directional derivative . Divergence – solenoidal vector. Curl – irrotational vector – scalar potential. Laplacian operator.

UNIT – V: Vector Integral theorems

Greens theorem , Stokes theorem and Gauss Divergence Theorem - related problems. Applications: Work done, flux across the surface.

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th edition, Maitrey Printech Pvt. Ltd, Noida, 2014.
2. B.S. Grewal, Higher Engineering Mathematics, 44th edition, Khanna Publishers, New Delhi, 2020.

Reference Books

1. Schaum's Series, Differential Equtions, Tata-Mc Graw Hill Company Limited.
2. Bali & Iyengar,Text Book of Engineering Mathemtics, Laxmi Publications (P) Ltd.

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LINEAR ALGEBRA

I Year – II Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

Course Objectives

- To discuss the consistencyof the system of equations and to find the solution.
- To know the procedure of finding the coordinates of a vector for a given basis.
- To understand the kernel and image of a Linear Transformation.
- To know about the orthogonal projection and orthonormal basis.
- To understand the procedure of diagonalization.

Course Outcomes

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

- identify whether the given system of equations are consistent or not. If so, ableto find the solution.
- describe the coordinates of a vector for a given basis.
- find the kernel and image of a Linear Transformation.
- compute the orthogonal projection and find the orthonormal basis by Gram–Schmidt orthogonalization process.
- perform the diagonalization of matrices.

Course Content

UNIT – I: System of Linear Equations

Matrices and elementrary row operations, Rank, Echelon form, Normal form, System of linear equations – Homogeneous, Non -homogeneous equations, Consistency..

UNIT – II: Vector Spaces

Vector Spaces and Subspaces, Linear combination of vectors, Linear dependence, Basis and Dimension, Definition of a Line, Introduction to Affine Spaces, Quotient Space.

UNIT – III: Linear Transformations

Representation of Linear Maps by matrices, Kernel and Image of a Linear Transformation, Linear Isomorphism, and Geometric Ideas.

UNIT – IV: Inner Product Spaces

The Euclidean Plane and the Dot Product, General Inner Product Spaces, Orthogonality, Orthogonal Projection onto a line, Orthnormal Basis, Orthogonal Complements and Projections, Coordinates Associated with an Orthonormal Basis, Some Geometric Applications.

UNIT – V: Diagonalization (Theorems and Properties are Without Proofs)

Rotation of Axes of Conics, Eigenvalues and Eigenvectors, and its properties, Cayley-Hamilton Theorem, Diagonalization of Symmetric Matrices.

Text Books

1. S. Kumaresan, Linear Algebra-A Geometric Approach, PHI publication, Eastern Economy Edition.
2. V. Krishnamurthy, V.P Mainsa and I.L. Arora, An Inroduction to Linear Algebra, Affiliated East-West press, Reprint 2005.

Reference Books

1. B. S. Grewal, Higher Engineering Mathematics, 42nd editionKanna publications.
2. Seymour Lipschutz, Linear Algebra, Schaum's solved problem series, Tata McGraw Hill Edition.
3. Gilbert Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press(2016)

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PYTHON PROGRAMMING
(Common to CSE & AI&DS)

I Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To explore various problem solving approaches in python programming.
- To apply object-oriented programming concepts in problem solving.

Course Outcomes

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

- describe the basic elements of python programming for logic building.
- use functions and modules to develop python programs.
- differentiate mutable and immutable data types.
- develop code to handle exceptions and files.
- apply object-oriented concepts to develop programs.

Course Content

UNIT – I: Basics of Python Programming and Control Statements

Features and history of python, literal constants, data types, variables, operators, operator precedence, expressions, type conversion, command line arguments, input and output operation.

Conditional Statements: simple-if, if-else, nested-if and if-elif-else.

Iterative Statements: while, for and else with for and while, un-conditional branching: break, continue and pass statement.

UNIT – II: Functions and Modules

Functions: Function definition, call, return statement, local and global variables, Types of arguments, Types of Functions: Anonymous, Fruitful, Recursive function and Passing functions as arguments.

Modules: The from…import statement, making your own modules, dir() function, modules and namespaces, types of namespaces: global, local and built-in, packages and Modules, introduction to PIP, installing packages via PIP.

UNIT – III: Data Structures

Mutable and Immutable data structures, declaring and using numeric data types: int, float, complex. Strings, list, tuple, dictionary, set and string: usage, conversions, built-in methods and differences, list and dictionary comprehensions.

UNIT – IV: Exception and File Handling

Exception Handling-Difference between an error and exception, handling Exception, try except block, Raising Exceptions and User Defined Exceptions.

File Handling - Significance of files, types of files, file path, file modes, Understanding read functions: read(), readline() and readlines() Understanding write functions: write() and writelines(), manipulating file pointer using seek.

UNIT – V: Object Oriented Concepts

OOP principles, classes, objects, 'self' variable, methods, constructor method, inheritance, overriding methods, data hiding.

Text Books

1. "Python Programming – Using Problem Solving Approach ",Reema Thareja, Oxford University Press, 2014 Edition.
2. "Python Programming: A Modern Approach", Vamsi Kurama, Pearson.

Reference Books

1. "Core Python Programming" Wesley J. Chun, 2nd Edition, Prentice Hall.
2. "Python: The Complete Reference", Martin C. Brown, 2001 Edition, McGraw Hill.
3. 'Fundamentals of Python – First Programs", Kenneth A. Lambert, 2012 Edition, Cengage.
4. "Python Crash Course:AHands-on, Project-Based Introduction to Programming", Eric Matthes.

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DATA STRUCTURES
(Common to CSE, AI&DS & IT)

I Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart the concepts of data structures.
- To solve computational problems with the help of data structures.

Course Outcomes

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

- implement and analyse searching and sorting techniques.
- implement algorithms for linked lists.
- apply algorithms of stacks and queues.
- develop data structures to make use of trees and heaps.
- develop algorithms for traversal of graphs and hashing for efficient storage of data.

Course Content

UNIT – I: Searching and Sorting

Introduction: Concept of data structures, overview of data structures.

Searching: Linear Search, Binary Search.

Sorting (Internal): Basic concepts, Sorting by: insertion (Insertion sort), selection (selection sort), exchange (Bubble sort).

UNIT – II: Linked lists

Linked Lists- Basic concepts, operations on Single linked list, Circular linked list and Double linked list.

UNIT – III: Stacks and Queues

Stack: Introduction, representation using Arrays and Linked List, operations on stack, Applications of Stacks- Expression Conversion and evaluation – corresponding algorithms.

Queue: Introduction, representation using Arrays and Linked List, operations on Queue, Circular Queue.

UNIT – IV: Trees

Binary Trees: Basic tree concepts, Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, Creation of binary tree from in-order and pre (post) order traversals.

Binary Search Trees: Basic concepts, BST operations: Search, insertion, deletion and traversals.

Heap Trees: Basic Concepts, operations, Application-Heap sort.

UNIT – V: Graphs and Hashing

Graphs: Basic concepts, representations of graphs, graph traversals-Breadth First Search and Depth First Search techniques.

Hashing: Basic concepts, Hashing Functions (Division Method, Multiplication Method), Collision Resolution Techniques- Open Hashing and Closed Hashing.

Text Books

1. Horowitz, Sahani, Anderson Freed, "Fundamentals of Data Structure in C", 2nd edition, University Press.
2. Richard F, Gilberg, Forouzan, "Data Structures", 2nd edition, Cengage.

Reference Books

1. G. A. V. Pai, "Data Structures and Algorithms", TMH, 2008.
2. DebasisSamanta, "Classic Data Structures", 2nd edition, PHI, 2011.

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PROFESSIONAL COMMUNICATION LAB
(Common to All Branches)

I Year – II Semester

Practical	: 4	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

- Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.

Course Outcomes

Upon successful completion of Professional Communication Lab, the students will be able to

- enhance the effectiveness of their communication through body language;
- take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency
- take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining, and apologizing) with fluency
- speak professionally in telephone conversations;
- make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session;
- take part in group discussions and debates successfully;
- answer questions at an elementary level in job interviews (e.g. Can you tell us something about yourself? What kinds of things do you worry about? What are your key skills? What skills do you need to improve? What do you see as your strengths? What do you like doing in your spare time? How would you describe the way you work? Tell us about a time when you showed strong leadership skills. Tell us about a time when you had to make a difficult decision. How do you see yourself in five years' time?) ;and
- use team-building skills with impact in different situations.

Course Content

UNIT–VI : Body Language
UNIT–VII : Dialogues
UNIT–VIII : Presentation Skills
UNIT–IX : Group Discussion
UNIT–X : Interviews and Telephonic Interviews
UNIT–XI : Debates

Text Books

1. Hari Prasad, et al., *Strengthen Your Communication Skills*, First Edn., Maruthi Publications, Hyderabad, 2014.
2. The following pieces of software:
   - 'Multimedia Language Lab' provided by K-Van Solution, Hyderabad
   - 'Foundation Course in Communication Skills' provided by the Andhra Pradesh State Council of Higher Education (APSCHE), Government of AP.

Testing Pattern

1. Internal **30 marks**

a. Regular performance in the Communications Lab 15 marks
b. Completing the tasks in the lab manual 05 marks
c. Making a PowerPoint presentation (Pair/Group) 10 marks
(Note: A hard copy of the presentation is to be submitted)

2. External **70 marks**

a. Test of writing
A telephone conversation 10 marks
The minimum number of exchanges to be specified
- Writing a resume 10 marks

The length (1page / 2 pages) is to be specified. The features to be included in the resume are also to be specified; the examinees will, however, have the option of including more features within the length specified.

- Answering 3 job-interview questions 15 marks

Questions at an elementary level. In other words, questions that require candidates to talk about themselves, their ambitions, , why they chose to study engineering, their strengths and weaknesses, their hobbies and interests, their personality, their perception of their leadership skills, and their key skills. Industry/job-related questions could be avoided.

Sample questions:

Can you tell us something about yourself?
What kinds of things do you worry about?
What are your key skills?
What skills do you need to improve?
What do you see as your strengths?
What do you like doing in your spare time?
How would you describe the way you work?
Tell us about a time when you showed strong leadership skills.
Tell us about a time when you had to make a difficult decision.
How do you see yourself in five years' time?

b. Test of speaking
Group discussion 20 marks
Time: 10-15 minutes (approx.) per group

c. Viva voce with an external examiner 15 marks

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PYTHON PROGRAMMING LAB
(Common to CSE & AI&DS)

I Year – II Semester

Practical	: 4	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

- To familiarize with the basic commands of the python.
- To develop python programs to solve problems.

Course Outcomes

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

- make use of control statements in decision making for various case studies.
- handle exceptional cases at run-time.
- use file handling operations for storing and retrieving of data.
- apply object-oriented concepts to develop reusable code.

List of Experiments

Exercise 1: Basics and operations

a) Write a python program to find sum of two numbers using command line arguments.

b) Write a Python program to compute distance between two points taking input from the user. Formula for Pythagorean theorem for compute distance between two points is: $\sqrt{((x2 - x1) ** 2) + ((y2 - y1) ** 2)}$.

Exercise 2: Selection statements

a) Write a python program to test whether a given number is even or odd using if-else statement.

b) To calculate grade of students in python, you have to ask from user to enter marks obtained in 5 subjects and calculate the sum of all the marks and then average marks to find the grade according to the average marks obtained by student as shown in the given below:

Percentage	Grade
≥ 90	O
≥ 80 & < 90	A+
≥ 70 & < 80	A
≥ 60 & < 70	B+
≥ 50 & < 60	B
≥ 40 & < 50	C
< 40	F

Exercise 3: Iterative Control Statements

a) Write a python program to print out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10 using for loop.

b) Write a python program to find the sum of all the primes below hundred.

Exercise 4: Functions

a) Write a python program to compute cumulative product of a list of numbers (write function cumulative_product).

b) Write a python program that uses function to find the sum of the even-valued terms in the Fibonacci sequence whose values do not exceed ten thousand.

Exercise 5: Packages and Modules

a) Create and access a user defined package ArithmeticPackage where the package contains a module named ArithmeticDemo, which inturn contains a method called sumtwo() , subtwo(), multwo() and divtwo() which takes two numbers as parameter and returns the result.

b) Write a python program to compute GCD, LCM of two numbers (Each function shouldn't exceed one line use predefined module).

Exercise 6: Strings

a) Write a python program to accept a string from a user and re-display the same after removing vowels from it.

b) Write a python program to calculate the length of a string using recursion and check whether the given number is palindrome or not.

Exercise 7: Data Structures-Tuple, List and Dictionary

a) Write a function ball_collide that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding. **Hint:** Represent a ball on a plane as a tuple of (x, y, r), r being the radius, if (distance between two balls centers) <= (sum of their radii) then (they are colliding)

b) Write a python program to find mean, median, mode for the given set of numbers in a list.

c) Write a Python Program to count the number of characters in the string and store them in a dictionary.

Exercise 8: Exception Handling

a) Write a python program to handle multiple errors with one except statement.

b) Write a python program to create a user-defined exception named "ShortInputException" that raises when the input text length is less than 3.

Exercise 9: File Handling

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

b) To install the package pandas write a python program to calculate the mean and standard deviation for list of numbers stored in excel file named data.xlsx.(Use JupyterNotebook or Spyder tool in Anaconda Navigator)

Exercise 10: Object Oriented Programming

a) Write a python program to store the name and marks of students using classes. (Use list to store marks in 3 subjects).

b) WeCare insurance company wants to calculate premium of vehicles. Vehicles are of two types – "Two-Wheeler" and "Four-Wheeler". Each vehicle is identified by vehicle id, type, cost and premium amount. Premium amount is 2% of the vehicle cost for two wheelers and 6% of the vehicle cost for four wheelers. Calculate the premium amount and display the vehicle details. Write a Python program to implement the class chosen with its attributes and methods.

Note: 1. Consider all instance variables to be private and methods to be public
2. Include getter and setter methods for all instance variables.

References Books

1. "Python Programming – Using Problem Solving Approach ",Reema Thareja, Oxford University Press, 2014 Edition.
2. "Python Programming: A Modern Approach", Vamsi Kurama, Pearson.

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DATA STRUCTURES LAB
(Common to CSE, AI&DS & IT)
I Year – II Semester

Practical	: 4	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

- To implement different searching and sorting algorithms.
- To implement linear and non-linear data structures.

Course Outcomes

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

- implement sorting and searching algorithms.
- develop suitable code to simulate the operations on linked lists.
- implement stacks and queues using arrays and linked lists.
- write code using a stack for arithmetic expressions evaluation and conversion.
- perform operations on binary search trees and graphs.
- create a hash table and perform operations on it.

List of Exercises

Write a C program for the following

Exercise – I:

1. Develop recursive and non-recursive functions to perform search for a Key value in a given list using

(i) Linear Search (ii) Binary Search

Exercise – II:

2. Implement the following sorting techniques to sort a given list of integers in ascending order

(i) Bubble sort (ii) Insertion sort (iii) Selection sort

Exercise – III:

3. Use functions to

(i) Create a singly linked list. (ii) Insert an element into a singly linked list.
(iii) Delete an element from a singly linked list.

Exercise – IV:

4. Use functions to

(i) Create a circular linked list. (ii) Insert an element into a circular linked list.
(iii) Delete an element from a circular linked list.

5. Use functions to

(i) Create a Doubly linked list. (ii) Insert an element into a doubly linked list.
(iii) Delete an element from a doubly linked list.

Exercise – V:

6. Implement stack (its operations) using arrays.
7. Implement Queue (its operations) using linked lists.

Exercise – VI:

8. To Convert infix expression into postfix expression.
9. To evaluate postfix expression.

Exercise – VII:

10. Create a Binary Search Tree of integers and perform the following operations (i)insert (ii) delete (iii). Search (iv) traversals (pre-order, in-order, post-order)

Exercise – VIII:

11. Implement the DFS and BFS Traversals on Graphs.

Exercise – IX:

12. Implement Heap sort to sort given set of integers.
13. Create a Hash Table to perform the following operations

(i) Insertion (ii) Deletion (iii) Search

Reference Books

1. Horowitz, Sahni, Anderson Freed, "Fundamentals of Data Structure in C", 2nd edition, University Press.
2. Richard F, Gilberg ,Forouzan, "Data Structures", 2nd edition, Cengage.

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ENVIRONMENTAL STUDIES
(Common to EEE, ECE CSE & AIDS)
I Year – II Semester

Lecture	: 2	Internal Marks	: 30
Credits	: -	External Marks	: 70

Course Objectives

- To impart the basic knowledge about the environment and ecology.
- To develop an attitude of concern for biodiversity and its conservation.
- To create awareness on environmental pollution and waste management.

Course Outcomes

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

- create awareness among the people in protection of environment.
- analyze structure and functional attributes of an ecosystem.
- explain the values of biodiversity.
- identify the sources of environmental pollution, assess their effects and suggest suitable control measures.
- adopt sustainable waste management practices.

Course Content

UNIT – I: Multidisciplinary Nature of Environmental Studies

Definition – Scope – Importance - Need for Public Awareness – Multidisciplinary nature of Environmental Studies – Role of a citizen in protection of environment

UNIT – II: Ecosystem

Concept of an ecosystem – Structural features of an ecosystem – Functional attributes of an ecosystem: Trophic structure – Food Chains – Food Web – Ecological Pyramids – Energy Flow– Biogeochemical Cycles – Ecological Succession.

UNIT – III: Biodiversity & Its Conservation

Definition – Levels of Biodiversity – Bio-geographical zones of India – Values of biodiversity (Consumptive use value, Productive use value, Social value, Ethical value, Aesthetic value, Option values, Ecosystem service values) – India as a mega diversity nation–Hot spots of biodiversity-Threats to biodiversity – Endangered &Endemic species of India – Conservation of biodiversity.

UNIT – IV: Environmental Pollution

Definition, causes, effects & control measures of : Air pollution – Water pollution – Noise pollution-Soil pollution. Global climatic issues: IPCC- Introduction – Role of IPCC-Global warming – Acid rains – Ozone layer depletion.

UNIT – V: Waste Management

Waste water treatment – Municipal solid waste management – Biomedical waste management – Hazardous waste management – E-waste management – Environmental legislations: Wild life (Protection) Act,1972 – Water (Prevention and Control of Pollution) Act, 1974 –Forest (Conservation) Act,1980 – Air (Prevention and Control of Pollution) Act, 1981 – Environmental(Protection) Act,1986.

Text Books

1. Anubha Kaushik, C.P.Kaushik, Environmental Studies, Fourth Edition, New Age International Publishers.
2. P.Anandan, R.Kumaravelan, Environmental Science & Engineering, Scitech Publications (INDIA) Pvt. Ltd.

Reference Books

1. Shashi Chawala, Environmental Studies, Tata McGraw Hill Education Private Limited.
2. Deeksha Dave & P. Udaya Bhaskar, Environmental Studies, Cengage Learning.
3. Dr.Suresh, K.Dhameja, Society and Environment, S.K. Kataria & Sons.
4. Benny Joseph, Environmental studies, Tata McGraw Hill Publishing Company Limited.

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS
(Common to CSE, IT and AI&DS)
II Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To expose the importance of managerial economics and its role in achieving business objectives.
- To analyze the financial performance of a business unit.

Course Outcomes

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

- apply managerial economic concepts in business decision making.
- categorize production with respect to time and cost.
- relate market structures and pricing of a product.
- establish suitable business organization with available resources.
- apply accounting rules in determining the financial results and prepare financial statements.

Course Content

UNIT – I: Introduction to Managerial Economics

Definition, nature and scope of managerial economics, Demand analysis- Demand determinants, law of demand and its exceptions, elasticity of demand, methods of demand forecasting.

UNIT – II: Theory of Production and Cost Analysis

Production function, isoquants and isocosts, MRTS, least cost combination of inputs, Cobb-Douglas production function, laws of returns.

Cost analysis- Cost concepts & break even analysis with simple problems.

UNIT – III: Introduction to Markets and Pricing Strategies

Market structures: Types of competition, features of perfect competition, monopoly and monopolistic competition.

Pricing strategies: cost based, demand based, competitive based and strategy based pricing.

UNIT – IV: Introduction to Business Organizations

Factors affecting the choice of business organizations, Forms of business organizations - Sole proprietorship, partnership, joint stock company.

UNIT – V: Introduction to Accountancy

Introduction to accountancy, types of accounts, journal, ledger and trial balance,final accounts with simple adjustments.

Text Books

1. A R Aryasri, “Managerial Economics and Financial Analysis”, 2nd edition, TATA McGraw Hill.
2. H. Craig Peterson, Sudhir K. Jain and W. Cris Lewis, “Managerial Economics”, 4thedition, Pearson Education.

Reference Books

1. R. L. Varshney, “Managerial Economics”, Sultan Chand.
2. Ambrish Gupta, “Financial Accounting for Management-An Analytical Perspective”, 5thedition, Pearson Education.

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ADVANCED STATISTICS

II Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart knowledge on statistical inference.
- To familiarize with multivariate statistical analysis and statistical quality control.

Course Outcomes

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

- find probabilities using different probability distributions.
- apply suitable statistical tests for large samples.
- apply suitable statistical tests for small samples.
- classify the multivariate techniques.
- draw the statistical decisions using the control charts.

Course Content

UNIT – I: Probability Distributions

Discrete Distributions: – Binomial and Poisson distributions. Continuous distributions - Exponential and Normal distributions.

UNIT – II: Statistical Inference – I(Large Samples)

Null hypothesis - Alternative hypothesis- level of significance. Type-I and Type-II errors- One tailed and two tailed tests- Testing of hypothesis concerning means and proportions.

UNIT – III: Statistical Inference - II (Small Samples)

Concept of degrees of freedom t- test, F-test, χ^2 -test (independence of attributes) and their applications.

UNIT – IV: Multivariate Statistical Analysis

Introduction – Classifying Multivariate Techniques – Dependence Techniques – Interdependence techniques - Analysis of Dependence: – Multiple Regression - Analysis of interdependence : - Factor Analysis.

UNIT – V: Statistical Quality Control

Definitions of Quality and Quality Improvement, Statistical Methods and Management aspects for quality control and improvement; Statistical Process Control and Product Control, Applications of SPC, Control Chart for variables – mean and range charts. Control Chart for attributes - p, np and c.

Text Books

1. Dr. T. K. V. Iyengar, Dr. B. Krishna Gandhi, S. Ranganatham and Dr. M.V. S. S. N. Prasad, Probability and Statistics, S. Chand & Company Ltd., New Delhi.
2. S.C. Gupta & V.K. Kapoor, Applied Statistics, S.Chand & Company Ltd., New Delhi.
3. Business Research Methods, William G. Zikmund, Barry J. Babin, Jon C.Carr, Mitch Griffin, 9th Edition.

Reference Books

1. Montgomery, Douglas C (2009), "Introduction to Statistical Quality Control" John Wiley and Sons, Inc. (ISBN: 978-0-470-16992-6).
2. Richard A. Johnson, Dean W. Wichern "Applied Multivariate Statistical Analysis (AMSA)" 3rd Edition, , Inc. (ISBN – 81 – 203- 1045-4).

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DIGITAL LOGIC DESIGN
(Common to CSE, IT and AI&DS)
II Year – I Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

Course Objectives

- To familiarize with the concepts of designing digital circuits.

Course Outcomes

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

- perform number system conversions, signed number arithmetic using complements.
- simplify Boolean functions using Boolean laws, theorems and k- maps
- implement combinational logic for adders and subtractors.
- design combinational logic circuits such as decoders, encoders, multiplexers and demultiplexers.
- design registers and counters using flip flops.

Course Content

UNIT – I: Number Systems

Binary, octal, decimal, hexadecimal number systems, conversion of numbers from one radix to another radix, r's, (r-1)'s complements, signed binary numbers, addition and subtraction of unsigned and signed numbers, weighted and un-weighted codes.

UNIT – II: Logic Gates and Boolean Algebra

NOT, AND, OR, universal gates, X-OR and X-NOR gates, Boolean laws and theorems, complement and dual of a logic function, canonical and standard forms, two level realization of logic functions using universal gates,minimizations of logic functions (POS and SOP) using Boolean theorems, K-map (up to four variables), don't care conditions.

UNIT – III: Combinational Logic Circuits - 1

Design of half adder, full adder, half subtractor, full subtractor, ripple adders and subtractors, ripple adder / subtractor.

UNIT – IV: Combinational Logic Circuits - 2

Design of decoders, encoders, priority encoder, multiplexers, demultiplexers, higher order decoders, demultiplexers and multiplexers, realization of Boolean functions using decoders, multiplexers.

UNIT – V: Sequential Logic Circuits

Classification of sequential circuits, latch and flip-flop, RS- latch using NAND and NOR Gates, truth tables, RS, JK, T and D flip-flops, truth and excitation tables, conversion of flip- flops, flip-flops with asynchronous inputs (preset and clear). Design of registers, shift registers, bidirectional shift registers, universal shift register, design of ripple counters, synchronous counters and variable modulus counters, ring counter, Johnson counter.

Text Books

1. M. Morris Mano, Michael D Ciletti, "Digital Design", 5th edition, PEA.

Reference Books

1. Kohavi, Jha, "Switching and Finite Automata Theory", 3rd edition, Cambridge.
2. Leach, Malvino, Saha, "Digital Principles and Applications", 7th edition, TMH.
3. Roth, "Fundamentals of Logic Design", 5th edition, Cengage.

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OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Common to CSE, IT and AI&DS)
II Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To make acquainted with the concepts of object oriented programming.
- To apply concepts of Java to solve problems.

Course Outcomes

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

- describe OOP concepts and features of Java.
- apply class and inheritance concepts in developing the Java code.
- create user interfaces and packages for a given problem.
- develop code to handle exceptions and implement multi-threading to make applications more dynamic.
- design GUI applications with event handling mechanism.

Course Content

UNIT – I: Fundamentals of OOP and Java

Need of OOP, principles of OOP languages, procedural languages vs. OOP, Java virtual machine, Java features.

Java Programming constructs: variables, primitive data types, identifiers, keywords,literals, operators, arrays, type conversion and casting, Wrapper Classes and Data Conversion methods, control flow statements, I/O statements and output formats.

UNIT – II: Class Fundamentals and Inheritance

Class fundamentals, declaring objects and methods, recursive methods, nested method calling,returning of objects, Parameter passing techniques, Instance initializer blocks, constructors, overloading-methods and constructors,this and static keywords,nested classes, Mutable and Immutable Strings.

Inheritance- Basics, types, method overriding, dynamic method dispatch, super and final keywords and access controls with inheritance, abstract classes, Object class.

UNIT – III: Interfaces and Packages

Interfaces: Defining an interface, implementing interfaces, nested interfaces, variables in interfaces and extending interfaces, multiple inheritance, class within interface and interface within class, up-casting and down-casting, marker interfaces, interfaces with default and static methods,Introduction to Collection framework, lambda expressions in Java.

Packages: Predefined packages: java.util.Date, java.util.Random,java.util.Arrays, creating and accessing user defined packages, package hierarchy, and multiple classes in single packageand access controls with packages.

UNIT – IV: Exception Handling and Multi-Threading

Exception Handling- Fundamentals, Types of exceptions, using try and catch, multiple catch clauses, nested try statements, try with resources, throw, throws, finally, re-throwing an exception, user-defined exceptions, Throwable class.

Multi-threading-Introduction to multi-tasking, multi-threading vs multi-tasking, thread life cycle, Thread Creation,Thread class constructors, Thread priorities and its methods,synchronizing threads, daemon threads, Garbage Collection, thread groups.

UNIT – V: GUI, Event Handling

Applets- Concepts of application and applets and applet life cycle, creating applets, applet parameters.

Event Handling- Events, event sources, event classes, event listeners, delegation event model, handling mouse and keyboard events, adapter classes

AWT: AWT hierarchy, Basic user Interface components, Layout managers, Introduction to swings.

Text Books

1. Herbert Schildt," Java The Complete Reference", 7th edition.
2. SachinMalhotra, Saurabh Chaudhary, "Programming in Java", 2nd edition, Oxford.

Reference Books

1. Herbert Schildt," Java The Complete Reference", 9th edition.
2. "JAVA 8 Programming", Black Book, Dreamtech press publishers.
3. Y.Daniel Liang, "Introduction to Java Programming", 7th edition, Pearson.

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DATABASE MANAGEMENT SYSTEMS
(Common to CSE and AI&DS)
II Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart knowledge on database design.
- To familiarize with SQL.

Course Outcomes

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

- analyze information storage problem and derive a model in the form of an entity relationship diagram.
- develop simple and complex queries using Structured Query Language (SQL).
- apply principles of normalization for designing a good relational database schema.
- compare different techniques related to transaction management and concurrency control.
- construct multi-level indices for fast retrieval of data and use recovery techniques to recover the database from a crash.

Course Content

UNIT – I: Introduction to Database

Introduction, Advantages of using DBMS, Data Models, Levels of Abstraction, Entity- Relationship Model: Attributes and Keys, Relationship Types, Weak Entity set, Strong Entity Set, Enhanced E–R Modeling: Specialization and Generalization, Database design for Banking Enterprise, Reduction to relational schemas .

UNIT – II: Relational Model and SQL

Relational Model: Basic Concepts, Schema and Instances, Keys, Relational Algebra, SQL: DDL, DML, Integrity constraints, Defining different constraints on a table, Set operations, Aggregate Functions, Group by and Having clauses, Nested queries.

UNIT – III: Database Design

Functional dependencies: Partial, full, transitive and trivial dependencies, Axioms, Decomposition: Lossless Join and Dependency Preserving decomposition, Attribute Closure, **Normal forms:** 1NF, 2NF, 3NF and BCNF.

UNIT – IV: Transaction Management and Concurrency Control

Transaction Management: Transaction concept, ACID properties, Transaction State Diagram, Schedules-Serial, Concurrent and Serializable Schedules, Serializability- Conflict and View serializability, Recoverability.

Concurrency Control: Concurrency Control- Concurrent Execution of Transactions, Anomalies due to Concurrent Execution, Lock-based protocols-2PL, Strict 2PL and Rigorous 2PL, Timestamp-based protocols, Thomas Write Rule, Deadlock Handling-Deadlock Prevention, Deadlock detection and recovery.

UNIT – V: Indexing and Crash Recovery

Indexing - Order indices, Multi level indices, Dynamic Multilevel indices using B+ Trees.

Crash Recovery - Failure classification, Different types of Recovery techniques: deferred update, immediate update, Shadow paging, Checkpoints.

Text Books

1. Korth and Sudarshan, "Database system concepts", 6th edition, MH.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", MH

Reference Books

1. Elmasri Navate, "Fundamentals of Database Systems", Pearson Education
2. C.J.Date, "Introduction to Database Systems", Pearson Education
3. Peter Rob and C Coronel, "Database Systems Design, Implementation, and Management", 7th edition.

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FORMAL LANGUAGES AND AUTOMATA THEORY
(Common to IT and AI&DS)
II Year – I Semester

Lecture : 2	Tutorial : 1	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To introduce the classification of machines by their power to recognize languages and to solve problems in computing.
- To familiarize with deterministic and non-deterministic machines.

Course Outcomes

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

- design finite automata for regular languages.
- write regular expressions for regular languages or for DFA by applying Arden's theorem.
- generate grammar for a given language.
- design PDA for context free languages.
- design Turing Machine for the phrase-structured languages.

Course Content

UNIT – I: Finite Automata

Strings, alphabet, language, operations, finite state machine, finite automaton model, transition diagrams, acceptance of strings and languages, deterministic finite automaton and non-deterministic finite automaton,NFA to DFA conversion, NFA with epsilon transitions - significance, equivalence between NFA with and without E-transitions, minimization of FSM, equivalence between two FSM's, finite automata with output- Moore and Mealy machines, applications of FA.

UNIT – II: Regular Languages

Regular sets, regular expressions, identity rules, Equivalence of two RE, construction of finite automata for a given regular expressions and its inter conversion, pumping lemma of regular sets, closure properties of regular sets (proofs not required), applications of regular languages.

UNIT – III: Grammar Formalism

Grammars, Chomsky hierarchy of languages, regular grammars - right linear and left linear grammars, equivalence between regular linear grammar and FA, Contextfree grammars, derivation trees, sentential forms, rightmost and leftmost derivation of strings, ambiguity in context free grammars, Minimization of context free grammars.

UNIT – IV: Pushdown Automata

Chomsky normal form, Greibach normal form, pumping Lemma for context free languages, closure properties of CFL (proofs not required), applications of CFLs. Push Down Automata: Definition, model of PDA, Instantaneous Description, Language Acceptance of Pushdown Automata, Design of Pushdown Automata.

UNIT – V: Turing Machine

Model, design of TM, types of Turing machines (Proofs not required), recursively enumerable languages and recursive languages.

Computability Theory: Decidability of problems, undecidability of posts correspondence problem.

Text Books

1. John E.Hopcroft, Rajeev Motwani and Jeffrey D.Ullman J.D., "Introduction to Automata Theory Languages and Computation", 2nd edition, Pearson Education.
2. Mishra and Chandrashekaran, "Theory of Computer Science - Automata, Languages, and Computation", 3rd edition, PHI.

Reference Books

1. Daniel I.A. Cohen, "Introduction to Computer Theory", 2nd edition, Wiley.
2. Sipser, "Introduction to Theory of Computation", 3rd edition, Cengage.
3. Lewis H.R., Papadimitriou C.H, "Elements of Theory of Computation", 2nd edition, PHI.

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JAVA PROGRAMMING LAB
(Common to CSE, IT and AI&DS)
II Year – I Semester

Practical: 4	Internal Marks : 15
Credits : 2	External Marks : 35

Course Objectives

- To demonstrate object oriented programming concepts.
- To introduce the creation of GUI using AWT components.

Course Outcomes

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

- apply the concept of object oriented approach in problem solving.
- create packages for reusability.
- examine exceptions and multi-tasking.
- create GUI applications to handle events

List of Exercises

Exercise-1

1. John found another manuscript of ancient mathematicians. According to this manuscript an integer k is a lucky number if k = a1 + a 2 + ... + a n , where : $a_i = 7^p$. p may be any positive integer. if i and j are distinct, a_i != a_j

   For example 7 is a lucky number: $7 = 7^1$. 56 is a lucky number $56 = 7^2 + 7^1$.

   John has an array of n integers. He wants to determine how many members of this array are lucky. He is not good at programming and needs your help. Write a program which takes an integer n and array consisting of n integers and determines quantity of lucky integers in this array.

   Input

   The first line of input contains integer n: number of elements in the array. The second line of input contains n space separated integers.

   Output

   Print the number of lucky integers in a given array.

   Constraints

   1 <= n <= 100

   1 <= arr[i] <= 1000000. arr[i] is the ith element of array.

   Example #1

   Input

   2

   49 50

   Output

1

$49 = 7^2$. 50 can't be represented as a sum of distinct powers of 7.

Example #2

Input

2

7 49

Output

2

$7 = 7^1$ and $49 = 7^2$.

2. Write a Java program that reads an integer number (between 1 and 255) from the user and prints the binary representation of the number. The answer should be printed as a String.

   Note: The output displayed should contain 8 digits and should be padded with leading 0s(zeros), in case the returned String contains less than 8 characters. ***For example***, if the user enters the value 16, then the output should be 00010000 and if the user enters the value 100, the output should be 01100100 (Hint : You may use String.format() method for the expected output)

Exercise-2

3. Software is being developed by a university that displays SGPA of your current semester. You are given the task to develop a module that calculates the SGPA with respect to the secured grade points corresponding to given number of credits in each subject. The credits for the courses are:

   Graphics: 2, PPS: 4, JAVA: 3, Chemistry: 3, English: 2, Technical Skills: 1.5, Data Structures: 4

   Complete your Module by displaying the SGPA of current semester.

4. You are given a string consisting of n lowercase Latin letters. You must find the count of number of larger alphabets for every character of the string (according to lexicographical order).

   Input

   The first line of input contains an integer n, the length of the given string.

   The second line of input contains a string.

   Output

   Print the count of number of larger alphabets for every character of the string on a single line. Separate elements by white spaces.

   Constraints

   1 <= n <= 100

   Example#1

   Input

   3

   abc

Output
2 1 0
Explanation: a - 2: ‘a’ < ‘b’, ‘a’ < ‘c’. ‘b’ - 1: ‘b’ < ‘c’. ‘c’ - 0: There is no letter in this string, which is larger than ‘c’.
Example#2
Input
5
aaabb
Output
2 2 2 0 0
Explanation: a - 2: ‘a’ < ‘b’ (b at index 3 and index 4). There is no letter in this string, which is larger than ‘b’.

Exercise-3

5. Tom and Jerry found two bags of apples. The bag that Jerry chose contains 5 apples and the bag chosen by Tom has 3 apples. Tom wants to have more apples, so he swaps the bags. Write a program to display the apples in the two bags before and after swapping.
   Hint :-(Try using call by value and call by reference; Write which can be used to swap)
6. Access the instance variables by using ‘this’ and super keywords.

Exercise-4

7. Create an abstract class named shape, that contains an empty method named numberOfSides(). Define three classes named Trapezoid, Triangle and Hexagon, such that each one of the classes contains only the method numberOfSides(), that contains the number of sides in the given geometrical figure.
8. You are supposed to calculate the area of a polygon based on number of inputs given by the user. Polygon can be a square, a rectangle or a triangle.

Exercise-5

9. Write an interface called Playable, with a method *void play();*
   Let this interface be placed in a package called music.
   Write a class called Veena which implements Playable interface. Let this class be placed in a package music.string
   Write a class called Saxophone which implements Playable interface. Let this class be placed in a package music.wind
   Write another class Test in a package called live. Then,
   a. Create an instance of Veena and call play() method
   b. Create an instance of Saxophone and call play() method
   c. Place the above instances in a variable of type Playable and then call play()

10. Create and access a user defined package where the package contains a class named CircleDemo, which in turn contains a method called circleArea() which takes radius of the circle as the parameter and returns the area of the circle.

Exercise-6

11. Handle the following exceptions using exception handling mechanism in java. (Note: Handle all exceptions in single program using command line arguments)
    - **a.** ArithmeticException
    - **b.** ArrayIndexOutOfBoundsException
    - **c.** NullPointerException
    - **d.** IOException
    - **e.** NumberFormatException
12. Write a java program to create three userdefined exceptions and throw the exceptions using throw and write appropriate catch and finally blocks to handle.

Exercise-7

13. Create three threads (by using Thread class and Runnable interface) where the first thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds.
14. Create three threads- with different priorities – MAX, MIN, NORM- and start the threads at the same time. Observe the completion of the threads.

Exercise-8

15. Handle keyboard events, which echoes keystrokes to the applet window and shows the status of each key event in the status bar.
16. Display the position of x and y co-ordinates of the cursor movement using mouse.

Exercise-9

17. Design GUI to handle Choice Control event.
18. Design simple arithmetic Calculator using Grid Layout manager.

Text Books

1. Herbert Schildt, "Java - The Complete Reference", 7th edition, TMH.
2. Sachin Malhotra, Saurabh choudhary, "Programming in Java", 2nd edition, Oxford.

Reference Books

1. E. Balagurusamy, "Programming with Java".
2. "Java 8 Programming", Black Book DreamTech,
3. P.Radha Krishna, "Object Oriented Programming through Java", Universities Press.

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DATABASE MANAGEMENT SYSTEMS LAB
(Common to CSE and AI&DS)
II Year – I Semester

Practical: 4	Internal Marks : 15
Credits : 2	External Marks : 35

Course Objectives

- To familiarize with creation of database and formulate SQL solutions to manipulate the database.
- To disseminate knowledge on triggers and PL/SQL programs in a database environment.

Course Outcomes

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

- create relational database with the given constraints.
- formulate simple and complex queries using features of SQL.
- create views on relational database based on the requirements of users.
- develop PL/SQL programs for processing multiple SQL statements.
- implement triggers on a relational database.

List of Experments

1. Execute **DDL, DML, DCL** and **TCL** Commands on below given relational schema. **EMP**(Empno, Ename, Job, Salary, Mgr, Comm, Hiredate, Deptno).
2. Implement the following integrity constraints on the following database **EMP** (Empno, Ename, Job, Salary, Mgr, Comm, Hiredate, Deptno) **DEPT**(Deptno, Dname, Location)

   a. Primary Key b. Foreign Key c. Unique d. Not NULL e. Check.
3. Execute basic **SQL** statements using the following
   a) Projection
   b) Selection
   c) arithmetic operators
   d) Column aliases
   e) Concatenation operator
   f) Character Strings
   g) Eliminating Duplicate Rows
   h) Limiting Rows Using
      - Comparison operators
      - LIKE,BETWEEN AND,IN operators
      - Logical Operators

   i) ORDER BY Clause
      - Sorting in Ascending Order
      - Sorting in Descending Order
      - Sorting by Column Alias
      - Sorting by Multiple Columns
4. Execute the following **single row functions** on a Relation.

- Character Functions
  - Case-manipulation functions(LOWER, UPPER, INITCAP)
  - Character-manipulation functions(CONCAT, SUBSTR, LENGTH, INSTR, LPAD | RPAD, TRIM, REPLACE)
- Number Functions(ROUND, TRUNC, MOD)
- Date functions
  - Months_Between
  - Add_Months
  - Next_Day
  - Last_Day
  - Round
  - Trunc
  - Arithmetic with Dates

5. Execute the following Multiple row functions (Aggregate Functions) on Relation.
   - Group functions(AVG, COUNT, MAX, MIN, SUM)
   - DISTINCT Keyword in **Count** Function
   - Null Values in Group Functions
   - NVL Function with Group Functions
6. Create Groups of Data using **Group By** clause
   - Grouping by One Column
   - Grouping by More Than One Column
   - Illegal Queries Using Group Functions
   - Restricting groups using HAVING Clause
   - Nesting Group Functions
7. Retrieve Data from Multiple Tables using the following join operations
   - Cartesian Products
   - Equijoin
   - Non-equijoin
   - Outer join
   - Self join
8. Execute Set operations on various Relations.
   - UNION
   - UNION ALL
   - INTERSECT
   - MINUS
9. Execute Sub Queries and Co-Related Nested Queries on Relations.
   - Implement
     - Single-row subquery
     - Multiple-row subquery
   - Using Group Functions in a Subquery
   - Using HAVING Clause with Subqueries
   - Using Null Values in a Subquery
   - Data retrieval using Correlated Subqueries
     - EXISTS Operator
     - NOT EXISTS Operator
10. Perform following operations on views
    - Simple Views
    - Complex Views
    - Modifying a View

- DML Operations on a View
- Denying DML Operations on view
- Removing a View

11. Develop the following PL/SQL programs
    - Simple PL/SQL programs
    - PL/SQL programs Using Control structures.
        - Conditional structures
        - Iterative structures
    - PL/SQL program using the following exception handling mechanisms.
        - Pre defined exceptions
        - user defined exceptions
12. Implement a PL/SQL block using triggers for transaction operations of a typical application.

    Note: For above experiments purpose use Sailors or Bank or Employee database from given text books.

Reference Books

1. Korth and Sudarshan, "Database system concepts", 3rd edition, MH.
2. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 3rd edition, MH
3. Benjamin Rosenzweig, Elena Silvestrova, "Oracle PL/SQL by Example", 3rd edition, Pearson Education.
4. Scott Urman, "Oracle Database Log PL/SQL Programming", Tata Mc-Graw Hill.
5. Dr. P.S. Deshpande, "SQL and PL/SQL for Oracle 10g".

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LOGIC BUILDING AND ALGORITHMIC PROGRAMMING
(Common to ECE, CSE, IT, AI&DS, IoT, CSE (AI&ML))

II Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

- Analysis of Algorithms
- Searching and Sorting
- Greedy Algorithms
- Dynamic Programming
- Pattern Searching
- Other String Algorithms
- Backtracking
- Divide and Conquer
- Geometric Algorithms
- Mathematical Algorithms
- Bit Algorithms
- Graph Algorithms
- Randomized Algorithms
- Branch and Bound
- Quizzes on Algorithms

DISCRETE MATHEMATICAL STRUCTURES
(Common to CSE and AI&DS)
II Year – II Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

Course Objectives

- To impart the knowledge on mathematical reasoning, relations, graphs and recurrence relations.

Course Outcomes

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

- use mathematical logic for analyzing propositions and proving theorems.
- describe the properties of relations, functions and lattice theories.
- categorize different types of algebraic structures and describe their properties.
- apply the concepts of graph theory in modeling and solving non-trivial problems incomputer networks.
- apply pigeon hole principle in computer applications and solve recurrence relations.

Course Content

UNIT – I: Mathematical Logic

Propositional Calculus: Statements and Notations, Connectives, Truth Tables, Tautologies, Equivalence of Formulas, Tautological Implications, Theory of Inference for Statement Calculus.

UNIT – II: Relations, Functions and Lattice Theory

Relations: Properties of Binary Relations, Equivalence, Compatibility and Partial order relations, Hasse Diagram.

Functions: Inverse, Composite functions. Lattice – Definition. Principle of duality, types of lattices – distributive & modular lattices.

UNIT – III: Algebraic Structures

Introduction to algebraic systems, Quasi- group, Semi-group,Monoid, Group and abelian group. Subgroupsand Cyclic Groups.

UNIT – IV: Graph Theory

Introduction to Graphs. Representation of Graphs: Adjacency Matrices, Incidence Matrices. Isomorphism in Graphs. Eulerian Graphs, Planar Graphs, Hamiltonian Graphs and chromatic number of a graph.

UNIT – V: Pigeon hole principle and Recurrence Relations

Pigeonhole principle and its applications.Recurrence relations - Homogeneous and Non-Homogeneous recurrence relations using method of characteristic roots and generating functions.

Text Books

1. J.P.Trembley, R Manohar, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill, New Delhi.
2. Mott, Kandel, Baker, “Discrete Mathematics for Computer Scientists & Mathematicians”, 2nd edition, PHI.

Reference Books

1. J K Sharma, “Discrete Mathematics”, 2nd edition, Macmillan Publications.
2. Schaum’s Outlines,” Discrete Mathematics”, 2nd edition, Tata McGraw Hill, New Delhi.
3. Rosen, “Discrete Mathematics and its Application with combinatorics and Graph Theory”, 7thediton, Tata McGraw Hill, New Delhi.

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COMPUTER ORGANIZATION
(Common to CSE, IT and AI&DS)
II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with organizational aspects of memory, processor and I/O.

Course Outcomes

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

- identify different types of instructions.
- differentiate micro-programmed and hard-wired control units.
- analyze the performance of hierarchical organization of memory.
- summarize different data transfer techniques.
- demonstrate arithmetic operations on fixed- and floating-point numbers and illustrate concepts of parallel processing.

Course Content

UNIT – I: Register Transfer Language and Micro Operations

Introduction- Functional units, computer registers, register transfer language, register transfer, bus and memory transfers, arithmetic, logic and shift micro operations, arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, instruction cycle. Register reference instructions, Memory – reference instructions, input – output and interrupt.

UNIT – II: CPU and Micro Programmed Control

Central Processing unit: Introduction, instruction formats, addressing modes. Control memory, address sequencing, design of control unit - hard wired control, micro programmed control.

UNIT – III: Memory Organization

Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, cache coherence

UNIT – IV: Input-Output Organization

Peripheral Devices, input-output interface, asynchronous data transfer, modes of transfer- programmed I/O, priority interrupt, direct memory access, Input –Output Processor (IOP).

UNIT – V: Computer Arithmetic and Parallel Processing

Data representation- fixed point, floating point, addition and subtraction, multiplication and division algorithms.

Parallel Processing-Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline.

Text Books

1. M. Moris Mano, "Computer Systems Architecture", 3rd edition, Pearson/PHI.

Reference Books

1. Carl Hamacher, ZvonksVranesic, SafeaZaky, "Computer Organization", 5thedition, McGraw Hill.
2. William Stallings, "Computer Organization and Architecture", 8thedition, Pearson/PHI.

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COMPILER DESIGN
(Common to CSE, IT and AI&DS)
II Year – II Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

Course Objectives

- To familiarize with lexical analyzer and different parsers.
- To introduce various storage allocation strategies, code generation and code optimization techniques.

Course Outcomes

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

- list compilation process steps of a language and represent tokens using regular expressions.
- design a parser to verify the syntax of a programming language.
- design syntax directed translation schemes for a given context free grammar.
- construct symbol table to access identifier information and perform various operations on it.
- apply code optimization techniques to enhance the efficiency of the intermediate code and generate code using generic code generation or DAG.

Course Content

UNIT – I: Lexical Analysis

Overview of language processing, preprocessors, compiler, assembler, interpreters, linkers and loaders, phases of a compiler. Lexical Analysis- role of lexical analysis, token, patterns and lexemes, transition diagram for recognition of tokens, reserved words and identifiers.

UNIT – II: Parsing

Syntax analysis, role of a parser, classification of parsing techniques.
Top-down parsing: Recursive descent parsing, first and follow, LL(1) grammars, non-recursive predictive parsing.
Bottom-up Parsing:Shift-Reduce parsing, operator precedence parsing, LR Parsers: construction of SLR, CLR (1), LALR parsers.

UNIT – III: Semantic Analysis

SDT, evaluation of semantic rules, Symbol tables- use of symbol tables, contents of symbol-table, operations on symbol tables, symbol table organization for block and non-block structured languages.

UNIT – IV: Intermediate Code Generation

Intermediate code- Three address code-quadruples, triples, abstract syntax trees. Machine-independent code optimization- common sub expression elimination, constant folding, copy propagation, dead code elimination, liveness analysis,loop optimization-strength reduction, code motion.

UNIT – V: Code Generation

Code Generation- issues in code generation, generic code generation, code generation from DAG. Machine dependent code optimization: Peephole optimization.

Text Books

1. Alfred V Aho, Monica S Lam, Ravi Sethi, Jeffrey D. Ullman, "Compilers, Principles Techniques and Tools", 2nd edition, Pearson.
2. V. Raghavan, "Principles of compiler design", 2nd edition, TMH.

Reference Books

1. Kenneth C Louden, "Compiler Construction, Principles and Practice", 1st edition, Cengage.
2. Jean-Paul Trembly, Paul G. Sorenson, "The Theory and Practice of Compiler writing", 1st edition, McGraw-Hill.
3. Nandini Prasad, "Principles of Compiler Design", 2nd edition, Elsevier.

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ARTIFICIAL INTELLIGENCE

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the basic principles of AI towards problem solving, inference, and learning.
- To investigate applications of AI in intelligent agents, expert systems and other machine learning models.

Course Outcomes

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

- analyze and formalize the problems as a state space, graph, or tree.
- use search algorithms to discover solution to a given problem.
- solve problems with uncertain information using probabilistic reasoning.
- formalize sequential decision making using Markov decision process.
- apply reinforcement learning to take suitable action to maximize reward in particular situation.

Course Content

UNIT – I: Introduction

Concept of AI, history, current status, scope, agents, environments, Problem Formulations, Review of tree and graph structures, State space representation, Search graph and Search tree.

UNIT – II: Search Algorithms

Random search, Search with closed and open list, Depth first and Breadth first search, Heuristic search, Best first search, A* algorithm, Game Search.

UNIT – III: Probabilistic Reasoning

Probability, conditional probability, Bayes Rule, Bayesian Networks- representation, construction and inference, temporal model, hidden Markov model.

UNIT – IV: Markov Decision Process

MDP formulation, utility theory, utility functions, value iteration, policy iteration and partially observable MDPs.

UNIT – V: Reinforcement Learning

Passive reinforcement learning, direct utility estimation, adaptive dynamic programming, temporal difference learning, active reinforcement learning- Q learning.

Text Books

1. Stuart Russel, Peter Norvig, “Artificial intelligence, A modern Approach”, 2nd edition, PEA.
2. Rich, Kevin Knight, Shiv Shankar B Nair, “Artificial Intelligence”- 3rd edition, TMH.

Reference Books

1. Saroj Kaushik, “Artificial Intelligence”- CENGAGELearning.
2. Patterson, “Introduction to Artificial Intelligence”, PHI.
3. George F Lugar, “Artificial intelligence, structures and Strategies for Complex problem solving”, 5th edition, PEA.

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SOFTWARE ENGINEERING
(Common to CSE and AI&DS)
II Year – II Semester

Lecture : 3	Practical : 2	Internal Marks	: 30
Credits : 4		External Marks	: 70

Course Objectives

- To familiarize with the software engineering principles to be followed in software development.
- To impart knowledge on software project management.

Course Outcomes

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

- apply suitable process model for software development based on stake holder requirements.
- estimate cost and schedule required to develop a software.
- analyze customer requirements and prepare SRS document.
- use software design principles in the design of a software.
- test a software using different testing techniques.

Course Content

UNIT – I: Introduction and Software Life Cycle Models

Evolving - From an art form to an Engineering Discipline. Life Cycle Models- Classical waterfall model, Iterative waterfall model, Prototyping model, Agile development models.

Lab Experiment

1. Assume that a software development company is already experienced in developing payroll software and has developed similar software for several customers (organizations). Assume that the software development company has received a request from certain customer (organization), which was still using manually processing of its pay rolls. For developing payroll software for this organization, which life cycle model should be used? Justify your answer.
2. Identify the criteria based on which a suitable life cycle model can be chosen for a given project development. Illustrate your answer using suitable examples.

UNIT – II: Software Project Management

Project Planning, Metrics for Project size Estimation- Lines of code- Function Point, COCOMO- Basic- Intermediate- Complete, Scheduling- work breakdown structure- Critical path method- PERT charts.

Lab Experiment

1. Compute the FP value for the grade calculation of students. Assume that it is an average complexity size project. The information domain values are as follows:

a. Number of user inputs = 13
b. Number of user outputs = 4
c. Number of user inquiries = 2
d. Number of files = 5
e. Number of external interfaces = 2
f. The total value of complexity adjustment attribute is 13

2. Assume that a system for simple student registration in a course is planned to be developed and its estimated size is approximately 10,000 LOC. The organization proposed to pay 25,000 per month to software engineers. Compute the development effort, development time, and the total cost for product development.
3. Suppose a library management system (LMS) is to be designed for an academic institution. From the project proposal, the following five major components are identified:online data entry 1.0 KLOC,data update 2.0 KLOC, file input and output 1.5 KLOC, library reports 2.0 KLOC, query and search 0.5 KLOC.The data base size and application experience are very important.Use of software tool and main storage is highly considerable.Virtual machine and its volatility can be kept low.All other cost drivers have nominal requirements.Use the COCOMO model to estimate the development effort and the development time.

UNIT – III: Requirements Analysis and Specification

Requirements gathering and analysis, software requirement specification- users of SRS document- characteristics of a good SRS document, Attributes of Bad SRS documents, important categories of customer Requirements, Functional requirements, Traceability, organization of the SRS document.

Lab Experiment

1. Suppose you have been appointed as the analyst for a large software development project. Discuss the aspects of the software product you would document in the software requirement specification (SRS) document? What would be the organization of your SRS document? How would you validate your SRS document? (Take any real time problem and prepare SRS document)

UNIT – IV: Software Design and Modelling

Software Design: Approaches to software design- function oriented design- object oriented design.

Object Modelling Using UML: Basic object orientation Concepts, Use case Model, Class diagram, Interaction diagrams, Activity Diagram, state chart Diagram, Component and Deployment diagrams.

Lab Experiment

1. To create a UML diagrams of ATM APPLICATION.
2. To create a UML diagram of BANKING SYSTEM.
3. To create a UML diagram of LIBRARY MANAGEMENT SYSTEM.

UNIT – V: Testing

Testing, Black-Box Testing- Equivalence class partitioning- Boundary value analysis, White-Box Testing- Basic concepts- statement coverage- branch coverage- multiple condition coverage- path coverage- McCabe's cyclomatic complexity metric, Integration testing, System Testing.

Lab Experiment

Design of Test cases based on requirements and design.

Text Books

1. Rajib Mall, "Fundamentals of Software Engineering",4th edition, PHI
2. Roger S Pressman,"Software engineering A practitioner's Approach", 6th edition McGraw Hill International Edition.

Reference Books

1. K.K Aggarwal and Yogesh Singh, "Software Engineering", 3rd edition, NewAge Publications.
2. Ian Sommerville, "Software Engineering", 7th edition, Pearson education.
3. Pankaj Jalote,, "Software Engineering, A Precise Approach", Wiley India, 2010.
4. Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd edition, Pearson Education.

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ARTIFICIAL INTELLIGENCE LAB

II Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To familiarize with different search techniques used in problem solving.
- To disseminate knowledge on Bayesian networks and reinforcement learning.

Course Outcomes

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

- conduct uninformed and informed search and game search.
- construct a Bayesian network for the given data and infer from the Bayesian network.
- develop programs to do reinforcement learning in a grid world.

List of Experiments

1. Write a programme to conduct uninformed and informed search.
2. Write a programme to conduct game search.
3. Write a programme to construct a Bayesian network from given data.
4. Write a programme to infer from the Bayesian network.
5. Write a programme to run value and policy iteration in a grid world.
6. Write a programme to do reinforcement learning in a grid world.

Reference Books

1. Stuart Russel, Peter Norvig, Artificial intelligence, A modern Approach, 2nd edition, PEA.
2. Saroj Kaushik, Artificial Intelligence- CENGAGE Learning.
3. George F Lugar, Artificial intelligence, structures and Strategies for Complex problem solving, 5th edition, PEA.

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GAME PROGRAMMING
(Common to CSE and AI&DS)
II Year – II Semester

Lecture : 1	Practical : 2	Internal Marks	: 15
Credits : 2		External Marks	: 35

Course Objectives

- To be able to develop gaming applications.

Course Outcomes

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

- install and make use of Unity 3D Editor in developing gaming apps.
- developing game objects using scripts.
- develop a 2D gaming application on windows.
- develop a 3D gaming application on windows.

Course Content

Introduction

- Course Overview
- Installation (on Windows)
- Creating Project(2D/3D) template
- Explaining difference between 2D and 3D
- Unity3D Editor Quick Reference (Brief)
- Interface Overview, The Scene View, The Game View, The Hierarchy Window, The Project Window, The Inspector Window, Game Objects and Components, Lights, Materials, Models and Materials, The Standard Shader.
- Physics 2D & 3D (1. Colliders 2. Colliders as Triggers 3. Rigidbodies 4. Adding Physics Forces 6. Physics Materials 7. Physics Joints 8. Detecting Collisions with OnCollisionEnter)

Script (C#) in Unity 3D

- Installation of visual studio (on Windows)
- Creating and Using Scripts
- Variables in Unity 3D
- Controlling GameObjects using components
- Numbers in Unity 3D
- Conditionals in Unity 3D
- Array and Loops in Unity 3D
- Functions and Methods in Unity 3D

Developing Unity 2D game

- Creating 2D platform game
- Player Moving
- Platform Moving and Adding Bullets
- Adding Animations to Player and Platforms
- Add Coins
- Score and health bar
- Enemy creation
- Destorying Enemy Using Player
- Level Creation and adding Audio
- Adding Andriod Buttons

Developing Unity 3D Game

- Creating 3D game template
- Project Structure should include (Materials, Prefabs, Scripts, scene)
- Introduction to 3D Game - Infinite Runner
- Environment and Player: Setting up the Game, Moving the Player.
- Camera and Play Area: Moving the Camera, Setting up the Play Area
- Collecting Gems and Scoring: Creating Collectable Objects, Collecting the Pick Up Objects, Displaying the Score and Text

Text Book

1. Alex Okita “Learning C# Programming with Unity 3D”,CRC Press.

Web Links

1. https://www.studytonight.com/game-development-in-2D/

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PROGRAMMING FOR CORPORATE
(Common to ECE, CSE, IT, AI&DS, IoT, CSE (AI&ML))
II Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Using JAVA

- Coding Standards / Best Practices
- Wrapper Classes, I/O Streams, Annotation
- Junit
- Multithreading | / II
- RDBMS / SQL / PL/SQL
- JDBC
- ANT
- HTML
- JavaScript / CSS
- Serviets and JSP
- XML-I and XML-II

OPERATING SYSTEMS

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To impart the concepts of process, memory and file management techniques.
- To familiarize with the deadlock handling techniques.

Course Outcomes

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

- describe the role, functions and structures of operating systems.
- demonstrate the concept of process an analyze the performance of CPU scheduling algorithms.
- compare a different memory management schemes and apply page replacement algorithms in virtual memory.
- apply deadlock handling techniques and analyze various disk scheduling algorithms.
- develop software or hardware based solutions for critical section problems and outline files and directory structures.

Course Content

UNIT – I:

Introduction: Operating system services, Operating –system structures, System calls: Types of system calls.

UNIT – II:

Process Management: Process, Process state, Process control block (PCB), Process scheduling, Scheduling queues, Schedulers, Scheduling criteria, Scheduling algorithms, Inter process communication.

Multithreaded Programming: Multithreading models.

UNIT – III:

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

Virtual-Memory Management: Demand paging, Page replacement Algorithms, Thrashing.

UNIT – IV:

Deadlocks: Deadlock characterization, Methods for handling deadlocks: deadlock-prevention, Avoidance, Detection, recovery

Mass-storage structure: Magnetic disk, Disk Scheduling.

UNIT – V:

Synchronization: The critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors.

File system Interface: File attributes, File operations, Access methods, Directory structures.

Text Books

1. Abraham Silberschatz, Peter B, Galvin, Greg Gagne, Operating System Principles, John Wiley, 7th edition.
2. Stallings, Operating Systems - Internal and Design Principles, Pearson education, 6th edition, 2005.

Reference Books

1. D. M. Dhamdhere, Operating systems- A Concept based Approach, TMH, 2nd edition.
2. Andrew S Tanenbaum, Modern Operating Systems, PHI, 3rd edition.

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COMPUTER NETWORKS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the fundamental concepts of computer networking.
- To familiarize with networking concepts to work on various Protocols of ISO OSI and TCP/IP.

Course Outcomes

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

- compare protocol models (OSI, TCP/IP) and select suitable protocol for network design.
- design a network by deciding relevant multiplexing and switching technique to improve performance of the network.
- apply flow control, error control techniques and protocols to verify the correctness of data in the communicated network.
- apply routing and congestion control algorithms to deliver data packets across the networks.
- use communication protocols like IP, TCP, UDP, DNS, HTTP, FTP across the Internet.

Course Content

UNIT – I:

Introduction-components of data communication, data flow, network topologies, categories of networks-LAN, MAN, WAN, ISO-OSI model, TCP/IP.

UNIT – II:

Physical Layer Multiplexing- frequency division multiplexing, synchronous time division multiplexing, statistical time division multiplexing, Introduction to switching - circuit switched networks, datagram networks, virtual circuit networks.

UNIT – III:

Data Link Layer Design issues, framing, error control, error detection and correction, CRC, checksum, hamming code. 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, data link layer in HDLC, PPP.

UNIT – IV:

Medium Access Control Sub Layer ALOHA, CSMA, CSMA/CD, IEEE standards-standard Ethernet, wireless LAN, bridges.

Network Layer Routing algorithms- shortest path routing, distance vector, link state routing, and hierarchical routing. Congestion control algorithms-congestion control in virtual circuit subnets, datagram subnet, leaky bucket, token bucket. The network layer in the Internet: The IP protocol, IPAddresses-IPv4, IPv6.

UNIT – V:

Transport layer: Transmission Control Protocol (TCP)- services, segment header, connection establishment, termination, transmission policy, congestion control. User Datagram Protocol (UDP)- header format.

Application layer: The Domain Name System (DNS), electronic mail-architecture, SMTP, POP3, FTP, HTTP.

Text Books

1. Andrew S Tanenbaum, "Computer Networks", 4th edition, Pearson.
2. Behrouz A Forouzan, "Data Communications and Networking", 5th edition, TMH.

Reference Books

1. S. Keshav, "An Engineering Approach to Computer Networks", 2nd edition, Pearson Education.
2. W.A. Shay, Thomson, "Understanding Communications and Networks", 3rd edition, Cengage Learning.

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FULL STACK APPLICATION DEVELOPMENT

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To develop web applications using Full stack technologies.

Course Outcomes

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

- design web pages using HTML5 and CSS3.
- develop dynamic web pages and perform form validations using Javascript.
- develop server side script to handle the given form data using JSP.
- perform CRUD operations on MySql database using PHP.
- perform various operations on constructing React elements with data.

Course Content

UNIT – I: HTML5 and CSS3

HTML5: HTML5 Document Structure, Basic HTML tags, Section elements, text, links, tables, images, forms.

CSS3: Evolution of CSS3, Syntax of CSS3, Types, Selectors, Background, Font, Text, Borders.

UNIT – II: Bootstrap and JavaScript

Bootstrap: Introduction to Bootstrap, Structure of the page, Typography, Forms.

Java Script: Introduction to Javascript, variables, primitive data types, control flow statements, Built-in objects, arrays, functions, event handling, DHTML - Object model.

JQuery: Working with JQuery

UNIT – III: JSP

JSP architecture, Life Cycle, Creating Simple JSP Pages, JSP Basic tags, Implicit Objects.

JDBC: Introduction to JDBC, JDBC architecture, JDBC Drivers, Database Connectivity, CRUD operations.

UNIT – IV: PHP

Introduction, Creating and running a PHP script, variables, constants, data types, arrays and functions, Reading and processing data from web form controls.

MySql: Connecting to MySql server using PHP, creating new database and tables, reading and displaying table data, Inserting, deleting and updating records in database table using PHP.

UNIT – V: ReactJS

Components in React, Styling in React, Creating Complex Components, Transferring Properties, Dealing with States, Going from Data to UI, Working with events.

Text Books

1. HTML5 Black Book, Dream Tech Publisher.
2. Web Technologies, Black Book, DreamTech Publisher, 2017

Reference Books

1. Kirupa Chinnathambi, Learning React , Addison Wesley ,2017.
2. Jorge Krause, Introducing Bootstrap 4 , Apress Publisher,2016
3. Riaz Ahmed, “Full Stack Web Development For Beginners”, Atlantic Publishers and Distributors.

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DESIGN AND ANALYSIS OF ALGORITHMS

III Year – I Semester

Lecture	: 2	Tutorial	: 1	Internal Marks	: 30
Credits	: 3			External Marks	: 70

Course Objectives

- To analyze the running time of algorithms using asymptotic notations.
- To impart knowledge on different algorithmic design paradigms.

Course Outcomes

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

- analyze the performance of algorithms based on time and space complexity.
- apply divide and conquer technique to solve sorting and searching problems.
- apply greedy method to find optimal solution to a class of problems.
- solve optimization problems using dynamic programming.
- construct state space tree to find all possible solutions to a class of problems
- using back tracking and branch and bound techniques.

Course Content

UNIT – I: Introduction

Algorithm, Characteristics of Algorithms, Performance Analysis: Space and Time complexity, Asymptotic Notations- Big oh, Omega and Theta.

UNIT – II: Divide and Conquer

General method, Solving recurrence relations- Master theorem, Substitution method, Applications-Binary search, Quick sort, Merge sort.

UNIT – III: Greedy Method

General method, Applications- knapsack problem, Job sequencing with deadlines problem, Single source shortest path problem and Minimum cost spanning trees.

UNIT – IV: Dynamic Programming

General method, Applications-Matrix chain multiplication, 0/1 knapsack problem, All pairs shortest paths problem, Travelling salesperson problem.

UNIT – V: Back Tracking & Branch and Bound

Back Tracking: General method, Applications-n queens' problem, Graph coloring problem.

Branch and Bound: General method, LC search, Applications - 0/1 knapsack problem: LCBB, FIFOBB solutions, Travelling salesperson problem: LCBB solution.

Text Books

1. Ellis Horowitz, SatrajSahni and Rajasekharam, “Fundamentals of Computer Algorithms”, 2nd Edition, Galgotia publications Pvt. Ltd.
2. T.H.Cormen,C.E.Leiserson, “Introduction to Algorithms”, 2nd Edition, PHI Pvt. Ltd.

Reference Books

1. Aho, Ullman and Hopcroft, “Design and Analysis of algorithms”, 1st Edition, Pearson Education.
2. Allen Weiss, “Data structures and algorithm analysis in C++”, 2nd Edition, Pearson Education.

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Professional Elective - I

UML AND DESIGN PATTERNS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To get familiar with the Object Oriented Analysis and Design in software development, develop UML structural and behavioral models of an application.
- To describe and choose an appropriate Design Pattern to refine the model.

Course Outcomes

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

- apply the software development object oriented analysis and designs in software development and familiar with the UML concepts.
- develop static conceptual models of the system.
- create dynamic behavioral models of the system to meet user needs.
- design object oriented architecture models.
- select an appropriate design pattern to refine the model.

Course Content

UNIT – I: Introduction to UML

Importance of modeling, principles of modeling, object orientedmodeling, Conceptual model of the UML, Architecture of UML.

UNIT – II: Structural Modeling and Behavioral Modeling

Structural Modeling: Classes, Relationships - Dependency, Generalization, Realization, Association- advanced features of association, Class diagrams and Object Diagrams.

Behavioral Modeling: Interaction Diagrams - Sequence diagram, Collaboration diagram, Use case Diagrams, Activity Diagrams.

UNIT – III: Advanced Behavioral Modeling and Architectural Modeling

Advanced Behavioral Modeling: Events and signals, state machines, state chart diagrams.

Architectural Modeling: Components, Component diagrams, Deployment diagrams.

UNIT – IV: Introduction to Design Patterns

Introduction to Design patterns: What is a Design Pattern? Describing Design Patterns, How to Select a Design Pattern, How to Use a Design Pattern.

UNIT – V: Types of Design Patterns

Creational Design Patterns - Factory Method, Prototype.

Structural Design Patterns – Bridge, Façade.

Behavioral Design Patterns - Chain of responsibility, Template Method.

Text Books

1. "The Unified Modeling Language User Guide" Booch, James Rumbaugh, Ivar Jacobson, Pearson Education.
2. "Design Patterns: Elements of Reusable Object-Oriented Software", Erich Gamma, Ralph Johnson, John Vlissides, Richard Helm.

Reference Books

1. "Fundamentals of Object Oriented Design in UML", Meilir Page-Jones, Pearson Education.
2. "Object Oriented Analysis and Design with Applications" Grady Booch, Pearson Education Asia, 2nd Edition.
3. "Patterns Patterns for Object-Oriented Software Development", Wolfgang Pree, Addison- Wesley/ACM Press, 1995.

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Professional Elective - I

KNOWLEDGE REPRESENTATION AND ONTOLOGY

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To investigate the key concepts of knowledge representation(KR) techniques and different notations.
- To integrate the KR view as a knowledge engineering approach to model organizational knowledge.
- To introduce the study of ontologies as a KR paradigm and applications of ontologies.
- To understand various KR techniques.
- To understand process, knowledge acquisition and sharing of ontology.

Course Outcomes

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

- analyze and design knowledge based systems intended for computer implementation.
- acquire theoretical knowledge about principles for logic-based representation and reasoning.
- ability to understand knowledge-engineering process.
- ouline the syntax and semantics of concepts.
- ability to implement production systems, frames, inheritance systems and approaches to handle uncertain or incomplete knowledge.

Course Content

UNIT – I: The Key Concepts

Logic: Historical background, Representing knowledge in logic, Varieties of logic, Name, Type, Measures, Unity Amidst diversity.

UNIT – II: Ontology

Ontological categories, Philosophical background, Top-level categories, Describing physical entities, Defining abstractions, Sets, Collections, Types and Categories, Space and Time.

UNIT – III: Knowledge Representations

Knowledge Engineering, Representing structure in frames, Rules and data, Object-oriented systems, Natural language Semantics, Levels of representation.

UNIT – IV: Processes

Times, Events and Situations, Classification of processes, Procedures, Processes and Histories, Concurrent processes, Computation, Constraint satisfaction, Change.

Contexts: Syntax of contexts, Semantics of contexts, First-order reasoning in contexts, Modal reasoning in contexts, Encapsulating objects in context.

UNIT – V: Knowledge Soup

Vagueness, Uncertainty, Randomness and Ignorance, Limitations of logic, Fuzzy logic, Non-monotonic Logic, Theories, Models and the world, Semiotics

Knowledge Acquisition and Sharing: Sharing Ontologies, Conceptual schema, Accommodating multiple paradigms, Relating different knowledge representations, Language patterns, Tools for knowledge acquisition.

Text Books

1. Knowledge Representation logical, Philosophical, and Computational Foundations by JohnF. Sowa, Thomson Learning.
2. Knowledge Representation and Reasoning by Ronald J.Brachman, Hector J.Levesque, Elsevier.

Reference Books

1. Concepts, Ontologies, and Knowledge Representation by Grega Jakus , Veljko Milutinovic.
2. Knowledge Representation and Ontologies by Grimm Stephan, Hitzler Pascal & Abecker Andreas

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Professional Elective - I

DATA WAREHOUSING AND DATA MINING

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart the basic foundation towards the concepts of Data Mining and Preprocessing Techniques.
- To understand and apply various concepts of Association Rule Mining, Classification, Clustering Techniques and Algorithms**.**

Course Outcomes

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

- describe fundamentals, and functionalities of data mining system and data preprocessing techniques.
- analyze the performance of association rule mining algorithms for finding frequent item sets from the large databases.
- outline the data classification procedure by selecting appropriate classification methods / algorithms.
- classify various clustering methods and algorithms on data sets to create appropriate clusters.
- apply appropriate web and text mining techniques for data analysis.

Course Content

UNIT – I: Introduction to Data Mining and Data Preprocessing

Introduction: What is Data Mining, What Kinds of Data Can Be Mined, What Kinds of Patterns Can Be Mined, Major Issues in Data Mining.

Data Preprocessing: Data Cleaning, Data Integration, Data Reduction Data Transformation and Data Discretization, Data visualization, Data similarity and dissimilarity.

UNIT – II: Data Warehousing and OLAP

What is a Data Warehousing? Differences between Operational Databases Systems and Data Ware houses, Data Warehousing: A Multi-tiered Architecture, Data Warehouse Modeling: A Multidimensional Data Model, Star, Snowflake and Fact Constellations, a Role of Concept Hierarchies, OLAP Operations.

UNIT – III: Mining Frequent Patterns, Associations and Correlations

Basic Concepts: Frequent Itemsets, Closed Itemsets, and Association Rules, Frequent Itemset Mining Methods: Apriori Algorithm, Generating Association Rules from Frequent Itemsets, A Pattern-Growth Approach for Mining Frequent Itemsets.

UNIT – IV: Classification

Basic Concepts: What Is Classification, General Approach to Classification, Decision Tree Induction: Decision Tree Induction, Attribute Selection Measures-Information Gain, Gain Ratio, Bayes Classification Methods: Bayes' Theorem, Naïve Bayesian Classification, Rule-Based Classification: Using IF-THEN Rules for Classification, Lazy Learners: k-Nearest-Neighbor Classifier.

UNIT – V: Cluster Analysis

Cluster Analysis: Requirements for Cluster Analysis, Overview of Basic Clustering Methods, Partitioning Methods: k-Means, k-Medoids, Hierarchical Method: Agglomerative versus Divisive Hierarchical Clustering, Density-Based Method: DBSCAN. Grid-Based Method: STING.

Text Books

1. Jiawei Han, Micheline Kamber& Jian pei, "Data Mining Concepts and Techniques",3rdedition, Morgan Kaufmann Publishers an imprint of Elsevier.
2. Pang-Ning Tan, MichaelSteinbach, VipinKumar "Introduction to DataMining",1stedition, Pearson 2016.

Reference Books

1. Arun K Pujari ,"Data Mining Techniques", 3rd Edition, Universities Press.
2. Margaret H Dunham, "Data Mining Introductory and Advanced Topics", 1stedition, Pearson Education
3. T.VSveresh Kumar, B.EswareReddy, Jagadish S Kalimani," Data Mining Principles & Applications Elsevier.

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Professional Elective - I

VIRTUAL AND AUGMENTED REALITY

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce key elements of virtual Reality with the components in VR systems.
- To disseminate knowledge on input and output devices required for interacting in virtual world and augmented reality.

Course Outcomes

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

- identify basic elements of virtual Reality.
- describe various input and output devices required for VR experience.
- classify human factors that affect VR experience.
- distinguish augmented reality from virtual reality.
- determine the object position and orientation in virtual space.

Course Content

UNIT – I: Introduction and 3D Computer Graphics

The virtual world space, positioning the virtual observer, the perspective projection, Human vision, Stereo perspective projection, 3D clipping, The three I's of virtual reality, commercial VR technology and the five classic components of a VR system.

UNIT – II: Input Devices and Geometric Modelling

From 2D to 3D, 3D space curves, 3D boundary representation,(Trackers, Navigation, and Gesture Interfaces): Three- dimensional position trackers, Navigation and manipulation, interfaces and gesture interfaces.

UNIT – III: Output Devices and Geometrical Transformations

Frames of reference, Modeling transformations, instances, picking flying, Scaling the VE, Collision detection, Graphics displays, sound displays & haptic feedback.

UNIT – IV: Human Factors

Methodology and terminology, user performance studies, VR health and safety issues.

Applications: Medical applications, military applications, robotics applications.

UNIT – V: Augmented Reality and Understanding Virtual Space

Introduction, Augmenting Displays, Fully Immersive Displays, Applications of Augmented and Virtual Reality, Visual and Object Space, Defining Position and Orientation in Three Dimensions.

Text Books

1. John Vince, - Virtual Reality Systems , Pearson Education.
2. Grigore C. Burdea, Philippe Coiffet - Virtual Reality Technology||,Second Edition.
3. Steve Aukstakalnis, Practical Augmented Reality: A Guide to the Technologies, Applications, and Human Factors for AR and VR , Addison-Wesley.

Reference Books

1. Brett S. Martin, ¯Virtual Reality, Norwood House Press, 2017.
2. Alan B. Craig,-Understanding Augmented Reality: Concepts and Applications, Newnes.

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COMPUTER NETWORKS LAB

III Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To implement the functionalities of various layers of OSI model.

Course Outcomes

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

- implement data link layer framing and error detection methods.
- analyze the topological and routing strategies for an IP based networking infrastructure.

List of Experiments

1. Implement the data link layer farming methods such as character, character stuffing and bit stuffing.
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
3. Implement Dijkstra's algorithm to compute the Shortest path thru a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm.
5. Take an example subnet of hosts. Obtain broadcast tree for it.
6. Implement hierarchal routing algorithm.
7. Implement error detecting techniques.

Reference Books

1. Andrew S Tanenbaum, "Computer Networks", 4th edition, Pearson.
2. Behrouz A Forouzan, "Data Communications and Networking", 5th edition, TMH.
3. W.A. Shay, Thomson, "Understanding Communications and Networks", 3rd edition, Cengage Learning

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WEB APPLICATION DEVELOPMENT USING FULL STACK

III Year – I Semester

Practical	: 4	Internal Marks	: 15
Credits	: 2	External Marks	: 35

Course Objectives

- To facilitate designing of dynamic web pages using HTML5, CSS3 and Javascript.
- To familiarize server side programming and master database access using PHP.

Course Outcomes

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

- design web pages using HTML5, CSS3 and Javascript.
- use Javascript and PHP to access and validate form data.
- develop a database application and perform various operations on database using JSP and PHP.

List of Experiments

1. Design the following static web pages required for an online book store web site.
   i. Home page:- must contains three frames
      - Top frame: - should contain logo and college name and links to homepage, login page, registration page and catalogue page.
      - Left frame: - at least four links for navigation which will display the catalogue of Respective links.
      - Right frame: - the pages to links in the left frame must be loaded here initially it Contains the description of the website

   ii. Login Page: - should contain Username and Password fields, Submit and reset buttons.

   iii. Registration Page: - should contain fields for Username, Password, Confirm Password, Gender, Date of Birth, Email Id, Mobile Number and Address.

   iv. Catalogue Page: - The details should contain the following details of books available in a tabular format: Snap shot of Cover Page, Author Name, Publisher details, Price and Add to Cart button.
2. Design a web page using CSS which includes the following:
   i. Use different font and text properties.

ii. Set a background image for both the page and single element on the page.
iii. Define styles for links.
iv. Add Customized cursors.

3. Write an XML file which will display the Book information which includes the following:
   i. Title of the book, Author Name, ISBN number, Publisher name, Edition and Price.
   ii. Validate the above document using DTD .
4. Using JavaScript and Regular expressions validate all the fields of:
   i. Login page. ii. Registration page.
5. Design a web page using jQuery to demonstrate
   i. Hide, show, fading and sliding effects.
   ii. Keyboard, mouse and form events
6. Using PHP and Regular expressions validate all the fields of:
   i. Login page. ii. Registration page.
7. Install a database and design a Web application using JSP:
   i. To connect to the database using JDBC.
   ii. Create new tables.
   iii. Insert the details of the users who register through the registration page of the online book store web site in to the database.
   iv. Retrieve and display data related to books stored in the tables to the user.
8. Create a user authentication application using JSP where the user submits login name and password to the server through form. The name and password are verified against the data already available in the database and if there is a match, a welcome page is returned. Otherwise a failure message is displayed to the user.
9. Design a Web application using PHP:
   i. To connect to the MySQL database.
   ii. Create new tables.
   iii. Insert the details of the users who register through the registration page of the online book store web site in to the database.
   iv. Retrieve and display data related to books stored in the tables to the user.

10. Create a user authentication application using PHP where the user submits login name and password to the server through form. The name and password are verified against the data already available in the database.
    i. On successful authentication, display welcome message to the user and create a new session.
    ii. Otherwise display a failure message to the user.
11. Design a web application to make the Button Click Do Something using React Events.

Text Books

1. HTML5 Black Book, Dream Tech Publisher.
2. Kirupa Chinnathambi, Learning React, Addison Wesley, 2017.

Reference Books

1. Robert W Sebesta, "Programming the World Wide Web", 7th edition, Pearson.
2. Chris Bates, "Web Programming, Building Internet Applications", 2nd edition, Wiley Dreamtech.
3. Uttam K Roy, "Web Technologies", 1st Edition, Oxford.

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COMPETITIVE CODING
(Common to ECE, CSE, IT, AI&DS, IoT, CSE (AI&ML))

III Year – I Semester

Practical: 2	Internal Marks : 15
Credits : 1	External Marks : 35

Preparing Students for High-Eng Salary Packages - Training Modules are Dynamic in nature and change from time to time keeping the latest requirements of the industry in view.

- Training Modules will be decided THREE MONTHS before commencing the Semester.

Advance DS & Algorithm Analysis:

Linked Lists

- Introduction About Linked Lists.
- All Types(Single) And Its Operations.

Linked Lists

- Loop Detection In Linked List.
- Deletion Of Duplicates(Sorted And Unsorted),K Th Swapping Problem, Linkedlist Rotations

Stacks

- Introduction To Stacks And Its Operations And Applications, Stacks As Linked List And Stack As Array,
- Balancing Parenthesis, Expression Conversion - (Infix, Prefix, Postfix), Expression Evaluation (Infix, Prefix, Postfix)

Queues

Introduction To Queue And Its Operations And Applications, Queue As Linked List And As Array. Types Of Queue and Circular Queue, Priority Queue, Deque, Queue Implementation Using Stacks, Queue Programs

Trees

- Introduction To Trees And Its Applications, Tree Terminologies And Its Types. Binary Tree representations - array, Linked List, Tree representations - Full, complete, binary, skewed, Formulae.
- Tree Traversals (In order, Preorder, Postorder, and Level Order), Depth Of Tree.

- Binary Search Tree - Creation, Insertion(all types), BST construction from preorder, Binary tree to BST, array to BST(level order, preOrder), BST - deletion(all types), Traversals, all Standard Operations, BST Programs - LCA, node with min value, BST Programs (Doubts,Revision), Programs

Graphs

- Introduction To Graphs And Its Applications Graph Terminologies And Types Of Graphs Graph Representation Using Adjacency List And Matrix, Traversals (Bfs And Dfs).
- Path finding problems Floyds Tortoise and Hare algorithm In Graphs Programs, Graphs Programs(Doubts, Revision),

Greedy Algorithms

Introduction to Greedy algorithms, Activity Selection problem, Fractional Knapsack and Problems on Greedy algorithms

Dynamic Programming

Greedy vs Dynamic programming. Top down and bottom up approach, Longest Common Subsequence, longest increasing subsequence, Edit distance, 0-1 Knapsack, Coin change problem and Problems on dynamic programming.

IMAGE PROCESSING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To describe and explain basic principles of digital image processing.
- To discuss various image processing techniques.

Course Outcomes

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

- illustrate fundamental steps in digital image processing.
- make use of appropriate digital image enhancement techniques in spatial domain for real worldproblems.
- apply suitable image segmentation and Compression techniques for an application.
- demonstrate color image processing techniques.
- summarize different reshaping operations on the image and their practical applications

Course Content

UNIT – I: Introduction

Digital image processing, examples of fields that use digital image processing, fundamental steps in digital image processing.

Digital Image Fundamentals- Image sensing and acquisition, sampling and quantization, basic relationships between pixels.

UNIT – II: Image Enhancement in the Spatial Domain

Introduction, Basic gray-level transformations, histogram processing, enhancement using arithmetic and logic operators. Basics of spatial filtering, smoothing and sharpening spatial filters, combining the spatial enhancement methods.

UNIT – III: Color Image Processing

Introduction, color fundamentals, color models, pseudo color image processing, basics of full–color image processing, color transformations, color image smoothing and sharpening, color segmentation.

UNIT – IV: Image Compression

Fundamentals, image compression models, error-free compression, lossy predictive coding.

UNIT – V: Morphology and Segmentation

Preliminaries, dilation, erosion, open and closing, hit or miss transformation, basic morphologic algorithms

Image Segmentation: Detection of discontinuous, edge linking and boundary detection, thresholding, region–based segmentation.

Text Books

1. Rafeal C. Gonzalez, Richard E. Woods, "Digital Image Processing", 2nd Edition, Pearson Education/PHI.
2. William K. Prat, "Digital Image Processing", Wily 3rd Edition.

Reference Books

1. Milan Sonka, Vaclav Hlavac and Roger Boyle, " Image Processing, Analysis, and "Machine Vision", 2nd Edition, Thomson Learning.
2. Adrian Low, "Computer Vision and Image Processing", 2nd Edition, B.S.Publications.
3. B. Chanda, D. DattaMajumder, "Digital Image Processing and Analysis", Prentice Hall of India, 2003.

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DATA SCIENCE

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize with statistical methods to analyse data using classification, graphical and computational methods.
- To introduce Data Wrangling approaches and descriptive analytics on large data sets.

Course Outcomes

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

- apply statistical learning methods to data for inferences.
- analyze data using Machine Learning approaches.
- Illustrate Graphical Analysis and Hypothesis testing methods.
- use Data Wrangling approaches for pre-processing the data.
- perform descriptive analytics over massive data.

Course Content

UNIT – I: Introduction and Linear Regression

Statistical learning, assessing model accuracy, descriptive statistics,
Linear Regression: Simple and multiple linear regressions, k-nearest neighbor regression.

UNIT – II: Machine Learning

Modeling, Overfitting and Underfitting, Correctness, The Bias-Variance Tradeoff, Feature Extraction and Selection, k-Nearest Neighbors, Naive Bayes. Gradient Descent.

UNIT – III: Graphical Analysis & Hypothesis Testing

Visualizing Data: matplotlib, Bar Charts, Histograms and frequency polygons, box-plots, quartiles, scatter plots, heat maps

Simple Hypothesis testing, student's t-test, paired t and u test, correlation and covariance, tests for association.

UNIT – IV: Data Wrangling

Data acquisition, the split-apply-combine paradigm, data formats, imputation, Cleaning and Munging, Rescaling, Dimensionality Reduction.

UNIT – V: Computational Methods and Analytical Processing

Programming for Eigen values and Eigen vectors, sparse matrices, QR and SVD. Data warehousing and OLAP, data summarization, data de-duplication, data visualization using CUBEs.

Text Books

1. Gareth James, Trevor Hastie, Robert Tibshirani, Daniela Witten, "An Introduction to Statistical Learning with Applications in R". Springer Publishing, 2013.
2. Joel Grus, "Data Science From Scratch", OReilly Media, 2015.

Reference Books

1. Mark Gardener, "Beginning R The statistical Programming Language", Wiley.

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MACHINE LEARNING

III Year – II Semester

Lecture : 2	Practical : 2	Internal Marks	: 30
Credits : 3		External Marks	: 70

Course Objectives

- To familiarize with different machine learning techniques.
- To impart knowledge on neural networks and decision tree learning.

Course Outcomes

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

- describe machine learning and different forms of learning.
- use statistical learning techniques to solve a class of problems.
- build support vector machine for the given data to create optimal boundary that best classifies the data.
- design neural networks to simulate the way human brain analyzes and processes information.
- solve classification problems using a decision tree.

Course Content

UNIT - I: Introduction

Towards Intelligent Machines, Well posed Problems, Example of Applications in diverse fields, Data Representation, Domain Knowledge for Productive use of Machine Learning, Diversity of Data: Structured / Unstructured, Forms of Learning.

UNIT - II: Statistical Learning

Machine Learning and Inferential Statistical Analysis, Descriptive Statistics in learning techniques, Bayesian Reasoning: A probabilistic approach to inference, K-Nearest Neighbor Classifier. Discriminant functions and regression functions, Linear Regression with Least Square Error Criterion, Logistic Regression for Classification Tasks.

UNIT - III: Support Vector Machines (SVMs), Decision Tree Learning

Introduction, Linear Discriminant Functions for Binary Classification, Perceptron Algorithm, Large Margin Classifier for linearly separable data, Kernel Induced Feature Spaces, Nonlinear Classifier.

Introduction, Example of classification decision tree, measures of impurity for evaluating splits in decision trees, ID3 decision trees, pruning the tree, metrics for assessing classification accuracy.

UNIT - IV: Clustering

Clustering Overview, unsupervised learning, Types of Clustering, Centroid based clustering, K-means, Heirarchial clustering, Principal Component Aanalysis.

UNIT - V: Learning with Neural Networks

Neuron Models, Network Architectures, Perceptrons, The Error-Correction Delta Rule, Multi-Layer Perceptron (MLP) Networks and the Error-Backpropagation Algorithm.

Text Books

1. M.Gopal, Applied Machine Learning, McGraw Hill Education.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.

Reference Books

1. Trevor Hastie, Robert Tibshirani, Jerome Friedman, The Elements of Statistical Learning, Springer 2009 (freely available online).
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2007.

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Professional Elective - II

STATISTICAL LEARNING

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To develop models to predict categorical and continuous outcomes, using such techniques as neural networks, decision trees, logistic regression, support vector machines and Bayesian network models.
- To know the use of the binary classifier and numeric predictor nodes to automate model selection.

Course Outcomes

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

- apply statistical measures for data analysis
- analyze probability and random experiments.
- define sampling techniques and apply various distribution models.
- solve testing of hypothesis problems
- apply predictive modeling approaches using a suitable package.

Course Content

UNIT – I: Statistic Fundamentals

Frequency Distributions and Measures of Central Tendency - Frequency Distribution, Graphic Representation of a Frequency Distribution, Averages or Measures of Central Tendency or measures of Location, Requisites for an Ideal Measure of Central Tendency, Arithmetic Mean, Median, Mode, Geometric Mean, Harmonic Mean, Selection of an Average, Partition Values, Measures of Dispersion, Skewness and Kurtosis – Dispersion, Characteristics for an Ideal Measure of Dispersion, Measures of Dispersion, Range, Quartile Deviation, Mean Deviation, Standard Deviation and Root Mean Square Deviation, Coefficient of Dispersion, Moments.

UNIT – II: Probability and Random Variables

Basic Probability - Random Experiments, Sample Spaces Events, The Concept of Probability, The Axioms of Probability, Some Important Theorems on Probability, Assignment of Probabilities, Conditional Probability, Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule, Discrete Random Variables, Continuous Random Variables and examples of Random Variables.

UNIT – III: Sampling

Introduction, Types or Sampling, Parameter and Statistic, Tests of Significance, Null Hypothesis, Errors in Sampling, Critical Region and Level of Significance, Sampling of Attributes, Sampling of Variable, Unbiased Estimate for population Mean and Variance, Standard Error of Sample Mean, Test of Significance for Single Mean, Difference of Means and Difference of Standard Deviations; Chi-Square Variate, Derivation of the Chi-square Distribution, Applications or Chi- square Distribution.

UNIT – IV: Inferential Statistics

Introduction, Characteristics of Estimators, Methods or Estimation, Confidence Interval and Confidence Limits, Statistical Hypothesis-Simple and Composite, Steps in Solving Testing of Hypothesis Problem, Optimum Test Under Different Situations, Neyman-Pearson Lemma.

UNIT – V: Linear Models and Regression

Overview of Supervised Learning - Two Simple Approaches to Prediction, Statistical Decision Theory, Statistical Models, Supervised Learning and Function Approximation, Structured Regression Models, Classes of Restricted Estimators; Linear Methods for Regression- Linear Regression Models and Least Squares, Subset Selection, Shrinkage Methods, Methods Using Derived Input Directions, Lasso and Related Path Algorithms; Logistic Regression.

Text Books

1. Fundamentals of mathematical statistics; S.C. Gupta, V.K. Kapoor; Sultan Chand & Sons.
2. Probability and statistics; Murray R. Spiegel, John Schiller and R. AluSrinivasan;Sschaum's outline series, Mcgraw-hill.
3. The Elements of Statistical leaning; Trevor Hastie, Robert Tibshirani, Jerome Friedman; Springer.

Reference Books

1. Applied Linear Statistical Models, Michael H. Kutner, Christopher J. Nachtsheim, John Neter; McGraw Hill
2. Applied logistic Regression, David W. Hosme, Stanley lemeshow; Wiley
3. Practical Statistics for Data Scientists, Peter Bruce & Andrew Bruce, O'Reilly.

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Professional Elective - II

INTERNET OF THINGS

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the fundamentals of Internet of Things.
- To familiarize with the building of small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.

Course Outcomes

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

- summarize the basic concepts of Internet of Things.
- analyze the requirements and specifications to design any IoT application.
- develop smart city and agricultural applications using Arduino IoT and Raspberry pi IoT kit.
- use the tools such as AutoBahn, Xively Cloud communication API's to exchange data between cloud and IoT kit
- analyze the Home, Agricultural and Smart City Applications

Course Content

UNIT – I:

Fundamentals of IoT Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies– IoT Levels and Deployment Templates – M2M, IoTvs M2M, Domain Specific IoTs : Home, Cities, Environment, Energy systems, Logistics, Agriculture,Health& Lifestyle

UNIT – II: IoT Platform Design Methodology IoT Design Methodology

Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and Application Development.

UNIT – III: Prototyping Embedded Device with ARDUINO

Sensors, Actuators, Embedded Computing Basics- Micro Controllers, System on Chips, Choosing your Platform, Introduction to Aurdino, Aurdino Pin Configuration, Aurdino Board Types, Developing on the Arduino.

UNIT – IV: Prototyping Embedded Device with Raspberry PI Raspberry PI and AutoBahn

Introduction, Pin configuration of raspberry PI, Cases and Extension Boards, Developing on the RaspberryPI, Introduction to Cloud Storage Models & Communication APIs – WAMP – AutoBahn for IoT, Xively Cloud for IoT.

UNIT – V: IoT Physical Servers & Cloud Offerings and Applications

Python Web Application Framework – Django, Designing a RESTful Web API. Domain Specific Applications of IoT Home Automation, Agriculture Applications, Smart City applications.

Text Books

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015.
2. Adrian McEwen & Hakim Cassimally, "Designing the Internet of Things", Wiley Publications – 2014.

Reference Books

1. Marco Schwartz, "Internet of Things with the Arduino Yun", Packt Publishing, 2014.
2. Manoel Carlos Ramon, "Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers", Apress, 2014.
3. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
4. Fundamentals of Python, K.A.Lambert and B.L.Juneja, Cengage Learning, 2012.

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Professional Elective - II

ETHICAL HACKING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize skills to perform security audits and penetration testing of systems and network.
- To introduce vulnerability testing to protect systems from DOS atacks

Course Outcomes

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

- describe the basic concepts in ethical hacking and legality.
- use CEH Scanning methodology to gather network and host information.
- implement the sniffers to give countermeasures to network vulnerabilities.
- protect web servers and web applications from DoS attack and other software vulnerabilities.
- use the sniffer tools, penetration and detection techniques in wireless network to protect from attacks

Course Content

UNIT – I: Introduction to Ethical Hacking and Legality

Purpose of Ethical Hacking, The Phases of Ethical Hacking, How to Be Ethical, Keeping It Legal. Cyber Laws in India, Gathering Target Information: Information-Gathering Methodology.

UNIT – II: Gathering Network and Host Information

CEH Scanning Methodology, Ping Sweep Techniques, *nmap* Command Switches, Enumeration, Covering Your Tracks and Erasing Evidence.

UNIT – III: Gathering Data from Networks: Sniffers

How a Sniffer Works, Wireshark, Trojans, Backdoors, Viruses, and Worms, Denial of Service and Session Hijacking.

UNIT – IV: Web Hacking &Attacking Applications

Web Servers, Web Application Vulnerabilities, and Web-Based Password Cracking Techniques, Denial of Service and Session Hijacking, Web Hacking, Attacking Applications: SQL Injection and Buffer Overflows

UNIT – V: Wireless Network Sniffers & Penetration Test

Using Wireless Sniffers to Locate SSIDs, MAC Filters and MAC Spoofing, Rogue Access Points Intrusion detection systems, Types of IDS and Evasion Techniques,

Firewall Types and Honeypot Evasion Techniques. Cryptography Attacks, Performing a Penetration Test

Text Books

1. Certified Ethical Hacker Study Guide, Kimberly Graves, Sybex. Wiley, 2010.
2. Beginning Ethical Hacking with Python, **Sanjib Sinha**, Apress Media, Springer, 2017.

Reference Books

1. Michael T. Simpson, Kent Backman and James E. Corley, “Hands on Ethical Hackingand Network Defence”, Cengage, 2019.

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Professional Elective - II

PATTERN RECOGNITION

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To get acquitted with theoretical concepts and practical issues associated with pattern recognition.
- To understand basic, as well as advanced techniques of pattern classification and analysis techniques for machine interpretation of a world and environment in which machine works.

Course Outcomes

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

- analyse classification problems probabilistically and estimate classifier performance.
- analyze methods for normal density and Bayes decision theory.
- apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as mixture density and hidden Markov models.
- apply Bayesian methods in probabilistic models.
- design systems and algorithms for pattern recognition.

Course Content

UNIT – I: Introduction

Introduction: Machine perception, pattern recognition example, pattern recognition systems, the Design cycle, learning and adaptation.

Bayesian Decision Theory: Introduction, continuous features – two categories classifications, minimum error-rate classification-zero–one loss function, classifiers, discriminant functions, and decision surfaces.

UNIT – II: Normal Density

Normal density: Univariate and multivariate density, discriminant functions for the normal Density different cases, Bayes decision theory – discrete features, compound Bayesian decision theory and context.

UNIT – III: Bayesian Parameter Estimation

Maximum likelihood and Bayesian parameter estimation: Introduction, maximum likelihood Estimation, Bayesian estimation, Bayesian parameter estimation–Gaussian case.

UNIT – IV: Un-Supervised Learning and Clustering

Un-supervised learning and clustering: Introduction, mixture densities and identifiability, maximum likelihood estimates, application to normal mixtures, K-means clustering. Date description and clustering – similarity measures, criteria function for clustering.

UNIT – V: Sequential Pattern Recognition

Pattern recognition using discrete hidden Markov models: Discrete-time Markov process, Extensions to hidden Markov models, three basic problems of HMMs, types of HMMs.

Continuous hidden Markov models: Continuous observation densities, multiple mixtures per state, speech recognition applications.

Text Books

1. Pattern classifications, Richard O. Duda, Peter E. Hart, David G. Stroke. Wiley student edition, Second Edition.
2. Pattern Recognition, An Introduction, V Susheela Devi, M Narsimha Murthy, Universiy Press.

Reference Books

1. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
2. Theodoridis, S. and Koutroumbas, K. Pattern Recognition. Edition 4. Academic Press, 2008.

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DATA SCIENCE LAB

III Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To familiarize with statistical methods to analyse data using classification, graphical and computational methods.

Course Outcomes

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

- apply statistical learning methods to data for inferences.
- analyze data using machine learning approaches.
- illustrate graphical analysis and hypothesis testing methods
- use eigen approaches for attribute subset selection.
- apply SVM for finding discriminating hyper plane.

List of Experiments

Use Advertising data that has sales (in thousands of units) for a particular product as a function of advertising budgets (in thousands of dollars) for TV, radio, and newspaper media.

1. Apply least squares model for the regression of number of units sold on TV advertising budget for the Advertising data, for least squares coefficient estimates for simple linear regression.
2. Compute t-statistic, Residual standard error, F-statistic and residual sum of squares (RSS) errors.

Use the Smart data of Daily percentage returns for S&P 500 over a 5-year period, data set to perform **KNN** with $K = 3$withDirection as the response and the five lag variables plus Volume as predictors.

3. Do any of the predictors appear to be statistically significant? If so, which ones?
4. Compute the confusion matrix and overall fraction of correct predictions. Explain what the confusion matrix is telling you about the types of mistakes made by **KNN**.
5. Compute Mallow's Cp, Akaike information criterion (AIC), adjusted R Squared and Bayesian information criterion (BIC)

Use College data set, which can be found in the file College.csv. It contains a number of variables for 777 different universities and colleges in the US.

6. Produce some **histograms** with differing numbers of bins for a few of the quantitative variables.

7. Continue exploring the data, and provide a brief summary of what you discover.
8. Carry out the pearson product moment correlation, spearman rho correlation and kendall's tau
9. Perform Simple Hypothesis testing, student's t-test, paired t and u test, correlation and covariance, tests for association.
10. Perform Programming for Eigen values and Eigen vectors.
11. Perform Programming for QR, SVD and PCA.
12. Compute the discriminating hyper plane using SVM for the following objects.

X	(3,1)	(3,-1)	(6,1)	(6,-1)	(1,0)	(0,1)	(0,-1)	(-1,0)
Y	+1	+1	+1	+1	-1	-1	-1	-1

Reference Books

1. Gareth James, Trevor Hastie, Robert Tibshirani, Daniela Witten, "An Introduction to Statistical Learning with Applications in R". Springer Publishing, 2013.
2. Joel Grus, "Data Science From Scratch", O Reilly Media, 2015.
3. Mark Gardener, "Beginning R The statistical Programming Language", Wiley.

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MEAN STACK TECHNOLOGIES

III Year – II Semester

Practical	: 4	Internal Marks	: 30
Credits	: 2	External Marks	: 70

Course Objectives

- To familiarize the development of front end using Angular and backend using Node and Express JS.
- To design and implement robust and scalable applications using MongoDB.

Course Outcomes

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

- implement basic CRUD operations using MongoDB.
- apply node.js constructs in application development
- use Express.js for web application development and apply web services concepts using Restful API.
- compose and transpile typescript codes.
- design applications using front-end framework Angular.

List of Experiments

1. Create a database related to Hospital Management System and perform CRUD operations using MongoDB.
2. Create a database related to Bus Ticket Reservation System and perform CRUD operations using MongoDB.
3. Write node.js program to create, access, modify the Arrays
4. Write node.js program to create, access, modify the JSON object
5. Install express and create an application.
6. Perform CRUD operations using express and mongoDB.
7. Write a typescript program to work with different types of variables, functions and run the programs using node environment.
8. Write a typescript program to work with classes.
9. Create a simple angular application using Angular CLI and Typescript.
10. Create an angular application to work with components.
11. Create an angular application to work with Pipes
12. Create an angular application to work with Directives.

Text Books

1. Getting MEAN with Mongo, Express, Angular, And Node, Simon Holmes Clive Harber, Manning
2. Node.js in Action, 2e, Alex Young, Bradley Meck, Mike Cantelon, Manning Publications.

Reference Books

1. Express.JS Guide, The Comprehensive Book on Express.js, AzatMardan, Lean Publishing.
2. Restful Web Services Cookbook, Subbu Allamraju, O'Reilly.

e- Resources

1. https://www.typescriptlang.org/
2. https://angular.io/cli

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LINGUISTIC COMPETENCY BUILDING
(Common to All Branches)

III Year – II Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

- Analytical skills
- Innovative and creative thinking
- A lateral mindset
- Adaptability and flexibility
- Level-headedness
- Initiative
- Teamwork
- Influencing skills
- Preparing professional resume
- Preparing for ivrs — Communication Skills evaluation tools like = VERSANT (pearson), SWAR(Aspiring Minds) Etc.

Elementary Statistics

- Mean, Median, Mode, Standard Deviation and Variance

Data Interpretation

- Tabular Data Interpretation
- Graphical Data Interpretation
- Pie Charts Data Interpretation

Simplifications & Approximations

- Simple Arithmetic Calculations

Usage of Language - Corporate Context

- Body Language and Professional Phrases
- Corporate etiquette
- protocol to be followed in Virtual Interview
- Online Meetings and Telephonic Interviews

BIG DATA ANALYTICS

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To optimize business decisions and create competitive advantage with Big Data analytics.
- To introduce the architectural concepts of Hadoop, HDFS and Map Reduce paradigm.
- To introduce programming tools Pig , Hive in Hadoop echo system.

Course Outcomes

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

- illustrate the importance of big data and challenges of conventional systems.
- outline the building blocks of hadoop and basic file system operations.
- analyze data with hadoop Map Reduce framework.
- process the data in hadoop environment using Pig and Hive to solve real world and industrial problems.
- enumerate the open source frameworks used to efficiently store and process large data sets.

Course Content

UNIT – I: Introduction to Big Data

What is big data, Meet Hadoop – Data, Characteristics of Big Data , Data Storage and Analysis, Comparison with other systems: Relational Database Management Systems, Grid computing and Volunteer Computing.

UNIT – II: Hadoop and HDFS

Introduction to Hadoop, Brief history of Hadoop, Apache Hadoop eco system. The design of Hadoop Distributed File System (HDFS), Architecture, Building blocks of Hadoop: Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker, Basic File System Operations.

UNIT – III: Map Reduce

Java Map Reduce, Introduction to Weather Dataset, Analyzing weather data with UNIX tools, Analyzing weather data with Map and Reduce, Word Count Program using Map Reduce, Combiner Functions, Running a Distributed Map Reduce Job, Anatomy of a Map Reduce Job Run, Shuffle and Sort.

UNIT – IV: Pig - Hadoop Programming Made Easier

Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, Uncovering Pig Latin structures, Looking at Pig

data types and syntax, Evaluating Local and Distributed Modes of Running Pig scripts, Checking Out the Pig Script Interfaces, Scripting with Pig Latin.

UNIT – V: Hive –A Data Warehouse in Hadoop

What is Hive? The Hive shell, Hive Services, The Metastore, Comparison with traditional Databases, HiveQL, Data types, Operators and Functions, Tables, Managed tables and External Tables, Partitions and Buckets, Importing data, Altering Tables, Dropping Tables,. Querying Data, Sorting and Aggregating, Joins, Subqueries, Views, What is UDF ? Types of Hive UDFs.

Text Books

1. Tom White, “Hadoop: The Definitive Guide”, O’reilly Media, Fourth Edition, 2015.
2. Dirk deRoos, Paul C. Zikopoulos, “Hadoop for Dummies” John Wiley & Sons, Inc., 2014.

Reference Books

1. Paul Zikopoulos, Chris Eaton, “Understanding Big Data Analytics for Enterprise Class Hadoop and Streaming Data”, 1st edition, TMH.
2. Chuck Lam, “Hadoop in Action”, 1st edition, Manning Publications.

Web Links

1. Hadoop:http://hadoop.apache.org/
2. Hive:https://cwiki.apache.org/confluence/display/Hive/Home
3. Piglatin: http://pig.apache.org/docs/r0.7.0/tutorial.html

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DEEP LEARNING

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the basic concepts of deep learning.
- To explore various deep learning algorithms.

Course Outcomes

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

- outline a feed forward neural network to solve classification problems.
- train the neural network using backpropagation algorithm.
- use deep neural networks to solve real life problems.
- solve classification and pattern problems using Probabilistic Neural Networks.
- apply neural networks in Object recognition, sparse coding, computer vision, and natural language processing.

Course Content

UNIT – I: Feed Forward Neural Network

Introduction: Various paradigms of learning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques. Feed forward neural network: Artificial Neural Network, activation function, multi-layer neural network.

UNIT – II: Training Neural Network

Training Neural Network: Risk minimization, loss function, back propagation, regularization, model selection, and optimization. Deep Neural Networks: Difficulty of training deep neural networks, Greedy layer wise training.

UNIT – III: Deep Learning

Deep Feed Forward network, regularizations, training deep models, dropouts, Convolution Neural Network, Recurrent Neural Network, and Deep Belief Network.

UNIT – IV: Probabilistic Neural Networks

Hopfield Net, Boltzmann machine, RBMs, Sigmoid net, Auto encoders.

UNIT – V: Applications

Applications: Object recognition, sparse coding, computer vision, natural language processing. Introduction to Deep Learning Tools: Tensor Flow, Caffe, Theano, Torch.

Text Books

1. Goodfellow, Bengio Y., and CourvilleA., Deep Learning, MIT Press, 2016.
2. Michael Neilson, Neural network and deep learning , e-book, D Press.

Reference Books

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.
4. Raúl Rojas ,Neural Networks: A Systematic Introduction, 1996.

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Professional Elective - III

CRYPTOGRAPHY AND NETWORK SECURITY

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with different types of security attacks and services.
- To expose different cryptographic techniques and algorithms.

Course Outcomes

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

- describe security goals and various attacks occurs in a network.
- compare and apply different encryption and decryption techniques.
- compute cryptographic checksums and evaluate the performance of different message digest and authentication algorithms.
- apply network and internet security protocols to secure E-mails, web content.
- analyze system security using various firewalls and intrusion detection techniques.

Course Content

UNIT - I: Introduction

Security Attacks, Security Services- Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability, Security Mechanisms, A model for Internetwork security. Non Cryptographic protocol vulnerabilities- DoS, DDoS, Session hijacking and Spoofing.

UNIT - II: Symmetric Key Cryptography

Conventional encryption principles, conventional encryption algorithms- Data Encryption Standard (DES), Strengths of DES, Triple DES, Advanced Encryption Standard (AES) Structure, Cipher block modes of operation, Block Cipher Design Principles.

UNIT - III: Public Key Cryptography and Hash Functions

Number Theory: Prime and Relatively Prime Numbers, Discrete Logarithms.

Principles of Public key Cryptosystems, Public Key Cryptography Algorithms- RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography algorithm,

Hash Functions: Application of Cryptographic Hash Functions, Requirements, Secure Hash Algorithm.

UNIT - IV: Cryptographic Data Integrity Algorithms

Message authentication Codes: Message authentication requirements, Message authentication functions, HMAC, Digital Signatures: Digital Signatures properties and requirements, Digital Signature Standard.

E-mail Security: PGP, S/MIME.

UNIT - V: Network and Internet Security

IP Security: IP Security Overview, IPSec documents, IPSec Services, IPSec AH header, and Encapsulating Security Payload.

Transport Level Security: Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS),

System Security: Firewalls- Characteristics, Types of Firewalls, Intruders.

Text Books

1. William Stallings, Cryptography and network Security, Principles and practice, Fifth edition, Pearson.
2. William Stallings, Network Security Essentials (Applications and Standards), Fourth Edition, Pearson.

Reference Books

1. Bernard Menezes, “Network security and cryptography”, Cengage Learning.
2. Atul Kahate , Cryptography and Network Security , 3 Edition , Mc Graw Hill
3. Behrouz A Forouzan, DebdeepMukhopadhyay,Cryptography and Network Security, 3rd Edition,2015, Mc- GrawHill.

e-Resources

1. https://nptel.ac.in/courses/106/105/106105031/ lecture by Dr.Debdeep Mukhopadhyay, IIT, Kharagpur [Video Lecture]
2. https://nptel.ac.in/courses/106/105/106105162/lecture by Dr.Sourav Mukhopadhyay, IIT Kharagpur [Video Lecture]

https://www.mitel.com/articles/web-communication-cryptography-and-network-security web articles by Mitel.

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Professional Elective - III

CLOUD COMPUTING

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To provide the architectural concepts of Cloud computing.
- To familiarize with cloud service models and cloud based applications.

Course Outcomes

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

- describe the stages in historical evolution of cloud computing.
- use suitable cloud services to define cloud for the enterprise.
- demonstrate hardware level and OS level virtualization to implement virtual machines.
- design machine images, web applications and databases for virtual machines.
- apply data, network and host security for the cloud.

Course Content

UNIT – I: Cloud Computing

Introduction, cloud computing: What it is and what it isn't, from collaboration to the cloud : A short history of cloud computing, the network is the computer: How cloud computing works, understanding cloud architecture , storage, services; The pros and cons of cloud computing. Who benefits from cloud computing? who shouldn't be using cloud computing.

UNIT – II: Defining Clouds for the Enterprise

Storage-as-a-Service, Database as-a-Service, Information-as-a-Service, Process as-a-Service, Application-as-a-Service, Platform-as-a-Service, Security-as-a service, Infrastructure-as-a-Service.

UNIT – III: Virtual Machines and Virtualization

Implementation levels of virtualization: levels of virtualization implementation, VMM design requirements and providers, virtualization support at the OS level, virtualization structures/tools and mechanisms: Hypervisor and Xen architecture, binary transition with full virtualization, para- virtualization with compiler support.

UNIT – IV: Hardware Virtualization and Ready for the Cloud

Hardware Virtualization: Virtualization of CPU, memory and I/O devices: Hardware support for virtualization, CPU virtualization, memory virtualization, I/O virtualization.

Ready for the cloud: Web application design, machine image design, privacy design, database management: clustering or replication? primary key management, database backups.

UNIT – V: Security

Data Security: data control, encrypt everything, regulatory and standards compliance; Network Security: firewall rules, network intrusion detection; Host Security: system hardening, antivirus protection, host intrusion detection, data segmentation, credential management, Compromise response.

Text Books

1. Kai Hwang, Jack Dongarra and Geoffrey C.Fox, "Distributed and Cloud Computing: From Parallel Processing to the Internet of Things", 1st edition, Morgan Kaufman Publications.
2. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", 1st edition, O'Reilly.

Reference Books

1. Michael Miller, "Cloud Computing- Web Based Applications That Change the Way You Work and Collaborate Online", 1st edition, Que publications.
2. David S. Linthicum, "Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide" Addison Wesley.

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Professional Elective - III

NATURAL LANGUAGE PROCESSING

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand the algorithms available for the processing of linguistic information and computational properties of natural languages.

Course Outcomes

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

- show sensitivity to linguistic phenomena and model them with formal grammars.
- carry out proper experimental methodology for training and evaluating empirical NLP systems.
- manipulate probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.
- design, implement, and analyze NLP algorithms
- design different language modelling Techniques

Course Content

UNIT – I: Finding the Structure of Words

Finding the Structure of Words: Words and Their Components, Issues and Challenges, Morphological Models.

Finding the Structure of Documents: Introduction, Methods, Complexity of the Approaches, Performances of the Approaches.

UNIT – II: Syntax

Parsing Natural Language, Treebanks: A Data-Driven Approach to Syntax, Representation of Syntactic Structure, Parsing Algorithms, Models for Ambiguity Resolution in Parsing, Multilingual Issues.

UNIT – III: Semantic Parsing

Introduction, Semantic Interpretation, System Paradigms, Word Sense.

UNIT – IV: Predicate-Argument Structure

Predicate-Argument Structure, Meaning Representation –Resources, Systems, Software.

UNIT – V: Language Modelling

Introduction, N-Gram Models, Language Model Evaluation, Parameter Estimation, Language Model Adaptation, Types of Language Models, Language-Specific Modeling Problems, Multilingual and Crosslingual Language Modelling.

Text Books

1. Multilingual natural Language Processing Applications: From Theory to Practice – Daniel M. Bikel and ImedZitouni, Pearson Publication
2. Natural Language Processing and Information Retrieval: Tanvier Siddiqui, U.S. Tiwary.

Reference Books

1. Speech and Natural Language Processing - Daniel Jurafsky& James H Martin, Pearson Publications

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Professional Elective - III

ENTERPRISE CHATBOTS

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To learn how artificial intelligence powers chatbots, get an overview of the bot ecosystem and bot anatomy, and study different types of bots and use cases.
- To identify best practices for defining a chatbot use case and use a rapid prototyping framework to develop a use case for a personalized chatbot.

Course Outcomes

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

- develop an in-depth understanding of conversation design, including onboarding,flows, utterances, entities, and personality.
- design, build, test, and iterate a fully-functional, interactive chatbot using acommercial platform.
- deploy the finished Chatbot for public use and interaction.
- describe the architecture and applications of NLP in chatbots.
- analyze various chatbot frameworks.

Course Content

UNIT – I: 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: 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: 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: 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. Introduction to IRIS, Intents, Slots and Matchers, IRIS Memory, Dialogues as Finate State Machines, Building a custom chatbots for an Insurance Use Case.

UNIT – V: Introduction to Microsoft Bot, RASA, and GoogleDialogflow

Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialogflow.

Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise Data Store, Integration Module

Text Books

1. Abhishek Singh, Karthik Ramasubramanian, ShreyShivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data Using Open Source Frameworks", ISBN 978-1-4842-5034-1, Apress, 2019.

Reference Books

1. Janarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
2. Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019. ISBN 978-303004298
3. Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitive computing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.
4. Abhishek Singh, Karthik Ramasubramanian and ShreyShivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334.

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Professional Elective - IV

INTRODUCTION TO RECOMMENDER SYSTEMS

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To learn basic techniques for building recommender Systems.
- To automate a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations.

Course Outcomes

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

- identify the importance of Recommender Systems.
- model Recommender System by using Content-based Filtering technique.
- build Recommender System by Collaborative Filtering technique.
- design Recommender System by Hybrid approaches.
- evaluate Recommender Systems.

Course Content

UNIT - I: Introduction

Introduction, Recommender Systems Function, Data and Knowledge Sources, Recommendation Techniques, Application and Evaluation, Challenges.

UNIT - II: Content-based Filtering

Content representation and content similarity- The vector space model and TF-IDF, Improving the vector space model/limitations.

Similarity based retrieval **-** Nearest neighbors, Relevance feedback – Rocchio's method, Other text classification methods - Probabilistic methods, Other linear classifiers and machine learning, Explicit decision models, On feature selection.

UNIT - III: Collaborative Filtering

User based nearest neighbor recommendation - example. Item based nearest neighbor recommendation - The cosine similarity measure, Preprocessing data for item-based filtering. About ratings - Implicit and explicit ratings, Data sparsity and the cold-start problem. Further model-based and preprocessing based approaches - Matrix factorization/latent factor models, Association rule mining, Probabilistic recommendation approaches.

UNIT - IV: Hybrid Approaches

Opportunities for hybridization - Recommendation paradigms, Hybridization designs. Monolithic hybridization design- Feature combination hybrids, Feature augmentation hybrids. Parallelized hybridization design- Mixed hybrids, Weighted

hybrids, Switching hybrids. Pipelined hybridization design- Cascade hybrids, Meta level hybrids.

UNIT - V: Evaluating Recommender System

Introduction, General properties of evaluation research- General remarks, Subjects of evaluation design, Research methods, Evaluation settings. Evaluation designs - Methodology, Metrics, Analysis of results.

Text Books

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
2. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer (2016), 1st ed.

Reference Books

1. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st ed.
2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st ed.

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Professional Elective - IV

BLOCKCHAIN TECHNOLOGIES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To Introduce how block chain systems (mainly Bit coin and Ethereum) work and to securely interact with them.
- To familiarize with design, build, and deploy smart contracts and distributed applications.

Course Outcomes

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

- demonstrate how the processes in payment and funding happens in block chain technology.
- identify the risks involved in building block chain applications.
- outline legal implications using smart contracts.
- choose the present landscape of block chain implementations and understand crypto currency markets.
- examine how to profit from trading crypto currencies.

Course Content

UNIT – I: Introduction

Introduction, Scenarios, Challenges Articulated, Blockchain, Blockchain Characteristics, Opportunities Using Blockchain, History of Blockchain.

Evolution of Blockchain :Evolution of Computer Applications, Centralized Applications, Decentralized Applications, Stages in Blockchain Evolution, Consortia, Forks, Public Blockchain Environments, Type of Players in Blockchain Ecosystem, Players in Market.

UNIT – II: Blockchain Concepts

Introduction, Changing of Blocks, Hashing, Merkle-Tree, Consensus, Mining and Finalizing Blocks, Currency aka tokens, security on blockchain, data storage on blockchain, wallets, coding on blockchain: smart contracts, peer-to-peer network, types of blockchain nodes, risk associated with blockchain solutions, life cycle of blockchain transaction.

UNIT – III: Architecting Blockchain Solutions

Introduction, Obstacles for Use of Blockchain, Blockchain Relevance Evaluation Framework, Blockchain Solutions Reference Architecture, Types of Blockchain Applications, Cryptographic Tokens, Typical Solution Architecture for Enterprise

Use Cases, Types of Blockchain Solutions, Architecture Considerations, Architecture with Blockchain Platforms, Approach for Designing Block chain Applications.

UNIT – IV: Ethereum Blockchain Implementation

Introduction, Tuna Fish Tracking Use Case, Ethereum Ecosystem, Ethereum Development, Ethereum Tool Stack, Ethereum Virtual Machine, Smart Contract Programming, Integrated Development Environment, Truffle Framework, Ganache, Unit Testing, Ethereum Accounts, MyEther Wallet.

UNIT – V: Hyperledger Blockchain Implementation

Hyperledger Blockchain Implementation, Introduction, Use Case – Car Ownership Tracking, Hyperledger Fabric, Hyperledger Fabric Transaction Flow, FabCar Use Case Implementation, Invoking Chaincode Functions Using Client Application.

Text Books

1. Ambadas, Arshad Sarfarz Ariff, Sham "Blockchain for Enterprise Application Developers", Wiley Publishers, 2020.
2. Kumar Saurabh, Asuthosh Saxena."Blockchain Technology Concepts and Applications", WILEY Publishers, 2020.

Reference Books

1. Chandramouli Subramanian , Asha A George, Abhishek K A and Meena Karthikeyan, "Blockchain Technology", Universities Press, 2021.

e-Resources

1. https://github.com/blockchainedindia/resources.

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Professional Elective - IV

VIDEO PROCESSING

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduces the fundamental knowledge about the processing of digital video signal in its time and frequency domain analysis.
- To understand the basic compression and coding techniques required for the transmission of video signal.

Course Outcomes

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

- identify the importance of digital video applications in today's world
- analyze how motion estimation algorithms work in video processing.
- distinguish the various and recent compression standards that exist.
- analysis of video communication and types of errors.

Course Content

UNIT – I: Video Formation, Sampling and Fourier Analysis

Video Capture and Display, Analog Video Raster, Progressive vs Interlaced scans, Digital Video – notation and formats Fourier Analysis of Video Signals, Spatial and Temporal Frequencies.

Sampling Video in Two Dimensions: Progressive versus Interlaced Scans.

UNIT – II: Two-Dimensional Motion Estimation

Optical Flow, Optical Flow Equation and Ambiguity in Motion Estimation, Motion Estimation Criteria.

Block-Matching Algorithm, Exhaustive and fast algorithms, Multiresolution Motion Estimation, Application of Motion Estimation in Video Coding.

UNIT – III: Waveform-Based Video Coding

Block-Based Transform Coding, The Discrete Cosine Transform, DCT-Based Image Coders and the JPEG Standard.

Predictive Coding, Spatial-Domain linear Prediction, Motion-Compensated Temporal Prediction.

UNIT – IV: Video Compression Standards

Basic compression techniques, Video compression standards (H.261 and H.263-Overview,highlights). MPEG1, MPEG2, MPEG4 profiles and features.

UNIT – V: Error Control

Error control in video communications, Digital video system and its applications.

Text Books

1. "Digital Video Processing," by NuratTekalp, Prentice Hall Signal Processing Series, 1995.
2. "Video Processing and Communications" by Yao Wang, Joern Ostermann, and Ya-Qin Zhang, Prentice Hall, 2002.

Reference Books

1. "Fundamentals of Multimedia", by Ze-Nian Li, and Mark S. Drew, Pearson Prentice Hall, October 2003.

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Professional Elective - IV

REINFORCEMENT LEARNING

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To provide the fundamentals of Reinforcement learning.

Course Outcomes

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

- enumerate the elements of Reinforcement Learning.
- solve the n-armed Bandit problem.
- compare different Finite Markov Decision Process.
- discuss about Monte Carlo Methods in solving real world problems.
- list the Applications and Case Studies of Reinforcement Learning.

Course Content

UNIT – I: The Reinforcement Learning Problem

Reinforcement Learning, Examples, Elements of Reinforcement Learning, Limitations and Scope, An Extended Example: Tic-Tac-Toe, Summary, History of Reinforcement Learning.

UNIT – II: Multi-arm Bandits

An n-Armed Bandit Problem, Action-Value Methods, Incremental Implementation, Tracking a Nonstationary Problem, Optimistic Initial Values, Upper-Confidence-Bound Action Selection, Gradient Bandits, Associative Search (Contextual Bandits).

UNIT – III: Finite Markov Decision Processes

The Agent–Environment Interface, Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, The Markov Property, Markov Decision Processes,

Value Functions, Optimal Value Functions, Optimality and Approximation.

UNIT – IV: 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, Off-Policy Monte Carlo Control, Importance Sampling on Truncated Returns.

UNIT – V: Applications and Case Studies

TD-Gammon, Samuel's Checkers Player, TheAcrobot, Elevator Dispatching, Dynamic Channel Allocation, Job-Shop Scheduling.

Text Books

1. Richard S. Sutton and Andrew G. Barto, “Reinforcement Learning-An Introduction”, 2nd Edition,The MIT Press,2018
2. Marco Wiering, Martijn van Otterlo Reinforcement Learning: State-of-the-Art (Adaptation, Learning, and Optimization (12)) 2012th Edition.

Reference Books

1. Vincent François-Lavet , Peter Henderson , Riashat Islam, An Introduction to Deep Reinforcement Learning (Foundations and Trends(r) in Machine Learning) , 2019.

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Professional Elective - V

SOFT COMPUTING TECHNIQUES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with different machine learning techniques.
- To impart knowledge on neural networks and decision tree learning.

Course Outcomes

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

- describe soft computing and its applications.
- design neural networks to simulate the way human brain analyzes and processes information.
- use fuzzy systems in information processing for classification and decision making.
- design genetic algorithms to find optimal or near optimal solutions to difficult problems.
- illustrate different kinds of hybrid systems used in soft computing.

Course Content

UNIT - I: Introduction

What is Soft Computing? Difference between Hard and Soft computing, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

UNIT - II: Neural Networks

What is Neural Network, Learning rules and various activation functions, Single layer Perceptrons, Back Propagation networks, Architecture of Backpropagation(BP) Networks, Backpropagation Learning, Variation of Standard Back propagation Neural Network, Introduction to Associative Memory, Adaptive Resonance theory and Self Organizing Map.

UNIT - III: Fuzzy Systems

Fuzzy Set theory, Fuzzy versus Crisp set, Fuzzy Relation, Fuzzification, Minmax Composition, Defuzzification Method, Fuzzy Logic, Fuzzy Rule based systems, Predicate logic, Fuzzy Decision Making, Fuzzy Control Systems, Fuzzy Classification.

UNIT - IV: Genetic Algorithms

History of Genetic Algorithms (GA), Working Principle, Various Encoding methods, Fitness function, GA Operators- Reproduction, Crossover, Mutation, Convergence of GA, Bit wise operation in GA, Multi-level Optimization.

UNIT - V: Hybrid Systems

Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.

Text Books

1. S.Rajasekaran, G. A. Vijayalakshami, Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications, PHI.
2. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.

Reference Books

1. Chin Teng Lin, C. S. George Lee, Neuro-Fuzzy Systems, PHI.
2. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

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Professional Elective - V

DATA VISUALIZATION TECHNIQUES

IV Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- Familiarize students with the basic and advanced techniques of information visualization and scientific visualization.
- To learn key techniques of the visualization process
- A detailed view of visual perception, the visualized data and the actual visualization, interaction techniques.

Course Outcomes

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

- describe the key techniques and theory behind data visualization
- classify various visualization systems and describe the methods used to spatial data to graphical depictions.
- use effectively the various visualization structures like tables, trees ,graphs/ networks, Text and Document.
- identify a wide variety of available visualization systems and its key features.
- analyze and Distinguish between visualization techniques for Line, Point and Region.

Course Content

UNIT – I: Introduction

Introduction: What is Visualization, Relationship between Visualization and Other Fields, The Visualization Process, The Scatterplot.

Data Foundations: Types of Data, Structure within and between Records, Data Pre-processing.

UNIT – II: Visualization Techniques for Spatial Data

Visualization Foundations: Semilogy of Graphical Symbols, The Eight Visual Variables, Taxonomies.

Visualization Techniques for Spatial Data: One-Dimensional Data, Two-Dimensional Data, Three-Dimensional Data, Dynamic Data.

UNIT – III: Visualization Techniques for Trees, Graphs , Networks, Text and Document

Visualization Techniques for Trees, Graphs andNetworks : Displaying Hierarchical Structures, Displaying Arbitrary Graphs / Networks.

Text and Document Visualization: Levels of Text Representations, Single Document Visualizations, Document Collection Visualizations.

UNIT – IV: Interaction Concepts and Techniques

Interaction Concepts: Interaction Operators, Interaction Operands and Spaces.

Interaction Techniques: Screen Space, Object Space, Data Space.

UNIT – V: Visualization Techniques for Time-Oriented Data and Multivariate Data

Visualization Techniques for Time-Oriented Data: Characterizing Time-Oriented Data, Visualizing Time-Oriented Data.

Visualization Techniques for Multivariate Data: Point-Based Techniques, Line-Based Techniques, Region-Based Techniques.

Text Books

1. Ward, Grinstein Keim, Interactive Data Visualization: Foundations, Techniques, and Applications. Natick: A K Peters, Ltd.
2. E.Tufte, The Visual Display of Quantitative Information, Graphics Press.

Reference Books

1. Chun-houh Chen Wolfgang Hardle Antony, Handbook of Data Visualization, Springer.

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Professional Elective - V

NO SQL DATABASES

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To understand the basic concepts and the applications of database systems.
- To understand the relational database design principles
- To become familiar with the basic issues of transaction processing and concurrency control.

Course Outcomes

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

- describe the basics of SQL and construct queries using SQL.
- identify type of NoSQL database to implement based on business requirements (key-value, document, full text, graph, etc.).
- apply NoSQL data modeling from application specific queries.
- use Atomic Aggregates and denormalization as data modelling techniques to optimize query processing.
- summarize database storage structures and access techniques.

Course Content

UNIT – I: Introduction to NoSQL

Definition And Introduction, Sorted Ordered Column-Oriented Stores, Key/Value Stores, Document Databases, Graph Databases, Examining Two Simple Examples, Location Preferences Store, Car Make And Model Database, Working With Language Bindings.

UNIT – II: Interacting with NoSQL

If NoSql Then What, Language Bindings For NoSQL Data Stores, Performing Crud Operations, Creating Records, Accessing Data, Updating And Deleting Data.

UNIT – III: NoSQL Storage Architecture

Working With Column-Oriented Databases, Hbase Distributed Storage Architecture, Document Store Internals, Understanding Key/Value Stores In Memcached And Redis, Eventually Consistent Non-Relational Databases.

UNIT – IV: NoSQL Stores

Similarities Between SqlAndMongodb Query Features, Accessing Data From Column-Oriented Databases Like Hbase, Querying Redis Data Stores, Changing Document Databases, Schema Evolution In Column-Oriented Databases, Hbase Data Import And Export, Data Evolution In Key/Value Stores.

UNIT – V: Indexing and Ordering Data Sets

Essential Concepts Behind A Database Index, Indexing And Ordering In Mongodb, Creating and Using Indexes In Mongodb, Indexing And Ordering In Couchdb, Indexing In Apache Cassandra.

Text Books

1. Pramod Sadalage and Martin Fowler, NoSQL Distilled, Addison-Wesley Professional, 2012.
2. Dan McCreary and Ann Kelly, Making Sense of NoSQL, Manning Publications, 2013.

Reference Books

1. Shashank Tiwari, Professional NoSQL, Wrox Press, Wiley, 2011, ISBN: 978-0-470- 94224-6
2. Gaurav Vaish, Getting Started with NoSQL, Packt Publishing, 2013.

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Professional Elective - V

ROBOTIC PROCESS AUTOMATION

IV Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the concepts of Robotic system, its components and instrumentation and control related to robotics.

Course Outcomes

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

- classify various types of automation & manufacturing systems
- discuss different robot configurations, motions, drive systems and its performance parameters.
- describe the basic concepts of control systems, feedback components, actuators and power transmission systems used in robots.
- explain the working of transducers, sensors and machine vision systems.
- discuss the future capabilities of sensors, mobility systems and Artificial Intelligence in the field of robotics.

Course Content

UNIT – I: Automation

History of Automation, Reasons for automation, Disadvantages of automation, Automation systems, Types of automation – Fixed, Programmable and Flexible automation, Automation strategies Automated Manufacturing Systems: Components, classification and overview of manufacturing Systems, Flexible Manufacturing Systems (FMS), Types of FMS, Applications and benefits of FMS.

UNIT – II: Robotics

Definition of Robot, History of robotics, Robotics market and the future prospects, Robot Anatomy, Robot configurations: Polar, Cartesian, cylindrical and Jointed-arm configuration. Robot motions, Joints, Work volume, Robot drive systems, Precision of movement – Spatial resolution, Accuracy, Repeatability, End effectors – Tools and grippers.

UNIT – III: Controllers and Actuators

Basic Control System concepts and Models, Transfer functions, Block diagrams, characteristic equation, Types of Controllers: on-off, Proportional, Integral, Differential, P-I, P-D, P-I-D controllers. Control system and analysis. Robot actuation and feedback components Position sensors – Potentiometers, resolvers, encoders, velocity sensors. Actuators - Pneumatic and Hydraulic Actuators, Electric Motors, Stepper motors, Servomotors, Power Transmission systems.

UNIT – IV: Robot Sensors and Machine Vision System

Sensors in Robotics - Tactile sensors, Proximity and Range sensors, use of sensors in robotics. Machine Vision System: Introduction to Machine vision, the sensing and digitizing function in Machine vision, Image processing and analysis, Training and Vision systems. 08 Hours.

UNIT – V: Robots Technology of the Future

Robot Intelligence, Advanced Sensor capabilities, Telepresence and related technologies, Mechanical design features, Mobility, locomotion and navigation, the universal hand, system integration and networking. Artificial Intelligence: Goals of AI research, AI techniques – Knowledge representation, Problem representation and problem solving, LISP programming, AI and Robotics, LISP in the factory.

Text Books

1. Industrial Robotics, Technology, Programming and Applications, M.P. Groover, Weiss, Nagel, McGraw Hill International, 2nd edition, 2012.

Reference Books

1. Robotics, control vision and intelligence-Fu, Lee and Gonzalez. McGraw Hill International, 2nd edition, 2007. .
2. Robotic Engineering - An Integrated approach, Klafter, Chmielewski and Negin, PHI, 1st edition, 2009.

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BIG DATA ANALYTICS LAB

IV Year – I Semester

Practical	: 2	Internal Marks	: 15
Credits	: 1	External Marks	: 35

Course Objectives

- To familiarize the basic concepts of Hadoop and its eco system.
- To develop programs using Map Reduce, PIG and HIVE.

Course Outcomes

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

- apply suitable LINUX commands to work in Hadoop environment.\
- use HDFS file structure and Map Reduce framework to solve complex problems.
- analyze data using Pig and Hive.

List of Experiments

1. Practice on basic Linux commands.
2. Implement the following file management tasks in Hadoop:
   a. Adding files and Directories
   b. Retrieving files
   c. Deleting files
   d. Copying files from local filesystem to HDFS and vice versa.
   e. Moving files
3. Write driver code, mapper code, reducer code to count number of words in a given file. (Hint: WordCount Map- Reduce Program)
4. Write a MapReduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
5. Implement Matrix Multiplication with Hadoop Map Reduce
6. Install Pig and write Pig latin scripts to Load , Store and Filter data
7. Write Pig Latin scripts to perform data processing operations
   a. Grouping and joining data
   b. Sorting data
   c. Combining and Splitting data
8. Implement user defined functions in PIG

9. Install Hiveand use Hive to create databases and tables
    a. Create and drop databases
    b. Create, alter, and drop tables
    c. Insert, Update and delete records
10. Perform data processing operations using Hive
    a. Sort and Aggregation of data
    b. Joins
11. Perform data processing operations using Hive
    a. Views
    b. Indexes
12. Implement user defined functions in Hive

Text Book

1. Tom White , “Hadoop: The Definitive Guide “, 3rd edition, O’Reilly. Chuck Lam, “Hadoop in Action”, Manning Publications.

Reference Book

1. Alex Holmes, “Hadoop in Practice “, Manning Publications.

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Open Elective - I

ELEMENTS OF CIVIL ENGINEERING

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce basics of Civil Engineering concepts in the fields of surveying, building materials, water resources, Water Supply, Sanitary, Electrical Works in Building and Highway Engineering.

Course Outcomes

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

- familiarize with basics of civil engineering.
- carryout various civil engineering survey works.
- identify the various properties of building materials and various types of buildings.
- get acquainted with fundamentals of Water Resources, Water Supply, Sanitary and Electrical Works in Building.
- enumerate the fundamental concepts highway engineering.

Course Content

UNIT - I: Introduction

Introduction of Civil Engineering, Scope of Civil Engineering, Role of Civil Engineer in Society. Impact of infrastructural development on economy of country.

UNIT - II: Surveying and Leveling

Introduction: Definition of Surveying, Fundamental principles of surveying, Classification of surveying.

Linear Measurement: Methods, Instruments used in chain surveying, Selection of stations, Chaining and Ranging

Angular Measurement: Instruments used, Types of compass, Types of meridians and bearings, Measurement of bearings, computation of angles. Compass traversing local attraction.

Leveling: Objectives and applications-terminology-Instruments,component parts of dumpy level, Types of leveling, levelling staff.

UNIT - III: Building Materials and Construction

Materials: Introduction to construction materials - Stones, Bricks, Lime, Cement, Timber, Sand, Aggregates, Mortar, Concrete and bitumen.

Construction: Classification of buildings, Building components and their functions.

UNIT - IV: Water Resources, Water Supply, Sanitary and Electrical Works in Building

Hydrologic cycle, water use and its conservation, Introduction to dams, barrages and check dams.

Introduction, water supply system, water supply layout of a building, housedrainage, traps, electrical works in building.

UNIT - V: Transportation Engineering

classification of roads, Introduction of flexible and rigid pavements, Introduction to road traffic and traffic control mechanism.

Text Books

1. Elements of Civil Engineering, Mimi Das Saikia, Bhargab Mohan Dasand Madan Mohan Das Publisher: PHI Learning Private Limited New Delhi.
2. Basic Civil Engineering, Dr. B.C Punmia,Ashok.K. Jain and Arun K. Jain: Laxmi Publications,Delhi.
3. Surveying Vol. I, Dr. B. C. Punmia, Ashokkumar Jain, ArunkumarJain, 17th Edition Publisher: Laxmi Publications ,Delhi.

Reference Books

1. Surveying and Leveling, R. Subramanian, Publisher: Oxford University.
2. Building drawing, M.G.Shah, C.M.Kale and S.Y.Patki Publisher: TataMcGraw Hill.

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Open Elective - I

ENVIRONMENTAL LAWS AND POLICIES

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To equip the students to have a basic awareness on environmental and socioeconomic Factors.
- To impart the knowledge of environmental pollution problem.
- To elucidate the rules and regulations of patents and trade laws.

Course Outcomes

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

- comprehend different moral perspectives and one's own Ethical standards.
- understand the concept of safety and risk.
- explain different initiatives to protect nature.
- identify the role of Environmental Engineering.
- understand different types of infringement of Intellectual Property Rights.

Course Content

UNIT - I: Introduction

Introduction to trade and environment - International environmental laws, Right to Environment as Human Right, International Humanitarian Law and Environment, Environment and conflicts management, Famous international protocols like Kyoto.

UNIT - II: Environmental Laws

Overview of environment, Nature and eco system, Concept of laws and policies, Origin of environmental law, Introduction to environmental laws and policies, Environment and Governance, Sustainable development and environment, Understanding climate change, Carbon crediting, Carbon foot print etc.

UNIT - III: Air and Noise Pollution Control Laws

Air pollutants, Sources, classification, Combustion, Processes and pollutant emission, Effects on Health, vegetation, materials and atmosphere, Reactions of pollutants in the atmosphere and their effects-Smoke, Smog and ozone layer disturbance, Greenhouse effect. Air sampling and pollution measurement methods, Principles and instruments, Overview of air pollution control laws and their mitigation measures. Sound power, Sound intensity and sound pressure levels; Plane, Point and line sources, Multiple sources; Outdoor and indoor noise propagation;

Psychoacoustics and noise criteria, Effects of noise on health; Special noise environments: Infrasound, Ultrasound, Impulsive sound and sonic boom; Noise standards and limit values; Noise instrumentation and monitoring procedure, Noise control methods.

UNIT - IV: Water Quality Laws

Introduction to water quality laws development, calibration and verification cost: benefit analysis using models, Laws for estuary and lakes, Waste water treatment legislation; Introduction to water quality management systems and procedures, Consequence Analysis; Socioeconomic aspects, Measures of effectiveness of pollution control activities.

UNIT - V: Environmental Impact Assessment and Life Cycle Analyses

Evolution of EIA: Concepts of EIA methodologies, Screening and scoping; Rapid EIA and comprehensive EIA; General framework for environmental impact assessment, Characterization and site assessment. Environmental Risk Analysis, Definition of risk, Matrix method - Checklist method, Fault tree analysis, Environmental Audit: Cost Benefit Analysis; Life Cycle Assessment; Resource balance, Energy balance & management review; Operational control; Case studies on EIA.

Text Books

1. Kuehn, T.H., Ramsey, J.W. and Threlkeld, J.L., Thermal Environmental Engineering, 3rd Edition, Prentice Hall, 1998.
2. A Textbook of Environmental Chemistry, by O. D. Tyagi and M. Mehra
3. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) Engineering impacting Social, economical and Working Environment, 120th ASEE Annual Conference and Exposition.

Reference Books

1. Larry W. Canter, “Environmental Impact Assessment”, 1st edition, McGraw-Hill (international edition).
2. David P. Lawrence, “Environmental Impact Assessment - Practical Solutions to Recurrent Problems”, 1st Edition, Wiley-Interscience.
3. Advanced Air and Noise Pollution Control, Lawrence K. Wang, Norman C. Pereira, Yung-Tss Hung, 2005 Edition, Humana Press.
4. Municipal Solid Waste Management, P. Jayarami Reddy, 1st Edition, B.S. Publications.

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Open Elective - I

ELECTRICAL MATERIALS

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the concepts of dielectric and ferro-magnetic materials.
- To impart knowledge on semiconductor materials, materials used in batteries and solar cells.
- To familiarize the materials required for specific electrical applications.

Course Outcomes

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

- describe the properties of liquid, gaseous and solid dielectric materials used in electrical applications.
- analyze the properties of Ferro electric, Peizo electric and Pyro electric materials.
- classify different magnetic materials and examine the effects of aging and impurities on magnets.
- elucidate various semiconductor materials and their applications in integrated circuit.
- choose appropriate material for a given electical and special purpose application.

Course Content

UNIT - I: Dielectic Materials

Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics.

UNIT - II: Ferromagnetic Materials

Properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials, applications of Ferro-electric materials.

UNIT - III: Magnetic Materials

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, Magnetostriction, magnetically soft and hard materials, ageing of magnets, Superconductivity and its origin, Zero resistance and Meissner Effect.

UNIT - IV: Semiconductor Materials

Properties of semiconductors, Classification of Semiconductors, Silicon wafers - Wafer manufacturing process, Resistor, Fabrication processes of MOSFET on IC.

UNIT - V: Materials for Electrical Applications

Materials used for Resistors, rheostats, heaters, stranded conductors, fuses, electric contact materials, Solid Liquid and Gaseous insulating materials. Effect of moisture on insulation, Testing of Transformer oil as per ISI standards - Galvanization methods, Materials for battery and solar cells.

Text Books

1. R K Rajput: A course in Electrical Engineering Materials, Laxmi Publications. 2009.
2. David Linden, Thomas B. Reddy "The Handbook of Batteries" McGraw-Hill Hand Books 2010.
3. T K BasaK: A course in Electrical Engineering Materials:, New Age Science Publications 2009.

Reference Books

1. TTTI Madras: Electrical Engineering Materials
2. Adrianus J.Dekker: Electrical Engineering Materials , THM Publication

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Open Elective - I

CONTROL SYSTEMS ENGINEERING

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To equip the students with the basic concepts of control systems by developing mathematical models for physical systems.
- To familiarize with the time domain behavior of linear control systems.
- To impart knowledge on analytical methods to quantify stability of linear control systems.
- To introduce the state space analysis to continues time systems.

Course Outcomes

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

- apply the basic concepts and properties of feedback control systems for mathematical modeling of physical systems.
- explore the transfer function analysis using singal flow graph representation of control systems.
- employ the time domain analysis to quantify the performance of linear control systems and specify suitable controllers.
- perform frequency domain analysis of control systems required for stability analysis.
- use the concept of state variable theory to determine the dynamic behavior of linear control systems.

Course Content

UNIT - I: Introduction

Concepts of Control Systems- Open loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back characteristics, Effects of feedback. Mathematical models – Differential equations, Impulse Response and transfer function for physical systems.

UNIT - II: Control Systems Components

Transfer Function of DC Servo motor - AC Servo motor -, Block diagram representation of systems considering -Block diagram algebra – Representation by signal flow graphs - Reduction is using Mason's gain formula.

UNIT - III: Time Response Analysis

Standard test signals - Time response of first order systems – Characteristic equation of feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants.

UNIT - IV: Stability Analysis in S-Domain

The Concept of Stability – Routh's Stability Criterion – Qualitative Stability and Conditional Stability –Limitations of Routh's Stability.

Root Locus Technique: The root locus concept - construction of root loci – simple problems.

UNIT - V: State Space Analysis of Continuous Systems

Concept of state, state variables and state model, derivation of state models from physical systems, solving the Time invariant state equations- State Transition Matrix and its Properties, concept of controllability and observability.

Text Books

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 6th edition, 2017.
2. Automatic control system – B.C.Kuo , john wiley and son's 8th edition, 2003.

Reference Books

1. Modern control engineering – K.Ogata , prentice Hall of India Pvt. Ltd., 5th Edition, 2015.
2. Control system – N.K.Sinha, New Age International (p) Limited Publishers, 3rd Edition, 1998.
3. Control system engineering – Norman S-Nice, Willey Studio Edition, 4th Edition. Feed back and control system – Joseph J Distefa.
4. Modern control systems - Richard C. Dorf and Robert H. Bishop, Pearson Prentice Hall Publications, 12th Edition, 2010.

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Open Elective - I

AUTOMOTIVE ENGINEERING

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce various components and sub systems of an automobile.
- To impart knowledge on various safety systems of an automobile and emission norms.

Course Outcomes

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

- outline the various components and sub systems of an automobile.
- specify different safety norms for the operation of an automobile.

Course Content

UNIT - I:

Introduction: classification of automobiles, components of four wheeler automobile-chassis, body, power unit, power transmission- front wheel drive, rear wheel drive, four-wheel drive.

Fuel supply systems: Simple fuel supply system in petrol and diesel engines. working of simple carburettor, direct fuel injection system in diesel engine.

UNIT - II:

Lubricating System: Functions & properties of lubricants, methods of lubrication splash, pressure, dry sump and wet sump lubrication.

Cooling System: Necessity, methods of cooling - air cooling & water cooling, components of water cooling, radiator, thermostat.

UNIT - III:

Ignition System: Functions, requirements, types of an ignition system, battery ignition system - components, Magneto ignition system, electronic ignition system.

Transmission system: Types and functions of the clutches- single plate clutch, multi plate clutch, centrifugal and semi centrifugal clutch, types of gear boxes- Sliding mesh, Constant mesh, Synchromesh, propeller shaft, universal joint and differential.

UNIT - IV:

Suspension System: Objectives of suspension system, front suspension systemrigid axle suspension system, independent suspension system, rear axle suspension, torsion bar, shock absorber.

Braking System: Mechanical brakes, hydraulic brakes-master cylinder, wheel cylinder, tandem master cylinder, brake fluid, air brakes and vacuum brakes.

UNIT - V:

Emissions from Automobile: Emission norms - Bharat stage and Euro norms. engine emissions - exhaust and non-exhaust.

Safety Systems: seat belt, air bags, bumper, antilock brake system (ABS), wind shield, suspension sensor, traction control, central locking, electric windows, speed control.

Text Books

1. Kirpal Singh, "Automobile Engineering Vol-1 & vol-2", Standard Publishers Distributors, 14 th edition, 2017 .
2. William H Crouse & Donald LAnglin, Automotive Mechanics, Tata Mc Graw Hill Publications, 10th edition, 2017.

Reference Books

1. R.B Gupta , Automobile Engineering, Satya Prakashan Publications, 6th edition,2016.
2. Newton steeds & Garrett, "The Motor vehicle", Society of Automotive Engineers, 13th edition,2001.
3. G.B.S. Narang, "Automobile Engineering", Khanna Publishers, 5th edition, 1995.

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Open Elective - I

ELEMENTS OF MECHANICAL TRANSMISSION

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the principles of mechanical power transmission elements.

Course Outcomes

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

- choose suitable shaft couplings for a given application.
- propose suitable transmission element for a given application.
- identify suitable power screw for motion transmission.

Course Content

UNIT - I: Shaft Couplings

Shaft couplings: Rigid couplings – muff, split muff and flange couplings, flexible coupling-modified flange coupling.

UNIT - II: Belt Drives

Flat Belts: Introduction, selection of a belt drive, types of belt drives, length of belts, materials, belt joints, types of flat belt drives, power transmitted.

UNIT - III: V-Belt, Rope Drives & Chain Drives

V-belts: Introduction, Types of V-belts, ratio of driving tensions for V-belt, power transmitted.

Rope Drives: Introduction, classification of rope drives, power transmitted.

Chain drives: Introduction, chain drives, polygonal effect, selection of roller chains, length of chain.

UNIT - IV: Power Screws

Forms of threads, multi-start threads, right hand and left hand threads, nut, compound screw, differential screw.

UNIT - V: Gears and Gear Trains

Types, terminology, materials, law of gearing, velocity of sliding, forms of teeth, path of contact, arc of contact, interference, gear Trains - types, differential of an automobile.

Text Books

1. Bhandari, “Design of Machine Elements”, Tata McGraw Hill book Co.,5th Edition, 2020.
2. P.C. Sharma & D.K. Agarwal, “Machine Design”, S.K.Kataria & Sons ,13th Edition, 2018.

Reference Books

1. Sharma & Purohit, “Design of Machine Elements”, PHI, 10th Edition,2011.
2. Kannaiah, “Design of Machine Elements”, Scitech Publications, 2nd Edition, 2015.

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Open Elective - I

INTRODUCTION TO EMBEDDED SYSTEMS

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the classification, characteristics, applications of embedded systems.
- To provide clear understanding about the role of firmware in correlation with hardware systems.
- To familiarize with the architecture of 8051 microcontroller.

Course Outcomes

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

- compare embedded and general computing systems.
- select the processors for an embedded system application.
- understand the architecture and instruction set of 8051 microcontroller.
- program the timers/counters and serial communication components of 8051 microcontroller.

Course Content

UNIT - I: Introduction to Embedded Systems

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

UNIT - II: Typical Embedded System: Core of the Embedded System

Elements of Embedded Systems, General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

UNIT - III: Embedded Firmware

Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT - IV: Introduction to 8051 Microcontroller

Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, Addressing modes and Instruction set of 8051, Simple programs.

UNIT - V: 8051 Real Time control

Interrupts- 8051 Interrupts, Interrupt Vector table of 8051, IE Register, IP register;Timers and Counters-Timer 0, Timer 1, TMOD Registers, TCON Register,Mode1 Programming; Serial Port- SBUF, SCON Registers, Doubling baud rate using PCON register, program for serial data transmission.

Text Books

1. K.V Shibu, "Introduction to Embedded System", TMH Education private limited, 2009.
2. Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, "The 8051 Microcontrollers and Embedded Systems", 2nd Edition, Pearson Education.

Reference Books

1. Kenneth. J. Ayala, Dhananjay V. Gadre, "The 8051 Microcontroller & Embedded Systems Using Assembly and C", 1st edition, Cengage learning, 2010.
2. Rajkamal," Embedded Systems" 2nd Edition, TMH, 2008.
3. Frank Vahid, Tony Givargis, "Embedded System Design", 2nd Edition, John Wiley Publishers.

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Open Elective - I

FUNDAMENTALS OF COMMUNICATION SYSTEMS

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce various analog and digital modulation and demodulation techniques
- To familiarize with various multiplexing schemes and cellular telephone systems

Course Outcomes

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

- understand the concepts of basic communication system
- compare different multiplexing techniques.
- differentiate DSB-SC, SSB and frequency modulation schemes.
- distinguish ASK, PSK and FSK modulations.
- know the concepts of the cellular telephone systems

Course Content

UNIT - I: Introduction to Communication Systems

Introduction, Communication Process: Elements of communication system, Concept of Bandwidth and frequency spectrum, Sources of information: Classification of signals, Baseband and Band pass signals, Communication channels, Classification of communication systems.

UNIT - II: Basic Models of Communication

Need of modulation, Different types of modulation systems, Multiplexing, Basic Models of Communication. Primary Communication Resources, Survey of communication applications, Analog and digital signals, Conversion of analog signals to digital signals, electromagnetic spectrum (EM) Spectrum.

UNIT - III: Linear Modulation

Basics of Amplitude Modulation: Definition and Physical Appearance, Single tone an AM wave, Frequency Spectrum and Bandwidth of an AM wave, Modulation Index, Power distribution in an AM wave; Forms of an AM signal (theoretical concepts): Double Side Band-suppressed Carrier (DSB-SC), Single Side Band (SSB).

UNIT - IV: Angle Modulation

Basics of Frequency Modulation: Definition and Physical Appearance, Frequency Deviation Curve, Equation of FM wave, Frequency Deviation, Modulation Index, Deviation Ratio; Comparison of FM and AM Signals.

Phase Modulation: Definition and Physical Appearance, Equation of PM wave.

UNIT - V: Digital Transmission

Digital communication system model, advantages and disadvantages of digital communication, pulse code modulation (PCM), ASK, FSK, PSK, Basics of cellular telephone systems.

Text Books

1. Wayne Tomasi, “Electronics Communication systems”, Pearson Education, 5th edition, 2004.
2. Dr. Sanjay Sharma, "Communication Systems: Analog and Digital", Katson Books, 7th Reprint Edition, 2018.

Reference Books

1. Simon Haykin, John Wiley, “Principles of Communication Systems”, 2nd Edition, John Wiley & Sons.
2. V. Chandra Sekar, "Analog Communication", Oxford University Press, 2010.
3. Dr. Sanjay Sharma, "Digital Communications", Katson Books.
4. B.P.Lathi, “Modern Analog and Digital Communication”, 3rd Edition, Oxford reprint, 2004.

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Open Elective - I

INFORMATION RETRIEVAL SYSTEMS

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce basic concepts in information retrieval.
- To familiarize with applications of information retrieval techniques in the Internet or Web environment.

Course Outcomes

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

- identify the basic theories in information retrieval systems.
- use inverted file as an index data structure to retrieve the documents from the database.
- create signature files for fast retrieval of text data.
- build PAT treesand PAT arrays for the given text document.
- use stemming algorithms to improve the performance of IR systems.

Course Content

UNIT - I: Introduction to Information Storage and Retrieval System

Introduction, Domain Analysis of IR systems and other types of Information Systems, IR System Evaluation. Introduction to Data Structures and Algorithms related to Information Retrieval: Basic Concepts, Data structures, Algorithms.

UNIT - II: Inverted files

Introduction, Structures used in Inverted Files, Building Inverted file using a sorted array, Modifications to Basic Techniques.

UNIT - III: Signature Files

Introduction, Concepts of Signature Files, Compression, Vertical Partitioning, Horizontal Partitioning.

UNIT - IV: New Indices for Text

PAT Trees and PAT Arrays: Introduction, PAT Tree structure, algorithms on the PAT Trees, Building PAT trees as PATRICA Trees, PAT representation as arrays.

UNIT - V: Stemming Algorithms

Introduction, Types of Stemming Algorithms, Experimental Evaluations of Stemming to Compress Inverted Files.

Text Books

1. Frakes W.B., Ricardo Baeza-Yates, “Information Retrieval Data Structures and Algorithms”, Prentice Hall, 1992.
2. Ricardo Baeza-Yates, Bertheir Ribeiro-Neto, “Modern Information Retrieval”, Pearson Education.
3. Robert Korfhage, “Information Storage & Retrieval”, John Wiley & Sons.

Reference Books

1. Kowalski, Gerald, Mark T Maybury, “Information Retrieval Systems-Theory and Implementation”, Kluwer Academic Press, 1997.
2. Information retrieval Algorithms and Heuristics, 2nd edition, Springer.

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Open Elective - I

COMPUTER GRAPHICS

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To emphasize on functionalities of various graphic systems and geometric transformations
- To familiarize on visible surface detection methods and computer animations.

Course Outcomes

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

- outline different graphical display devices and drawing algorithms.
- illustrate different 2-D geometrical transformations on graphical objects
- interpret different line and polygon clipping algorithms
- infer different 3- D transformations and viewing functions on objects.
- summarize different surface detection methods and computer animations

Course Content

UNIT - I: Introduction

Introduction: Application of computer graphics, raster scan and random scanDisplays.

Filled Area Primitives: Points and lines, inside and outside tests, line drawing algorithms, Scan line polygon fill algorithm.

UNIT - II: 2-D Geometrical Transforms

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transformations.

UNIT - III: 2D Viewing

The viewing pipeline, window to view-port coordinate transformation, Cohen-Sutherland line clipping algorithm, Sutherland – Hodgeman polygon clipping algorithm.

UNIT - IV: 3D Geometric Transformations

Translation, rotation, scaling, reflection and shear transformations, composite transformations, types of projections.

UNIT - V: Visible Surface Detection Methods and Animation

Classification – types, back-face detection, depth-buffer, BSP tree, area sub-division method.

Animations: General computer animation, raster animation, key frame systems, Graphics programming using Open GL .

Text Books

1. Donald Hearn, M. Pauline Baker, "Computer Graphics *C* version", 2nd e edition, Pearson Education.
2. Francis S.Hill, Stephen M. Kelley, "Computer Graphics using Open GL", 3rd edition, Pearson Education.

Reference Books

1. Foley, VanDam, Feiner, Hughes, "Computer Graphics Principles and Practice", 2nd edition, Pearson Education.
2. Rajesh K Maurya, "Computer Graphics with Virtual Reality Systems", Wiley.

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Open Elective - I

SYSTEM SOFTWARE

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the implementation details of assemblers, loaders, linkers, and macro processors.

Course Outcomes

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

- outline the relationship between system software and machine architecture.
- analyze working of assembler for a simplified Instructional computer.
- describe the important features of linkage Editors and Dynamic Linking .
- identify the mostly used macro processors algorithms and data structures.
- compare the functions of Absolute Loader , Bootstrap Loaders.

Course Content

UNIT - I: Introduction

System software and machine architecture, The Simplified Instructional Computer (SIC), Machine architecture, Data and instruction formats, addressing modes, instruction sets, I/O and programming System.

UNIT - II: Assemblers

Basic assembler functions, SIC assembler, assembler algorithm and data structures, machine dependent assembler features.

UNIT - III: Implementation of Assemblers

Instruction formats and addressing modes, program relocation, machine independent assembler features, literals, symbol, defining statements, expressions, one pass assemblers, multi pass assemblers, implementation example, MASM assemble.

UNIT - IV: Loaders & Linkers

Basic loader functions, design of an absolute loader, simple bootstrap loader, machine dependent loader features, relocation, loader options, program linking, algorithm and data structures for linking loader, linkage editors, dynamic linking, implementation example.

UNIT - V: Macro Processors

Basic macro processor functions, macro definition and expansion, macro processor algorithm and data structures, machine independent macro processor features, concatenation of macro parameters, generation of unique labels, conditional macro expansion.

Text Books

1. Leland L. Beck, "System Software – An Introduction to Systems Programming", 3rd edition, Pearson Education Asia, 2000.

Reference Books

1 D. M. Dhamdhere, "Systems Programming and Operating Systems", 2nd Revised edition, Tata McGraw-Hill, 1999.

2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 1972.

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Open Elective - I

FREE & OPEN SOURCE SOFTWARE

II Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To impart the opportunities for open source software in the global market.
- To familiarize with different steps in implementing the open source.

Course Outcomes

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

- state the need and applications of open source software.
- compare and Contrast between Open source and commercial software
- demonstrate LINUX operating systems concepts.
- create database in MYSQL and perform operations on it.
- design and develop a web application using PHP.

Course Content

UNIT - I: Introduction

Introduction to Open sources, Need of Open Sources, Advantages of Open Sources and Application of Open Sources.

UNIT - II: LINUX

LINUX Introduction, General Overview, Kernel Mode and user mode, Process, Advanced Concepts-Personalities, Cloning, Signals.

UNIT - III: PHP

PHP- Introduction, Programming in web environment, variables, constants, data types, operators Statements, Arrays.

UNIT - IV: MySQL

MySQL: Introduction, Setting up account, Starting, terminating and writing your own SQL programs, Record selection Technology, Working with strings, Date and Time, Generating Summary, Working with metadata.

UNIT - V: Advanced PHP

OOP–String Manipulation, PHP and SQL database, PHP Connectivity, Debugging and error handling.

Text Books

1. M.N.Rao, “Fundamentals of Open Source Software”, PHI Learning.
2. Steve Suchring,”MySQLBible”, John Wiley, 2002

Reference Books

1. Remy Card, Eric Dumas and Frank Mevel, “The Linux Kernel Book”, Wiley Publications, 2003.

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Open Elective - I

FUZZY MATHEMATICS

II Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart the knowledge of fuzzy set theory and its applications in Engineering.

Course Outcomes

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

- state the need and applications of open source software.
- distinguish between crisp set and fuzzy set.
- know different operations on fuzzy relations.
- use defuzzification methods to crisp sets.
- draw inferences using fuzzy logic.
- develop membership value assignments.

Course Content

UNIT - I: Classical Sets And Fuzzy Sets

Classical sets – Operations – Properties. Fuzzy sets – Operations – Properties – membership functions - Features of the membership function.

UNIT - II: Fuzzy Relations

Fuzzy Cartesian product and composition - Fuzzy relations - Operations - Properties of fuzzy relations - Fuzzy tolerance and equivalence relations.

UNIT - III: Fuzzification And Defuzzification

Fuzzification - defuzzification to crisp set - Defuzzification to scalars (centroid method, centre of sums method, mean of maxima method).

UNIT - IV: Fuzzy Logic

Classical logic – Fuzz logic – Approximate reasoning ["if ... then" approach and "if ... then ....else" approach] – Other forms of the implication operation.

UNIT - V: Development Of Membership Functions

Membership value assignments – Inference – Rank ordering – Neural networks – Genetic algorithms – Inductive reasoning.

Text Books

1. Timothy J.Ross., Fuzzy Logic with Engineering Applications - Second Edition, Wiley Publications, 2015, New Delhi.

2. S.Rajasekaran, G.A.Vijayalakshmi Pai, Neural networks, Fuzzy logic, and genetic algorithms synthesis and applications- – Prentice-Hall of India private limited, 2008, New Delhi.

Reference Books

1. H.J. Zimmarman, Fuzzy set theory and its applications, 4th edition — Springer, 2013. New Delhi.
2. S.Nanda and N.R.Das "Fuzzy Mathematical concepts, Narosa Publishing House, New Delhi.

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Open Elective - II

REMOTE SENSING AND GIS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the basic concepts and principles of Remote Sensing.
- To familiarize with structure and function of Geographic Information Systems.
- To illustrate the multidisciplinary nature of Geospatial applications.

Course Outcomes

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

- relate the scientific theories to the behaviour of electromagnetic spectrum
- distinguish between different types of satellites and identify appropriate remote sensing data products for mapping, monitoring and management applications
- interpret Satellite images and processed outputs for extracting relevant information
- structure the concept of a spatial decision support system in its analog and digital forms
- list and elaborate applications of Remote Sensing and GIS in various fields

Course Content

UNIT - I: Electro-Magnetic Radiation (EMR), Its Interaction with Atmosphere & Earth

Definition of remote sensing and its components – Electromagnetic spectrum, wavelength regions important to remote sensing, wave theory, particle theory, Stefan-Boltzmann and Wien's Displacement Law – Atmospheric scattering, absorption, atmospheric windows, spectral signature concepts, typical spectral reflective characteristics of water, vegetation and soil.

UNIT - II: Platforms and Sensors

Types of platforms, orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors, resolution concept, payload description of important Earth Resources and Meteorological satellites – Airborne and Space-borne TIR (Thermal Infrared Radiation) and microwave sensors.

UNIT - III: Image Interpretation and Analysis

Types of Data Products – types of image interpretation, basic elements of image interpretation, visual interpretation keys – Digital Image Processing, pre-processing, image enhancement techniques – multispectral image classification, supervised and unsupervised.

UNIT - IV: Geographic Information System

Introduction to Maps, definitions, map projections, types of map projections, map analysis – GIS definition, basic components of GIS, standard GIS software's – Data types, spatial and non-spatial (attribute) data - Data models – Data input - measurement scales – Data Base Management Systems (DBMS).

UNIT - V: RS and GIS Applications

Land cover and land use classification, crop productivity and crop monitoring, Smart city applications, Forest fire detection using image analysis.

Text Books

1. Remote Sensing and Image Interpretation by Thomas. M. Lillesand and Ralph. W. Kiefer,7th Edition, John Wiley and Sons, 2015.
2. Remote Sensing and Geographical Information Systems by M. Anji Reddy, 4th Edition, B.S. Publications.

Reference Books

1. Remote Sensing and GIS by Basudeb Bhatta, 2nd Edition, Oxford University Press.
2. Principles of Geographical Information Systems by Burrough P.A. and Rachel A. Mc Donell,3rd Edition, Oxford Publication, 2016.

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Open Elective - II

GREEN BUILDING TECHNOLOGY

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the different concepts of sustainable design and green building techniques.
- To explore the techniques available of best fit for the specific construction project.

Course Outcomes

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

- describe the concepts of sustainable design and green building techniques
- understand the energy efficiency and indoor environmental quality management
- explain the energy efficiency techniques and concepts of embodied energy
- apprise the drawings and models of their own personal green building project
- select the Indoor Environmental Quality and comfort

Course Content

UNIT - I: Introduction to Green Buildings

Definition of green buildings and sustainable development, typical features of green buildings, benefits of green buildings towards sustainable development. Green building rating systems – GRIHA, IGBC and LEED, overview of the criteria as per these rating systems.

UNIT - II: Site Selection and Planning

Criteria for site selection, preservation of landscape, soil erosion control, minimizing urban heat island effect, maximize comfort by proper orientation of building facades, day lighting, ventilation, etc. Water conservation and efficiency: Rainwater harvesting methods for roof & non-roof, reducing landscape water demand by proper irrigation systems, water efficient plumbing systems, water metering, waste water treatment, recycle and reuse systems.

UNIT - III: Energy Efficiency

Environmental impact of building constructions, Concepts of embodied energy, operational energy and life cycle energy. Methods to reduce operational energy: Energy efficient building envelopes, efficient lighting technologies, energy efficient appliances for heating and air-conditioning systems in buildings, zero ozone

depleting potential (ODP) materials, wind and solar energy harvesting, energy metering and monitoring, concept of net zero buildings.

UNIT - IV: Green Building Materials

Methods to reduce embodied energy in building materials: (a) Use of local building materials (b) Use of natural and renewable materials like bamboo, timber, rammed earth, stabilized mud blocks, (c) use of materials with recycled content such as blended cements, pozzolana cements, fly ash bricks, vitrified tiles, materials from agro and industrial waste. (d) reuse of waste and salvaged materials Waste Management: Handling of construction waste materials, separation of household waste, on-site and off-site organic waste management.

UNIT - V: Occupant Comfort and Wellbeing

Daylighting, air ventilation,exhaust systems, low VOC paints, materials & adhesives, building acoustics. Codes related to green buildings: NBC, ECBC, ASHRAE, UPC etc. Suggested.

Text Books

1. IGBC Green Homes Rating System, Version 2.0., Abridged reference guide, 2013, Indian Green Building Council Publishers.
2. GRIHA version 2015, GRIHA rating system, Green Rating for Integrated Habitat Assessment.
3. Alternative building materials and technologies by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, New Age International, New Delhi.

Reference Books

1. Non-Conventional Energy Resources by G. D. Rai, Khanna Publishers.
2. Sustainable Building Design Manual, Vol.1 and 2, TERI, New Delhi 2004.
3. Green Building Fundamentals by Mike Montoya, Pearson, USA, 2010.
4. Sustainable Construction – Green Building Design and delivery by Charles J. Kibert, John Wiley &Sons, New York, 2008.
5. Sustainable Construction and Design by Regina Leffers, Pearson/ Prentice Hall, USA, 2009.

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Open Elective - II

MODELING AND SIMULATION OF ENGINEERING SYSTEMS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with programming skills using basic MATLAB and its associated tool boxes.
- To impart knowledge on building SIMULINK and Graphical user interface

Course Outcomes

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

- create, modify and work with variables and its related operations
- develop MATLAB program to solve real time engineering problems.
- solve and visualize the dynamic performance of engineering systems through MATLAB plotting features.
- compute and analyze the numerical data of a physical system using advanced features in MATLAB.
- analyze the performance of physical system using toolboxes and GUI.

Course Content

UNIT - I: Introduction to MATLAB

Getting Started, MATLAB as language, MATLAB windows-Direct and Indirect windows, and Functions of Windows, MATLAB Environment, File Types, Inputting and Outputting methods.

UNIT - II: Variables, Scripts and Functions

Making Variables, Manipulating Variables, Vectorization, Scripts, , creating and working with scripts, Basic Functions, creating and working with function files, Flow Control-if, for, while and switch cases, Signal routing-break, continue and return, examples with engineering applications.

UNIT - III: Plotting

Basic Plotting, 2D Plotting – line, bar, area; 3D plotting-mesh and surface; plotting types - Multiple plotting, Sub plotting; Line styles, examples with engineering applications.

UNIT - IV: Solving Equations and Curve Fitting

Linear Algebra, Polynomials, Optimization, Differentiation / Integration, Differential Equations, Probability and Statistics, Data Structures, Images and Animation, Debugging, examples with engineering applications.

UNIT - V: Toolboxes and GUIs

Introduction to Neural networks, Fuzzy logic, Control systems, Symbolic Math, Simulink, File I/O, Graphical User Interfaces, examples with engineering applications.

Text Books

1. Getting started with MATLAB-A quick introduction for scientists and engineers, Rudra Pratap, Oxford University Press, January, 2010.
2. MATLAB and SIMULINK for Engineers, Agam Kumar Tyagi, Oxford University Press, 2012.

Reference Books

1. Introduction to MATLAB, Spencer, R.L. and Ware, M, Brigham Young University, available online accessed, May, 2008.
2. An introduction to MATLAB, David F. Griffiths, The University of Dundee, available online, accessed, October 2012.
3. MATLAB an introduction with applications, Amos Gilat, Wiley publications, January 2012.

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Open Elective - II

POWER SYSTEMS ENGINEERING

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the working of various types of power plants and layout of substations.
- To familiarize the concepts of corona, insulators and various tariff methods.

Course Outcomes

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

- describe the operation of thermal power station.
- illustrate the operation of hydro power plants.
- identify various components and their role in the operation of nuclear power plant
- distinguish various bus bar arrangements and insulators used in substation
- analyze the phenomenon of corona and describe various tariff methods.

Course Content

UNIT - I: Thermal Power Stations

Single line diagram of Thermal Power Station showing paths of coal, steam, water, air, ash and flue gasses-Brief description of TPS components: Economizers, Boilers, super heaters, Turbines ,condensers, chimney and cooling towers.

UNIT - II: Hydro Power stations

Selection of site, block diagram approach of hydro electric power plant and classification of pumped storage power plants.

UNIT - III: Nuclear Power Stations

Working principle, Nuclear fuels. Nuclear reactor Components: Moderators, Control roads, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR.

UNIT - IV: Air insulated substations

Equipments used in substations, Types of Insulators, Classification of substations: - Indoor & Outdoor substations: Single line diagram of substation. Bus bar arrangements and their classification.

UNIT - V: Corona and Tariff Methods

Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss.

Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods.

Text Books

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. A Textbook of Power System Engineering by Er.R k Rajput, Laxmi Publications ,2nd Edition, 2015.

Reference Books

1. Principles of Power Systems by V.K Mehta and Rohit Mehta S.Chand& Company Ltd.New Delhi 2004.
2. Generation Distribution and Utilization of Electrical Energy by C.L.Wadhawa New age International (P) Limited, Publishers 3rd Edition 2011.
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2008.

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Open Elective - II

RENEWABLE ENERGY SOURCES

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart knowledge on renewable sources of energy and techniques used in exploiting solar, wind, biomass, geothermal and ocean sources of energy.
- To introduce direct energy conversion systems such as thermo electric, MHD and Fuel Cells.

Course Outcomes

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

- classify various types of renewable sources of energy and illustrate the principles of solar radiation.
- illustrate various solar energy storage methods and applications.
- describe the techniques of exploiting wind, biomass and geothermal energies in power generation.
- illustrate the methods of tapping ocean thermal in power generation
- describe the working of various direct energy conversion systems and their applications.

Course Content

UNIT - I:

Introduction: Energy Sources and their availability, role and potential of renewable source.

Solar Radiation: Structure of the sun, the solar constant, sun-earth relationships, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation, solar radiation geometry, Numerical problems on solar radiation.

UNIT - II:

Solar Energy Storage and Collectors: Different methods - sensible, latent heat and stratified storage, solar ponds. solar collectors- flat plate, concentric collectors.

Applications of Solar Energy: Solar heating/cooling technique, solar distillation, drying, photovoltaic energy conversion, solar central power tower concept and solar chimney.

UNIT - III:

Wind Energy: Sources and potentials, horizontal and vertical axis wind turbines, Betz criteria.

Bio-Mass Energy: Biomass energy Sources, methods for obtaining energy from biomass, Biomass gasification.

UNIT - IV:

Geothermal Energy: Resources, types of wells, methods of harnessing the energy.

Ocean Energy: Requirements of OTEC, classifications of OTEC, Environmental impacts of OTEC.

UNIT - V:

Direct Energy Conversion: Need for DEC, limitations, principles of DEC. Thermo electric Power – See-beck, Peltier, joule, Thomson effects, Thermo-electric Power generators, applications.

MHD power Generation: Principles, dissociation and ionization, Hall effect, magnetic flux, MHD accelerator, MHD engine, power generation systems, advantages and disadvantages of MHD power generator, applications.

Fuel cells: Principles, types of fuel cells.

Text Books

1. Tiwari and Ghosal, "Renewable Energy Resources: Basic Principles and Applications", Narosa.
2. B.H.Khan "Non – conventional Energy Resources", Tata McGraw Hill education Pvt. Ltd.
3. G.D. Rai, "Non-Conventional Energy Sources", Dhanpat Rai and Sons.

Reference Books

1. Twidell & Weir, "Renewable Energy Sources ", Routledge (Taylor &Francis Group).
2. SP Sukhatme, "Solar Energy: Principles of thermal collection and storage". Tata McGraw Hill.

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Open Elective - II

VENTURE DEVELOPMENT

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize the learner with the concepts of venture development

Course Outcomes

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

- explain the significance of entrepreneurship for economic development.
- distinguish among micro, small, and medium enterprises.
- discuss the role of various agencies to raise the capital.
- apply marketing strategies for a given situation.
- analyse contemporary issues in entrepreneurship.

Course Content

UNIT - I: Entrepreneurship and Entrepreneur

Introduction; characteristics of an entrepreneur, types of entrepreneurs, entrepreneurship in India, women entrepreneurship, rural entrepreneurship.

UNIT - II: Small Scale Industries in India

Concept and definition of micro, small, and medium enterprises, scope and trends of small enterprises in India, role of government in promoting ssi in india, problems of entrepreneurs, planning for setting up an industry, agencies for supporting the process, the businesses planning processes.

UNIT - III: Institutional Finance to Entrepreneur

Small Industries Development Bank of India (SIDBI), export-import Bank, Andhra Pradesh State Trading Corporation (APSTC), Integrated Rural Development Programme (IRDP), Export Credit Guarantee Corporation (ECGC).

UNIT - IV: Entrepreneurial Strategies

Management of small industries- small entreprises and marketing strategies- product life cycle-marketing activities, channels of distribution- market research-marketing problems of small scale industries.

UNIT - V: Contemporary Issues in Entrepreneurship

Introduction- ecological entrepreurship, legal issues, international business opportunities- risk management strategies, diversification strategies , and bankruptcy, social and ethical responsibility of entrepreneurs.

Text Books

1. Robert D.Hisrich, Mathew J. Manimala, Michael P.Peters, A.Shepherd, "Entrepreneurship" , McGraw Hill Education, 2016 .
2. P.Narayana Reddy, "Entrepreneurship - Text and Cases", Cengage Learning, 2011.

Reference Books

1. G.G. Meredith, R.E.Nelson and P.A. Neek, "The Practice of Entrepreneurship", ILO, 1982.
2. David H.Holt, "Entrepreneurship New venture Creation", PHI Learning Limited.
3. MadhuriLall, ShikhaSahai, "Entrepreneurship", Excel Books, Second Edition.

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Open Elective - II

AUTOMOTIVE ELECTRONICS

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize with the electronic systems inside an automotive vehicle.
- To introduce the concepts of advanced safety systems.

Course Outcomes

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

- describe the fundamentals of automotive technology.
- differentiatedigital andanalog systems.
- classify various automotive sensors and control systems.
- develop communications & navigation/routing in automotive vehicles.

Course Content

UNIT - I: Automotive Fundamentals

Use of electronics in the automobile, evolution of automotive electronics, theautomobile physical configuration, evolution of electronics in the automobile, surveyof major automotive systems.

UNIT - II: Automotive Micro-Computer System

Microcomputer fundamentals-digital versusanalog computers, basic computer block diagram, microcomputer operations,CPU registers, accumulator registers, condition code register-branching;microprocessor architecture, memory-ROM, RAM; I/O parallel interface, digitalto analog converter and analog to digital converters with block diagram.

UNIT - III: Basics of Electronics Engine Control

Motivation for electronic engine control, exhaust emissions, fuel economy, conceptof an electronic engine control system, engine functions and control, electronicfuel control configuration, electronic ignition with sensors.

UNIT - IV: Sensors and Actuators

Basic sensor arrangement; types of sensors such as oxygen sensors,crank angle position sensors, fuel metering/vehicle speed sensors and detonation sensors, flow sensors, throttle position sensors, solenoids,actuators – fuel metering actuator, fuel injector, and ignitionactuator.

UNIT - V: Electronic Vehicle Management System

Cruise control system, antilock braking system, electronic suspension system,electronic steering control, safety: air bags, collisionavoidance radar warning system with block diagram, low tire pressure warningsystem.

Sensor multiplexing, control signal multiplexing with blockdiagram, automotive internal navigation system, GPS navigation system, Distributed Control Area Network example - a network of embedded systems in automobile.

Text Books

1. William B. Ribbens, "Understanding Automotive Electronics", 6th Edition SAMS/ElsevierPublishing.
2. Raj Kamal, "Embedded Systems - Architecture, Programming and Design", 3rd Edition, McGraw-Hill Education.
3. Robert Bosch Gambh, "Automotive Electrics Automotive Electronics Systems and Components", 5th edition, John Wiley& Sons Ltd., 2007.

Reference Books

1. Ronald K Jurgen, "Automotive Electronics Handbook", 2nd Edition, McGraw-Hill, 1999.
2. G. Meyer, J. Valldorf, W. Gessner, "Advanced Microsystems for AutomotiveApplications", Springer, 2009.
3. Robert Bosch, "Automotive Hand Book", 5th Edition, SAE, 2000.

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Open Elective - II

INTRODUCTION TO SIGNAL PROCESSING

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To familiarize with the basic concepts and operation on signals.
- To introduce various transform techniques on signals.

Course Outcomes

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

- classify the signals and various operations on signals.
- compute Fourier analysis on the signals.
- applyvarious sampling techniques on continuous time signals.
- analyzecontinuous time signals using Fourier and Laplace transforms.

Course Content

UNIT - I: Signal Analysis

Classification of signals, basic operations on signals-amplitude and time scaling, time shifting, addition and multiplication, introduction to elementary signals-unit step, impulse, ramp, parabolic, rectangular, triangular, sinusoidal, exponential, signum, sinc and gaussian functions.

UNIT - II: Fourier Series

Trigonometric and exponential Fourier series, relationship between trigonometric and exponential Fourier series, convergence of Fourier series, symmetry conditions-even and odd, complex Fourier spectrum.

UNIT - III: Fourier Transform

Representation of an arbitrary function over the entire interval: Fourier transform, ourier transform of some useful functions and periodic function, properties of Fourier transform, Parseval's theorem.

UNIT - IV: Sampling

Sampling theorem for band limited signals- explanation, reconstruction of signal from samples, aliasing, sampling techniques- impulse, natural and flat top sampling.

UNIT - V: Laplace Transform

Laplace transform of signals, properties of Region of Convergence (ROC), unilateral Laplace transform, properties of unilateral Laplace transform, inversion of Laplace transform, relationship between Laplace and Fourier Transforms.

Text Books

1. B.P.Lathi, “Signals, Systems &Communications”, BS Publications, 2003.
2. A.V. Oppenheim, A.S. Willsky and S.H.Nawab, “Signals and Systems”, 2nd EditionPHI.

Reference Books

1. Simon Haykin and Van Veen, “Signals &Systems”, 2nd edition, Wiley Publishers.
2. Michel J. Robert , “Fundamentals of Signals and Systems”, International Edition, Tata McGraw-Hill, 2008
3. C.L.Philips, J.M. Parr and Eve A. Riskin, “Signals, Systems and Transforms”, 3rd Edition, Pearson Education, 2004.

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Open Elective - II

NETWORK PROGRAMMING

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the basics of network Technologies.
- To impart in-depth knowledge in socket creation and client-server communication in TCP and UDP.

Course Outcomes

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

- analyze the requirements of a networked programming environment and identify the issues to be solved.
- interpret the basic network technologies and protocols usage by common internet application.
- develop client-server communication using TCP for communicating processes exist in the different systems.
- apply theoretical principles and use appropriate functions for establishing client-server communication.
- develop client-server communication using UDP protocols by writing socket programming.

Course Content

UNIT - I: Introduction to Network Programming

OSI model, UNIX standards, TCP and UDP and TCP connection establishment and termination, port numbers, TCP port numbers and concurrent servers, buffer sizes and limitation, protocol usage by common internet application.

UNIT - II: Sockets

Address structures, value–result arguments, byte ordering and manipulation functions. Elementary TCP sockets–socket, connect, bind, listen, accept, fork function, concurrent servers.

UNIT - III: TCP Client-Server

Introduction, TCP echo server functions, normal startup, termination, POSIX signal handling, termination of server process, crashing and rebooting of server host, shutdown of server host.

UNIT - IV: I/O Multiplexing and Socket Options

I/O models, select function, poll function, TCP echo server, getsockopt and setsockopt functions.

UNIT - V: Elementary UDP Sockets

Introduction, UDP echo server function, lost datagrams, UDP example, lack of flow control with UDP.

Text Books

1. W.Richard Stevens, Bill Fenner, Andrew M. Rudoff, "UNIX Network Programming: The Sockets Networking API", Volume 1, 3rd edition, Addison-Wesley.
2. W. Richard Stevens, "UNIX Network Programming", 1st edition, PHI.

Reference Books

1. Graham Glass, King Ables, "UNIX for Programmers and Users", 3rd edition, Pearson Education.
2. Marc. J. Rochkind, "Advanced UNIX Programming", 2nd edition, Pearson Education.

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Open Elective - II

SOCIAL NETWORK ANALYSIS

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To provide students with essential knowledge of network analysis applicable to real world data, with examples from today's most popular social networks.

Course Outcomes

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

- demonstrate social network analysis and measures.
- analyze random graph models and navigate social networks data
- apply the network topology and Visualization tools.
- analyze the experiment with small world models and clustering models.
- compare the application driven virtual communities from social network Structure.

Course Content

UNIT - I: Graphs

Graphs as models of Networks, Paths and Connectivity, Distance and Breadth-First Search, The Strength of Weak Ties, Structual Holes, Betweenness measure, Homophily, Affiliation, Structural Balance.

UNIT - II: Link Analysis and Web Search

Web as Directed Graph, Searching the Web, Link Analysis Using Hubs and Authorities, Page Rank, Applying Link Analysis in Modern Web Search.

UNIT - III: Cascading Behavior in Networks

Power Laws, Rich-Get-Richer Phenomenon, Diffusion, Cascading Behavior, Cascades and Clusters, Role of Weak Ties.

UNIT - IV: Small World Phenomenon

Six Degrees of Separation, Structure and Randomness, Decentralized search, Empirical Analysis and Generalized Models.

UNIT - V: Basics of Game Theory

Games, Reasoning about behavior in games, Best Responses and Dominant Strategies, Nash Equilibrium, Multiple Equilibria, Mixed Strategies.

Text Books

1. D. Easley and J. Kleinberg, Networks, Crowds and Markets: Reasoning about a highly connected world-2010.
2. Tanmoy Chakraborthy, Social Network Analysis, Wiley.

Reference Books

1. Social Network Analysis: Methods and Applications (Structural Analysis in the Social Sciences) by Stanley Wasserman, Katherine Faust, 1994.

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Open Elective - II

CYBER SECURITY

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To expose the multiple cyber security technologies, processes, and procedures.
- To analyze the threats, vulnerabilities and risks present in these environments.
- To develop appropriate strategies to mitigate potential cyber security problems.

Course Outcomes

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

- demonstrate the fundamentals of cyber crimes and information security systems.
- analyze and resolve security vulnerabilities in networks and computer systems to secure an it infrastructure.
- develop a security architecture for an organization which can handle mobile, wireless devices and related security issues.
- use the cybercrime tools and methods in solving real world problems
- analyze web and internet security threats and find the solutions

Course Content

UNIT - I:

Introduction to Cybercrime: Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT - II:

Cyber offenses: Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT - III:

Cybercrime-Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Authentication Service Security, Attacks on Mobile/Cell Phones,

Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile Devices-Related Security Issues, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT - IV:

Tools and Methods Used in Cybercrime: Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft (IDTheft).

UNIT - V:

Web and Network Security: Introduction, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Overview of Vulnerability Scanning, Scanning for Web vulnerabilities, Firewalls, Packet Filters, How a firewall protects a network.

Text Books

1. Nina Godbole and SunitBelpure ¯ Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives , 1st Edition Publication Wiley, 2011.
2. Mike Shema, ¯Anti-Hacker Tool Kit (Indian Edition) ,1st Edition Publication Mc Graw Hill.

Reference Books

1. Mark Rhodes, Ousley, Information Security, 1st Edition ,MGH, 2013.

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Open Elective - II

E-COMMERCE

III Year – I Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the basic concepts of E-Commerce.
- To gain the knowledge on various Mercantile Process models.
- To identify the concepts of E-Payment Systems and Web Marketing Strategies.

Course Outcomes

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

- outline the fundamentals in E-Commerce Frame work and Concepts.
- describe various Mercantile Process models for Consumers and Merchants.
- analyze Electronic Data Interchange (EDI) problems to perform e-transactions.
- categorize and classify various E-Payment systems used in online transaction procesing.
- distinguish various web marketing Strategies to improve customer relationship and marketing.

Course Content

UNIT - I: Electronic Commerce Framework

Introduction, Electronic Commerce Framework, Anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT - II: Consumer Oriented Electronic Commerce

Consumer Oriented Applications, Mercantile process models, Mercantile models from the consumer's perspective, Mercantile models from the merchant's perspective.

UNIT - III: Inter and Intra Organizational Commerce

Inter Organizational Commerce-EDI, EDI implementation, Value Added Networks, Intra Organizational Commerce -Work flow automation and coordination, Supply chain management.

UNIT - IV: Payment Systems for Electronic Commerce

Online Payment basics, payment cards, Electronic Cash, Electronic Wallets, Stored-Value Cards, Internet Technologies and the Banking Industry.

UNIT - V: Marketing on the Web

Web Marketing Strategies, Communicating with Different Market Segments, Advertising on The Web, E-Mail Marketing, Technology enabled Customer Relationship Management. Search engine Positioning and Domain Names.

Text Books

1. Kalakota, Winston , Frontiers of electronic commerce , Pearson, 2nd Edition, 2012.
2. Gary P.Schneider Thomson , Electronic Commerce, 7th Edition, 2012

Reference Books

1. S.Jaiswal ,E-Commerce, Galgotia publications.
2. Efrain Turbon, Jae Lee, David King ,E-Commerce, H.Michael Chang.

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Open Elective - II

INTELLIGENT SYSTEMS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand the fine structure or deeper origin of knowledge
- To generate intelligent behavior on the basis of statistical evidence.

Course Outcomes

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

- demonstrate Data representation and Logical operations.
- analyze backward reasoning and solving problems by reduction.
- learning of Verification and Validation of Rule Bases .
- explain the architecture of real time expert systems.
- define Quantitative simulation.

Course Content

UNIT - I: Knowledge Representation

Data and knowledge: Data representation and data items in traditional databases, Data representation and data items in relational databases. Rules: Logical operations, Syntax and semantics of rules, Data log rule sets, the dependence graph of data log rule sets, objects.

UNIT - II: Rule Based Systems

Solving problems by reasoning: The structure of the knowledge base, the reasoning algorithm, Conflict resolution, Explanation of the reasoning.

Forward reasoning: The method of forward reasoning, a simple case study of forward reasoning, backward reasoning: Solving problems by reduction, the method of backward reasoning, a simple case study of backward reasoning, Bidirectional reasoning.

UNIT - III: Verification and Validation of Rule Bases

Contradiction freeness: The notion of contradiction freeness, Testing contradiction freeness, The search problem of contradiction freeness .Completeness: The notion of completeness, Testing Completeness, The search problem of completeness. Decomposition of knowledge bases: Strict decomposition, Heuristic decomposition.

UNIT - IV: Real-Time Expert Systems

The architecture of real-time expert systems: The real-time subsystem, The intelligent subsystem Synchronization and communication between real-time and in-

telligent subsystems: Synchronization and communication primitives, Priority handling and time-out. Data exchange between the real-time and the intelligent subsystems: Loose data exchange, the blackboard architecture. Software engineering of real- time expert systems: The software lifecycle of real time expert systems, Special steps and tool, An Example of A Real-Time expert System.

UNIT - V: Qualitative Reasoning

Sign and interval calculus, Qualitative simulation: Constraint type qualitative differential equations, The solution of QDEs: the qualitative simulation algorithm: Initial data for the simulation, Steps of the simulation algorithm, Simulation results. Qualitative physics, Signed directed graph (SDG) models.

Text Books

1. Intelligent Control Systems-An Introduction with Examples by Katalin M. Hangos, RozáliaLakner ,MiklósGerzson, Kluwer Academic Publishers.
2. Intelligent Systems and Control: Principles and Applications Paperback – 12 Nov 2009 by Laxmidhar Behera, Indrani Kar by OXFORD.

Reference Books

1. Intelligent Systems and Technologies Methods and Applications by Springer publications.
2. Intelligent Systems - Modeling, Optimization and Control, by Yung C. Shin and Chengying Xu, CRC Press, Taylor & Francis Group, 2009.

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Open Elective - II

RECOMMENDER SYSTEMS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To learn basic techniques for building recommender Systems.
- To automate a variety of choice-making strategies with the goal of providing affordable, personal, and high-quality recommendations.

Course Outcomes

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

- identify the importance of Recommender Systems.
- model Recommender System by using Content-based Filtering technique.
- build Recommender System by Collaborative Filtering technique.
- design Recommender System by Hybrid approaches.
- evaluate Recommender Systems.

Course Content

UNIT - I: Introduction

Introduction, Recommender Systems Function, Data and Knowledge Sources, Recommendation Techniques, Application and Evaluation, Challenges.

UNIT - II: Content-based Filtering

High level architecture of content-based systems, Content representation and content similarity, Similarity-based retrieval, Other text classification methods, Comparative evaluation, Limitations.

UNIT - III: Collaborative Filtering

User-based nearest neighbor recommendation, Item-based nearest neighbor recommendation, About ratings, Further model-based and preprocessing-based approaches, Recent practical approaches and systems.

UNIT - IV: Hybrid Approaches

Opportunities for hybridization, Monolithic hybridization design: Feature combination, Feature augmentation, Parallelized hybridization design: Weighted, Switching, Mixed, Pipelined hybridization design: Cascade, Meta-level.

UNIT - V: Evaluating Recommender System

Introduction, General properties of evaluation research, Evaluation designs: Accuracy, Coverage, confidence, novelty, diversity, scalability, serendipity, Evaluation on historical datasets.

Text Books

1. Jannach D., Zanker M. and FelFering A., Recommender Systems: An Introduction, Cambridge University Press (2011), 1st edition.
2. Ricci F., Rokach L., Shapira D., Kantor B.P., Recommender Systems Handbook, Springer(2011), 1st edition.

Reference Books

1. Charu C. Aggarwal, Recommender Systems: The Textbook, Springer (2016), 1st edition.
2. Manouselis N., Drachsler H., Verbert K., Duval E., Recommender Systems For Learning, Springer (2013), 1st edition.

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Open Elective - II

INTRODUCTION TO IoT ARCHITECTURE

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To impart the basic characteristics and different technologies with the IoT.
- To familiarize with architectures, enabling technologies and design methodologies of IoT.

Course Outcomes

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

- demonstrate the concepts of IoT and its characteristics.
- make use of the design methodologies of IoT.
- compare IoT and M2M.
- outline different technologies used in IoT.
- explain the case studies on IoT.

Course Content

UNIT - I: Internet of Things Concepts

Introduction to Internet of Things, Block diagram of IoT, characteristics of IoT, architectural view of IoT, Physical Design of IoT, Logical Design of IoT.

UNIT - II: IoT Design Templates & Design Methodology

IoT Enabling Technologies, IoT levels, Development Templates, Developing Internet of Things: Introduction, IoT Design Methodology.

UNIT - III: IoT and M2M

M2M, Differences between IoT and M2M, SDN and NFV for IoT, Software defined Networking, Network Function Virtualization.

UNIT - IV: IoT Technologies

Basic building blocks of IoT, Introduction to cloud storage models, Role of Machine learning, Artificial Intelligence and Data Science in IoT, Categories of ML, Applications of ML, Tools in ML, Requirement of Data analytics in IoT.

UNIT - V: Case Studies

Case studies on Domain specific IoT's, Home Automation, cities, environment, Agriculture and health monitoring and energy, Health and fitness monitoring.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, “Internet of Things: A Hands-On-Approach”, Arshdeep & Vijay Madisetti Publishers, 2014.
2. V.K.Jain, “Data science and Analytics”, Khanna Publishing, 2018.
3. Rajkamal, Internet of Things Architecture & Design Principles”, Mc.Grawhill

Reference Books

1. Vlasios Tsiatsis Stamatis Karnouskos Jan Holler David Boyle Catherine Mulligan, “InternetofThings”, Academic Press, 2018.
2. Daniel Kellmereit, “The Silent Intelligence: The Internet of Things”, Lightning Source Inc., 2014.

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Open Elective - II

INTRODUCTION TO SMART SENSORS

III Year – I Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce the fundamentals of smart sensors and provides interfacing with embedded hardware.
- To gain knowledge of the latest developments in measurement and sensors expose with the various types of smart sensors.

Course Outcomes

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

- classify different types of smart sensor for iot applications
- apply signal conditioning circuit for sensor interface to digital computer.
- gain the knowledge required for interfacing the smart sensor
- demonstrate the various packaging types of smart sensor

Course Content

UNIT - I: Sensor Devices

Piezoresistive pressure sensor, Piezoresistive Accelerometer, Capacitive Sensing-Accelerometer and Microphone, Resonant Sensor and Vibratory Gyroscope Nano Sensors.

UNIT - II: Interfacing Sensor Information and MCU

Amplification and Signal Conditioning- Integrated Signal Conditioning- Digital conversion- MCU Control MCUs for Sensor Interface- Techniques and System Considerations- Sensor Integration.

UNIT - III: Control Techniques and Standards

Control of Sensors using - State Machines, Fuzzy Logic, Neural Networks, adaptive Control.

UNIT - IV: Communication for Smart Sensor

Wireless Data Communications- RF Sensing- Telemetry- Automotive Protocols-Industrial Networks, Home Automation- MCU Protocols.

UNIT - V: Packaging, Testing and Reliability Implications of Smart Sensors

Semiconductor Packaging- Hybrid Packaging- Packaging for Monolithic Sensors-Reliability Implications Testing Smart Sensors- HVAC Sensor Chip.

Text Books

1. Randy Frank, “Understanding Smart Sensors”, Artech House, Second Edition, 2011Boston.
2. Minhang Bao, “Analysis and design principles of MEMS devices”, Elsevier Publications, 2005,USA.

Reference Books

1. Nadim Maluf and Kirt Williams, “An Introduction to Micro Electro Mechanical Systems Engineering”, Second Edition, Artech House Publishers, June 2004, USA.
2. Gabriel M. Rebeiz, “RF MEMS: Theory, Design, and Technology”, Wiley-Inter science; 1st edition, 2002,UK

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Open Elective - III

BASICS OF ENVIRONMENTAL ENGINEERING

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To understand the basic of water borne diseases,drinking water standards and treatment of wastewater and disposal
- To expose the students to understand to treatment of wastewater and disposal
- To learn the basics of air pollution and effects, noise pollution and solid waste disposal

Course Outcomes

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

- demonstrate water sources, water borne diseases, water treatment and potable water standards
- understand basicsof wastewater treatment and disposal methods
- identity air pollution sources and understand air pollution effects
- identity noise pollution sources and understand noise pollution effects
- understand sources and basic principles of solid waste

Course Content

UNIT - I: Water

Sources of water; Availability of fresh water; Water borne diseases; Brief explanation on ground and surface water treatment; Potable water standards as per IS and WHO standards; Water conservation; Role of public health engineering department in the prevention of the water borne diseases.

UNIT - II: Wastewater

Wastewater sources; Sewage characteristics; Brief explanation on treatment of sewage; Disposal of treated wastewater; Practise on reuse of treated wastewater; Effects of wastewater without treatment disposal in streams, on land

UNIT - III: Air Pollution Sources and Effects

Layers of atmosphere; Sources and classification of air pollutants – Man made, Natural sources; Type of air pollutants; Pollution due to automobiles; Effect of air pollution on health, vegetation and materials; Global warming; Worst environmental disasters caused by humans.

UNIT - IV: Noise Pollution

Sources of noise pollution - plane, point and line sources, multiple sources; Effect of noise pollution on humans; Control of noise pollution; Outdoor and indoor noise propagation; Intensity of noise pollution; Noise pollution permissible limits as per CPCB and WHO

UNIT - V: Solid Waste

Sources of solid waste – classification solid waste - Basic principles of Solid Waste storage, collection, transportation, processing and Disposal.

Text Books

1. Water supply Engineering – Environmental Engineering (Vol. I) by S.K. Garg (2019)– Khanna Publishers.
2. Sewage Disposal and Air Pollution Engineering – Environmental Engineering (Vol. II)S.K. Garg (2019) – Khanna Publishers.
3. Water Supply Engineering by Punmia B.C., Ashok Jain & Arun Jain (2014), Laxmi Publication Pvt., Ltd., New Delhi
4. Wastewater Engineering by Punmia B.C., Ashok Jain & Arun Jain (2014), Laxmi Publication Pvt., Ltd., New Delhi

Reference Books

1. Environmental Engineering by Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, McGraw Hill Inc., New York, 2017.
2. Handbook of Solid Waste Management by Frank Kreith and George Tchobanoglous, McGraw-Hill, 1994.

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Open Elective - III

DISASTER PREPAREDNESS, PLANNING AND MANAGEMENT

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To provide an exposure to disasters, their significance and types.
- To impart the knowledge on different approaches of disaster preparedness.

Course Outcomes

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

- analyse the concepts, terminologies and developments in thefield of disaster and disaster management.
- differentiate the types of disasters, causes and their impact on environment and society.
- explain the process of risk and vulnerability.
- assess different types of disaster preparedness.
- explain the role of technology in disaster management.

Course Content

UNIT - I: Disaster and Disaster Management

Introduction, Disaster, Hazard – Classification of hazard, Magnitude of disasters, Vulnerability – Categorization of vulnerabilities, Coping Capacity, Risk – Disaster risk management, Risk formula, Disaster Management – Monitoring and evaluation, Disaster management cycle.

UNIT - II: Disasters Classification

Introduction, Types of disasters, Natural disasters - Earthquakes, Cyclones, Flood, Drought, Landslides, Avalanches, Manmade disasters – Chemical disaster, Industrial wastes, Hazardous wastes, Radioactivity, Traffic disasters.

UNIT - III: Risk and Vulnerability

Building codes and land use planning, social vulnerability, Macroeconomic management and sustainable development, environmental vulnerability, climate change risk rendition, financial management of disasterrelated losses.

UNIT - IV: Disaster Preparedness

Introduction, Components of preparedness, Formulation of preparedness plan, Types of disaster preparedness, Principles of preparedness, Problems associated with preparedness.

UNIT - V: Role of Technology in Disaster Management

Disaster management for infra structures, Mitigation program for earthquakes, Geospatial information in agricultural drought assessment, Multimedia technology in disaster risk management training, Transformable indigenous knowledge in disaster reduction.

Text Books

1. Disaster Management – Global Challenges and Local Solutions, by Rajib shah & R R Krishnamurthy, Universities press, 2009.
2. Disaster management,M.M. Sulphey, PHI Learning Pvt. Ltd, 2016.

Reference Books

1. Disaster Science & Management by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
2. An Introduction of Disaster Management- Natural Disasters & Vulnerable Hazard by S. Vaidyanathan, CBS Publishers& Distributors Pvt. Ltd.
3. Disaster Management - Future Challenges and Opportunities by Jagbir Singh I K International Publishing House Pvt. Ltd, 2007.

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Open Elective - III

PRINCIPLES OF SPECIAL ELECTRIC MACHINES

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize the students with the constructional details, operating principles, theory of torque production, and characteristics of various special electrical machines.
- To expose the students to different control practices associated with various special electrical machines and applications of special electrical machines.

Course Outcomes

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

- describe the constructional and operating principles, control schemes and applications of various types of Stepper Motors.
- explain the constructional details, working principles, control practices and applications of Switched Reluctance Motors.
- analyze the speed-torque characteristics, construction and principle of operation, control techniques and applications of Permanent Magnet Brushless D.C. Motors.
- acquire the knowledge of operating principles, constructional details and applications of Servomotors and Tachometers.
- compare the constructional details, principle of operation and applications of various single phase special electrical machines.

Course Content

UNIT - I: Stepper Motors

Constructional features – Types – Variable Reluctance and Permanent Magnet motors – Principle of operation – Dynamic Characteristics –Closed loop control of Stepper Motor – Applications.

UNIT - II: Switched Reluctance Motors

Constructional features – Principle of operation – Torque Equation – Torque Speed characteristics –Closed loop control of SRM – Applications.

UNIT - III: Permanent Magnet Brushless D.C. Motors

Constructional features – Principle of operation – EMF equations – Torque and Speed characteristics – control of PMBLDC motor –Applications.

UNIT - IV: Servomotors and Tachometers

Servomotor – Types – Constructional features – Principle of Operation – Characteristics – Applications of Servomotors – AC Tachometers – Schematic diagram – Operating Principle.

UNIT - V: Single Phase Special Electrical Machines

AC series Motor – Repulsion Motor – Reluctance Motor - Hysteresis Motor – Constructional features, Principle of Operation, Characteristics and Applications of the above motors.

Text Books

1. Special Electrical Machines by E.G.Janardanan, PHI Learning Pvt Ltd, Delhi, 2014.
2. Principles of Special Electrical Machines by J.Gnanavadivel, Dr.S.Muralidharan and J.Karthikeyan, Anuradha Publications, Chennai, 2013.

Reference Books

1. Stepping Motors and their Microprocessor Controls by Takashi Kenjo, Clarendon Press, 1984.
2. Special Electrical Machines by K.Venkata Ratnam, University press, New Delhi, 2009.
3. Basic Electrical Engineering by C.L.Wadhwa, New Age
4. International (P) Limited Publishers, New Delhi, 2007.
5. Principles of Electrical Machines by V.K.Mehta andRohit
5. Mehta, S.Chand Publishing,New Delhi, 2014.
6. Stepping Motors: A Guide to Modern theory and practice by P.P.Acarnley, Peter Peregrines, London, 2002.
7. Brushless Permanent Magnet & Reluctance Motor Drives by T.J.E. Miller, Clarenden press, Oxford, 1989.

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Open Elective - III

ELECTRICAL INSTRUMENTATION

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize various types of signals, their representation and measurements using CRO.
- To impart knowledge on construction, operation and working principles of digital measuring instruments and Transducers.

Course Outcomes

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

- analyze various types of signals, and errors in digital instruments.
- measure various parameters like amplitude, phase and frequency of a signal using CRO.
- select a suitable transducer working on electrical principles to measure non electrical quantities.
- select a suitable transducer working on non-electrical principles to measure physical parameters.
- analyse the operation of various digital meters.

Course Content

UNIT - I: Signals and their Representation

Measuring Systems, Performance Characteristics, – Static characteristics – Dynamic Characteristics – Errors in Measurement – Gross Errors – Systematic Errors – Statistical analysis of random errors. Signal and their representation – Standard test, periodic, aperiodic, modulated signal – Sampled data pulse modulation and pulse code modulation.

UNIT - II: Cathode Ray Oscilloscope

Basic operation of Oscilloscope Cathode ray oscilloscope – Cathode ray tube – Time base generator – Horizantal and vertical amplifiers – Measurement of phase and frequency – Lissajous patterns.

UNIT - III: Transducers

Classification of transducers – Characteristics and choice of transducers – Principle operation of resistor, inductor, and capacitor transducers – LVDT – Strain gauge and its principle of operation – Gauge factor– Thermistors – Thermocouples– Piezo electric transducers -– Pyro transducer – Hall sensor.

UNIT - IV: Measurement of Non–Electrical Quantities

Velocity – Angular Velocity – Acceleration – Force – Torque – Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

UNIT - V: Digital Voltmeters

Digital voltmeters – Successive approximation, ramp, dual–Slope integration continuous balance type – Micro-processor-based ramp type – DVM digital frequency meter – Digital phase angle meter – Q Meter.

Text Books

1. Electronic Instrumentation–by H.S.Kalsi Tata MCGraw–Hill Higher Education 4thEdition, 2018.
2. Electrical & Electronic Measurement & Instruments,A.K.Sawhney and Puneet Sawhney, Dhanpat Rai & Co., Pvt. Ltd., 18th edition, 2010.

Reference Books

1. Measurement and Instrumentation: Theory and Application, Alan S.Morris and Reza Langari, S. Netherlands: Elsevier Science, 2nd edition,2015.
2. Measurement Systems: Application and Design. Doebelin, E., Japan: McGraw – Hill Higher Education, 4th edition, 2003.
3. Modern Electronic Instrumentation and Measurement Techniques. Cooper,W. D., Helfrick, A. D.India: Pearson Education. 1st edition, 2005.
4. Transducers and Instrumentation. by D. V. S.MURTY, India, PHI Learning 2nd edition, 2010.

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Open Elective - III

GREEN ENGINEERING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To impart the knowledge needed to minimize impacts of products, processes on environment for sustainable development.

Course Outcomes

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

- evaluate the impact of technology on environment.
- compare biological ecology to industrial ecology.
- create sustainable products, facilities, processes and infrastructure.
- assess the life cycle of a product to evaluate its impact on energy and materials use.
- analyze technological systems.

Course Content

UNIT - I: Introduction

Humanity and technology, the concept of sustainability, quantifying sustainability.

UNIT - II: Frame Work for Green Engineering

Industrial ecology, relevance of biological ecology to industrial ecology, metabolic analysis, technology and risk, the social dimensions of industrial ecology.

UNIT - III: Implementation

Technological product development, design for environment and sustainability-customer products- buildings and infrastructure.

UNIT - IV: Life Cycle Assessment

An introduction to life cycle assessment, the LCA impact and interpretation stages, streamlining the LCA process.

UNIT - V: Analysis of Technological Systems

Systems analysis, industrial ecosystems, material flow analysis, energy and industrial ecology, air quality impacts, carbon cycles and energy balance, water quality impacts.

Text Books

1. T E Graedel, Braden R Allenby, “Industrial Ecology and Sustainable Engineering”, Prentice Hall, 2010.

2. David T. Allen, David R Shonnard, “Sustainable Engineering Concepts, Design and Case Studies”, Prentice Hall, 2012.

Reference Books

1. Bradley A. Striebig, Adebayo A. Ogundipe, Maria Papadakis, “Engineering Applications in Sustainable Design and Development”, Cengage Learning, 2016.
2. Anastas, Paul T, Zimmerman, Julie B, “Innovations in Green Chemistry and Green Engineering”, Springer, First Edition, 2013.
3. Daniel A. Vallero, Chris Brasier, “Sustainable Design: The Science of Sustainability and Green Engineering”, Wiley, First Edition, 2008.

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Open Elective - III

3D PRINTING TECHNOLOGIES

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To present the various 3D printing technologies for manufacturing.

Course Outcomes

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

- explain the fundamental principles of Rapid prototyping.
- explain the RP processes and analyze their process parameters.
- select appropriate 3D printing technique for a given application.

Course Content

UNIT - I:

Introduction: Brief description on design process**,** Prototyping fundamentals, fundamentals of rapid prototyping, advantages and limitations of rapid prototyping, commonly used terms, classification of RP process.

Rapid Prototyping Data Formats: STL Format, STL File Problems, consequence of building valid and invalid tessellated models, STL file repairs: generic solutions, other translators, newly proposed formats- AMF Files Format.

UNIT - II:

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, advantages and disadvantages, case studies.

Solid Ground Curing (SGC): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT - III:

Solid-Based Rapid Prototyping Systems: Laminated object manufacturing (LOM) – models and specifications, process, working principle, applications, advantages and disadvantages, case studies. Fused deposition modeling (FDM) – models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT - IV:

Powder Based Rapid Prototyping Systems: Selective laser sintering (SLS): models and specifications, process, working principle, applications, advantages

and disadvantages, case studies. three dimensional printing (3DP): models and specifications, process, working principle, applications, advantages and disadvantages, case studies.

UNIT - V:

RP Applications: Application in engineering, analysis and planning, aerospace industry, automotive industry, jewelry industry, coin industry, arts and architecture. RP medical and bioengineering applications: planning and simulation of complex surgery, customized implants & prosthesis.

Text Books

1. Ian Gibson, et.al., "Additive Manufacturing Technologies – 3D Printing, Rapid Prototyping and Direct Digital Manufacturing", Springer Publications, 2nd Edition, 2015.
2. Chua C.K., Leong K.F. and LIM C.S, "Rapid prototyping: Principles and Applications", World Scientific publications, 2010.

Reference Books

1. D.T. Pham and S.S. Dimov, "Rapid Manufacturing – The Technologies and Applications of Rapid Prototyping and Rapid Tooling", Springer Publications, 2001.
2. Andreas Gebhardt, Jan – Steffen Hotter, "Additive Manufacturing – 3D Printing for Prototyping and Manufacturing", Hanser Publishers, Munich, 2016.
3. Zimmers&P.Groover, "CAD/CAM", Pearson Education, 1st Edition, 2003.

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Open Elective - III

ASSISTIVE TECHNOLOGIES

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To introduce different assistive technology devices.
- To familiarize with the concepts of enhancing speech communication and Independent Living.

Course Outcomes

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

- identify the adaptation framework connected with assistive technologies.
- demonstrate various types of assessments for assistive technologies.
- explore the processes to enhance speech communication.
- describe the process to enhance mobility and information access.
- analyze the technology aspects needed for independent living.

Course Content

UNIT - I: Introduction to Assistive Technology and Adaptation Framework

Definition and historical overview of assistive technology, multidisciplinary nature of service provision, introduction to adaptations framework, selecting specific characteristics, evaluation of effectiveness of adaptations.

UNIT - II: Assistive Technology Assessments

Overview of assessment issues, overview of general assessments, assistive technology assessments, assessment components.

UNIT - III: Enhance Speech Communication

Nature of spoken language, introduction to augmentative and alternative communication systems, selection techniques for aided communication systems, overview of non-electronic systems and electronic devices.

UNIT - IV: Mobility and Access to Information

Introduction to mobility adaptations, basic design considerations, seating and positioning issues, introduction to information access, computer access, telecommunication, listening and print access.

UNIT - V: Enhance Independent Living

Introduction to independent living, devices for daily life, switches and scanning, environmental control units, access to management devices.

Text Books

1. Diane P edrotty Bryant, Brian R. Bryant, Allyn, Bacon, “Assistive Technology for People with Disabilities”, 2nd Edition, Psycho Educational Services.

Reference Books

1. Marion A. Herash, Michael A. Johnson, “Assistive Technology for the Hearing Impaired, Deaf and Deafblind”, Springer Publications, 2003.
2. Meeko Mitsuko K. Oishi, Ian M. Mitchell, H.F. MachielVanderloss, “Design and use of Assistive Technology”, Springer Publications, 2010.
3. Eckehard Fozzy Moritz, “Assistive Technologies for the Interaction of the Elderly”, Springer Publications, 2014.

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Open Elective - III

INTRODUCTION TO BIO-MEDICAL ENGINEERING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the basics of biological concepts and relate it to engineering.
- To familiarize with physiology of cardio-vascular system, respiratory system and the elements of Patient Care Monitoring.
- To impart the knowledge on the diagnostic techniques and shocking hazards.

Course Outcomes

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

- demonstrate the novel theory related to human body and various components in cardio vascular system.
- relate the concept of electrode theory and transduction principles to bio-medical instrumentation.
- analyze the operation of measuring the cardio-vascular and respiratory systems by knowing its inner organization.
- outline the patient care monitoring.
- apply the fundamental principles & techniques of diagnosis and demonstrate shocking hazards related to biomedical instrumentation.

Course Content

UNIT - I: Introduction to Bio-Medical Instrumentation and Electro-Cardiography

Man instrumentation system-introduction & components, physiological system of the body, sources of bio-electric potentials, resting & action potentials,The heart & cardiovascular system, Electro-Cardiography, Electro-Cardiogram(ECG),Electro-Encephalogram(EEG).

UNIT - II: Electrodes& Transducers

Bio-potential electrodes, basic transducers-transduction principles, biochemical transducers, active & passive transducers, transducers of bio-medical applications.

UNIT - III: Measurements of Cardio-Vascular & Respiratory Systems

Blood pressure measurement, pulse sensors, the physiology of the respiratory system, tests & instrumentation for the mechanics of breathing, respiration sensors, respiratory therapy equipment.

UNIT - IV: Patient Care & Monitoring

Elements of intensive care monitoring, patient monitoring displays, diagnosis,organization of the hospital for patient care monitoring, pace-makers, defibrillators.

UNIT - V: Diagnostic Techniques &Shocking Hazards

Principles of ultrasonic measurement, Ultrasonic Imaging, Ultrasonic Diagnosis, X-Ray &CT Scan, MRI,shock hazards & prevention, physiological effects & electrical equipment, methods of accident prevention

Text Books

1. Onkar N. Pandey, Rakeshkumar, "Bio-Medical Electronics and Instrumentation", S. K. Kataria& Sons, 2007.
2. Cromewell, Wiebell, P.feiffer, "Biomedical instrumentation and measurements",Prentice-Hall, 1973.

Reference Books

1. Joseph J.Carr, John M.Brown, "Introduction to Bio-Medical EquipmentTechnology", 4th Edition, Pearson Publications.
2. Khandapur, "Handbook of Bio-Medical Instrumentation", 2nd Edition, Tata McGrawHill.

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Open Elective - III

DEVOPS

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize with precise knowledge of tools to architect effective pipelines by selecting tools suitable for specific scenarios.

Course Outcomes

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

- explain fundamentals and advance concepts of Agile and DevOps.
- describe Usage of multiple tools for unit functions in a DevOps pipeline.
- illustrate various types of version control systems, continuous integration tools.
- elaborate on various tools to orchestrate, deployment, infrastructure management.
- outline Devops and Cloud work together.

Course Content

UNIT - I: The World without DevOps and Agile Methodology and DevOps

Introduction- Problem Case Definition, Benefits of fixing Application Development Challenges, DevOps Adoption Approach through Assessment.

Agile Methodology and DevOps - Before Agile-Waterfall, Agile Development, What is DevOps, DevOps Importance and Benefits, Devops Principles and Practices, 7 C's of DevOps Lifecycle for Business Agility, DevOps and Continuous Testing.

UNIT - II: Tool Suits

Introduction, Atlassian Tools - Key Features, where can Atlassian be Best Utilized, Pros and cons of Atlassian, Phabricator - Key Features, where can Phabricator be Best Utilized, Pros and cons of Phabricator.

UNIT - III: Orchestration

Introduction, Jenkins- Features, Example of Reference Architecture. Ansible - Key Features, Pros and Cons, Example of Reference Architecture, Bamboo- Key Features, Pros and Cons, Example of Reference Architecture.

UNIT - IV: Application Lifecycle Management and Deployment and Infrastructure Management

Introduction, JIRA - Key Features, Pros and Cons, Example of Reference Architecture, Chef - Key Features, Pros and Cons, Example of Reference Architecture.

UNIT - V: DevOps with Cloud

Introduction, DevOps and Cloud Adoption- Benefits of using DevOps along with Cloud, Few best practices for DevOps in the Cloud. AWS- Reasons for selecting AWS for DevOps. Features of AWS, AWS tools and services for Orchestrating DevOps Capability, Pros and Cons.

Text Books

1. Deepak Gaikwad, Viral Thakkar, DevOps Tools, from Practitioner's viewpoint, 1st edition, Wiley.
2. Jez Humble and David Farley, Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, 1st edition, 2010.

Reference Books

1. Jenkins and Kubernetes, Pierluigi Rit, Pro DevOps with Google Cloud Platform With Docker, Apress.

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Open Elective - III

OBJECT ORIENTED ANALYSIS AND DESIGN

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To get familiar with the Object Oriented Analysis and Design in software development, develop UML structural and behavioral models of an application.
- To describe and choose an appropriate Design Pattern to refine the model.

Course Outcomes

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

- apply the object oriented analysis and designs in software development and familiar with the UML concepts.
- develop static conceptual models of the system.
- create dynamic behavioral models of the system to meet user needs.
- design object oriented architecture models.

Course Content

UNIT - I: Introduction to UML

Importance of modeling, principles of modeling, object oriented modeling, Conceptual model of the UML, Architecture of UML.

UNIT - II: Structural Modelling

Structural Modeling:Classes, Relationships: Dependency, Generalization, Realization and Association- advanced features of association, Class diagrams, Interfaces and Packages, Object Diagrams.

UNIT - III: Behavioral Modelling

Behavioral Modeling: Use case, Use case Diagrams, Interactions, Interaction Diagrams- Sequence diagram, Collaboration diagrams.

UNIT - IV: Advanced Behavioral Modelling

Activity diagrams, Common modeling techniques of Activity diagram.

Advanced Behavioral Modeling: Events and signals, state machines, state chart diagrams.

UNIT - V: Architectural Modelling

Architectural Modeling: Components, Component diagrams, Deployment, Deployment diagrams.

Text Books

1. "The Unified Modeling Language User Guide", Booch, James Rumbaugh, Ivar Jacobson, Pearson Education 13th Edition,2004.
2. "Fundamentals of Object Oriented Design in UML", Meilir Page-Jones, Pearson Education.

Reference Books

1. "Object Oriented Analysis and Design with Applications", Grady Booch, Pearson Education Asia, 2nd Edition.
2. "Object-Oriented Systems Ananlysis And Design Using UML", Simon Bennett, Steve McRobb and Ray Farmer , TATA McGrawHill, 2nd Edition.

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Open Elective - III

SCRIPTING LANGUAGES

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To familiarize with JQuery, JSON, PERL, Ruby, AJAX to develop client-side and server-side web applications.

Course Outcomes

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

- make use of jQuery with DOM to manipulate HTML elements, attributes and CSS.
- develop script to exchange data between server and browser using JSON.
- develop PERL scripts using arrays, hashes, control structures and subroutines.
- create Ruby scripts using data types, arrays, hashes, control structures and classes.
- develop script to retrieve data from a database using PHP and AJAX.

Course Content

UNIT - I: jQuery

Introduction, Selectors, Events, Effects, Manipulating HTML and CSS using jQuery.

UNIT - II: JSON

Introduction, Syntax rules, JSON vs XML, Data types, Objects, Arrays, Parsing JSON and using stringify() function.

UNIT - III: PERL

Basic Syntax, Perl Language Elements: Variables, Operators, Control Flow Statements, Arrays, Hashes, Subroutines, Packages and Modules, File Handling and Operations on Files, Retrieving Documents from the Web using Perl LWP.

UNIT - IV: Ruby

Introduction to Ruby, Variables, types, simple I/O, Control, Arrays, Hashes, Methods, classes, Iterators.

UNIT - V: AJAX A New Approach

Introduction, Creating XMLHttp Request object, Integrating AJAX with PHP, Retrieving data from a database using PHP and AJAX, Handling XML data using PHP and AJAX.

Text Books

1. Kogent , HTML 5 Black Book, 2nd Edition, Dreamtech Press
2. Dave Thomas, Programming Ruby 1.9 & 2.0: The Pragmatic Programmers' Guide, 4th Edition, Pragmatic Bookshelf.

Reference Books

1. Randal L. Schwartz Brian D. Foy, Tom Phoenix, Learning Perl, 6th edition, O'REILLY Publications.

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Open Elective - III

FUNDAMENTALS OF SOFTWARE PROJECT MANAGEMENT

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To plan and manage projects at each stage of software development life cycle (SDLC).
- To develop effective software projects that support organization's strategic goals.

Course Outcomes

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

- interpret various necessary rudiments of software project management.
- apply improvement strategies to see the inline growth in economic concerns of the project.
- develop project plans that address real time management challenges.
- design efficient work break down structures that meet real time deadlines of a project.
- use software metrics to measure the quality of software projects and to gain insights of management issues related to the project.

Course Content

UNIT - I: Introduction to Software Project Management

Introduction, project definition, software project vs other types of project, activities covered by software project management, ways to categorize software projects, project as a system, management definition, problems with software projects , management control, stakeholders, requirement specification.

UNIT - II: 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

UNIT - III: The Old Way and The New

The Old Way and The New: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Life Cycle Phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT - IV: Checkpoints of the Process

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 - V: Project Organizations and Responsibilities

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.

Project Control and Process Instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations.

Text Books

1. Bob Hughes , Software Project Management, 4th edition, Mike Cotterell, TMH.
2. Walker Royce, Software Project Management, Pearson Education, 2005.

Reference Books

1. Joel Henry , Software Project Management, Pearson Education.
2. Pankaj Jalote , Software Project Management in practice, Pearson Education, 2005.

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Open Elective - III

WEB MINING

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To impart machine learning techniques to mine the web and other information networks like social networks and social media.
- To introduce search, retrieval, classification and recommendation methods.

Course Outcomes

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

- describe classic and recent developments in information retrieval, web search and web mining.
- apply Page Rank and HITS algorithm for social network data analysis.
- differentiate Universal, Focused and Topical crawlers in internet.
- analyze complex information and social networks using Information Integration techniques.
- discover sentiment from social media data using opinion mining and web usage mining.

Course Content

UNIT - I: Information Retrieval and Web Search

Basic concepts of information retrieval, IR models, text and web page preprocessing, inverted index and its compression, web search, meta-search.

UNIT - II: Link Analysis

Social network analysis, page rank algorithm, HITS algorithm, community discovery.

UNIT - III: Web Crawling

Crawler algorithm, implementation issues, universal crawlers, focused crawlers, topical crawlers.

UNIT - IV: Information Integration

Schema matching, pre-processing, schema level match, domain and instance level match, 1: m match, integration of web query interfaces.

UNIT - V: Opining and Web Usage Mining

Opining Mining - Sentiment classification, feature based opinion mining, comparative sentence and relation mining, opinion search.

Web Usage Mining - Data collection, data modelling for web usage mining, discovery and analysis.

Text Books

1. Bing Liu, “Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data”, Springer Science & Business Media.
2. Charu C. Aggarwal, “Social Network Data Analytics”, Springer Science & Business Media.

Reference Books

1. GuandongXu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer Science & Business Media.

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Open Elective - III

AI CHATBOTS

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To learn how artificial intelligence powers chatbots, get an overview of the bot ecosystem and bot anatomy, and study different types of bots and use cases.
- To identify best practices for defining a chatbot use case and use a rapid prototyping framework to develop a use case for a personalized chatbot.

Course Outcomes

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

- develop an in-depth understanding of conversation design, including onboarding, flows, utterances, entities, and personality.
- design, build, test, and iterate a fully-functional, interactive chatbot using acommercial platform.
- deploy the finished chatbot for public use and interaction.

Course Content

UNIT - I: 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: 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: 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: 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: Introduction to Microsoft Bot, RASA, and GoogleDialogflow

Microsoft Bot Framework, Introduction to QnA Maker, Introduction to LUIS, Introduction to RASA, RASA Core, RASA NLU, Introduction to Dialogflow.

Chatbot Integration Mechanism: Integration with Third-Party APIs, Connecting to an Enterprise Data Store, Integration Module.

Text Books

1. Abhishek Singh, Karthik Ramasubramanian, ShreyShivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data Using Open Source Frameworks",ISBN 978-1-4842-5034-1, Apress,2019.

Reference Books

1. Janarthanam and Srini, Hands-on chatbots and conversational UI development: Build chatbots and voice user interfaces with C (1 ed.), Packt Publishing Ltd, 2017. ISBN 978-1788294669.
2. Galitsky, Boris., Developing Enterprise Chatbots (1 ed.), Springer International Publishing, 2019. ISBN 978-303004298
3. Kelly III, John E. and Steve Hamm, Smart machines: IBM's Watson and the era of cognitive computing (1 ed.), Columbia University Press, 2013. ISBN 978- 0231168564.
4. Abhishek Singh, Karthik Ramasubramanian and ShreyShivam, Building an Enterprise Chatbot (1 ed.), Springer, 2019. ISBN 978-1484250334.

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Open Elective - III

TRENDS IN IoT

III Year – II Semester

Lecture : 3	Internal Marks : 30
Credits : 3	External Marks : 70

Course Objectives

- To introduce the advanced concepts in IoT
- To familiarize the digital transformation in various fields with the advent of IoT

Course Outcomes

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

- demonstrate the advantages of edge computing.
- describe the concepts of various technologies in IoT.
- analyze the digital transformation in IoT and future marketing.
- summarize the trust issues in IoT.

Course Content

UNIT - I: Edge Computing

Introduction, Edge Computing Architecture, Background Essentials: IoT Devices, Networking Architecture, Network Management and Control.

UNIT - II: IoT Ecosystems and Technologies

Introduction, support for IoT Ecosystem creation, spurring innovation in lead markets, outlook IoT vision, IoT strategic Research and Innovation Directions, IoT smart environments and applications, IoT and related future technologies.

UNIT - III: IoT and Digital Transformation

IoT Standardization, IoT security, IoT enabling the Digital Transformation of Industry, Case study - Farming Food and IoT: where we are going and challenges.

UNIT - IV: IoT in Future Marketing

Introduction, EU Initiatives and IoT Platforms for Digital Manufacturing, Digital Factory Automation, IoT Applications for Manufacturing.

UNIT - V: Trust in IoT

The need for evaluating trust in IoT, Trust management in IoT, Trust for devices, Trust for IoT services, consent and trust in personal data sharing, using trust in authorization

Text Books

1. Edge computing: Fundamentals, Advances and Applications, K.Anitha Kumari, G.Sudha Sada sivam, D.Dharani, M.Niranjamurthy, CRC Press,Taylor Francis Group,2022
2. Digitising the Industry Internet of Things Connecting the Physical, Digital and Virtual Worlds, Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publisher series.

Reference Books

1. Alasdair Gilchrist, “Industry 4.0: The Industrial Internet of Things”,Apress 2016.
2. Vijay Madisetti, Arshdeep Bahga,” Internet of Things A Hands-On- Approach”, 2014.

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Open Elective - III

ACADEMIC COMMUNICATION

III Year – II Semester

Lecture	: 3	Internal Marks	: 30
Credits	: 3	External Marks	: 70

Course Objectives

- To acquaint the students with the process and elements of academic writing.
- To help them gain accuracy in the academic writing tasks they will be called upon to perform as part of their graduate and postgraduate studies.
- To empower them to carry out academic writing tasks such as project report writing with success.

Learning Outcomes

Upon successful completion of the course, the student will be able to produce successful academic writing tasks (such as designing and reporting a survey/project, writing discussion essays, and composing formal letters) with attention to:

- the writing process involving a good understanding of the purpose and the register as well as organizational strategies such as introduction, main body, conclusion, paragraphing;
- the elements of academic writing such as argument, cause and effect, cohesion and coherence, generalizations, references, style, and visual information; and
- the kind of accuracy, technical as well as grammatical, that writing in academic contexts demands

Course Content

I. The Writing Process

a. Background to writing

i. The purpose of academic writing
ii. Common types of academic writing
iii. The features of academic writing
iv. Writing in paragraphs

b. From understanding to planning

i. The planning process
ii. Analyzing essay titles
iii. Brainstorming

c. Organizing paragraphs

i. Paragraph structure
ii. Development of ideas
iii. Linking paragraphs together

d. Introductions and conclusions

i. Introduction contents ii. Introduction structure

iii. Opening sentences iv. Conclusions

e. Re-writing and proof-reading

i. Re-writing ii. Proof-reading

II. Elements of Writing

a. Cohesion

i. Reference words ii. Preventing confusion

b. Comparisons

i. Comparison structures ii. Forms of comparison

iii. Using superlatives

c. Style

i. Components of academic style ii. Guidelines

d. Visual information

i. The language of change ii. Types of visuals

iii. Describing visuals iv. Labelling

III. Accuracy in Writing

a. Academic vocabulary b. Remedial grammar

c. Punctuation

IV. Writing Models

a. Formal/Professional emails b. CVs

c. Reports d. Scholarly essays

Suggesting Reading

1. Bailey, Stephen. (2011). *Academic Writing A Handbook for International Students*. Routledge: London.

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