RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

AUTONOMOUS

Affiliated to JNTUA-Ananthapuramu, Approved by AICTE-New Delhi,
Accredited by NBA-New Delhi, Accredited by NAAC with A+ Grade-New Delhi
Nandyal – 518501, AP, India

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING
(DATA SCIENCE)

Regulations, Course Structure and Detailed Syllabus

RGM-R-2020

(ESTD-1995)

Applicable for students admitted into
B.Tech (Regular) from 2020-2021
B.Tech (Lateral Entry Scheme) from 2021-22

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

ACADEMIC REGULATIONS, COURSE STRUCTURE AND DETAILED SYLLABI
B.Tech. (Regular) from 2020-21 and B.Tech. (Lateral Entry Scheme) from 2021-22

For pursuing four year Bachelor Degree Program (under graduate) of study in Engineering (B.Tech.), Two-year Master (post graduate) Degree of study in Engineering (M.Tech), Two year Master (post graduate) degree of study in Business Administration (MBA), Two year Master (post graduate) Degree of study in Computer Applications (MCA) offered by Rajeev Gandhi Memorial College of Engineering and Technology, Nandyal - 518501 under Autonomous status and herein referred to as RGMCET (Autonomous).

All the rules specified herein approved by the Academic Council will be in force and applicable to students admitted from the Academic Year 2020-21 onwards. Any reference to "Institute" or "College" in these rules and regulations shall stand for Rajeev Gandhi Memorial College of Engineering and Technology (Autonomous).

All the rules and regulations, specified hereafter shall be read as a whole for the purpose of interpretation. As and when a doubt arises, the interpretation of the Chairman, Academic Council is final. As per the requirements of statutory bodies, the Principal, Rajeev Gandhi Memorial College of Engineering and Technology shall be the Chairman, Academic Council.

The candidate seeking admission into the first year of study of four year B.Tech degree Program should have:

i) Passed either Intermediate Public Examination (IPE) conducted by the Board of Intermediate Education, Andhra Pradesh with Mathematics, Physics and Chemistry as optional subjects (or any equivalent examination certified by Board of Intermediate Education) or a Diploma in Engineering in the relevant branch conducted by the Board of Technical Education, Andhra Pradesh (or any equivalent examination certified by State Board of Technical Education) for admission.

ii) Secured a rank in the EAMCET/EAPCET

iii) examination conducted by AP State Council for Higher Education (APSCHE) for allotment of a seat by the Convener, EAMCET/EAPCET, for admission.

Admission Procedure:

As per the norms of A.P. State Council of Higher Education (APSCHE), Government of Andhra Pradesh, admissions are made to the first year of Four year B.Tech. Degree program as follows:

a) As per the norms of Government of Andhra Pradesh, A-Category (based on the rank obtained in EAMCET/EAPCET) seats will be filled by the Convener, EAMCET/EAPCET.

b) As per the norms of Government of Andhra Pradesh, B-Category seats will be filled by the management.

Admission to the Second year of Four year B.Tech. Degree Program in Engineering:

i) Candidates qualified in ECET and admitted by the Convener, ECET, in such cases for admission, when needed permission from the statutory bodies is to be obtained.

ii) 10% of the sanctioned strength in each program of study (of RGMCET) shall be filled by the Convener, ECET as lateral entry.

List of Programs offered

1. B.Tech – Regular & Lateral Entry
2. M.Tech – Regular
3. MBA – Regular
4. MCA – Regular

Academic Regulations for 2020-21 B. Tech. (Regular)

(Effective for the students admitted into the I year from the Academic Year 2020-2021)
The B.Tech. Degree be conferred by the Jawaharlal Nehru Technological University Anantapur, Anantapuramu, students who are admitted to the program and fulfill all the requirements for the award of the Degree as specified below:

1.0 Award of B.Tech. Degree

1.1. The student will be declared eligible for the award of the B. Tech. degree if he fulfils the following academic regulations:

1.2. Pursued a course of study for not less than prescribed course work duration and not more than double the prescribed course work duration.

1.3. Registered for 160 credits and secured 160 credits with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

S.No	Subject Particulars		
1	All the subjects offered in B.Tech course / MOOCs	7	Technical Seminar
2	**Mandatory Learning Courses** [Environmental Science, Environmental Engineering, Universal Human Values, Indian Heritage and Culture, Constitution of India, Induction Program, Essence of Indian Traditional Knowledge]	8	2 Months Internships - Two
3	All Practical Subjects	9	6 Month Internship
4	All Skill Oriented Courses /Skill Advanced Courses/ Soft Skill Courses	10	Main Project Work
5	Comprehensive Viva	11	Universal Human Values as 03 credits course with effective from 2021 admitted students.
6	Environmental Sciences/ Universal Human Values/ Environmental Engineering/ Indian Heritage and Culture/ Constitution of India/ Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses.		

2.0 Forfeit of seat

Students, who fail to fulfill all the academic requirements for the award of the degree within **eight academic years** from the year of their admission, shall forfeit their seat in B.Tech. Course.

3.0 Courses of study

The following courses of study are offered at present as specializations for the B.Tech. Course: and any other course as approved by the authorities of the University from time to time.

1) **Civil Engineering**
2) **Electrical and Electronics Engineering**
3) **Mechanical Engineering**
4) **Electronics and Communication Engineering**
5) **Computer Science and Engineering**
6) **Computer Science and Engineering (Data Science)**
7) **Computer Science and Engineering and Business Systems**

Table 2: Credits

Subject	Semester			
	Periods/ Week	Credits	Internal Marks (IM)	External Marks (EM)
Theory	2+1*	3	30	70
Mandatory Learning Courses (Internal Evaluation)	2	-	-	-
Practical	3	1.5	25	50
Drawing	1+4 P	3	30	70
Skill Development Courses (Internal Evaluation)	1+2*	2**	30	70
Summer Internship /CSP Two months (Mandatory) after second year (to be evaluated along with 5th Semester end examinations)/ Community Service Project (Internal Evaluation)	-	1.5	-	100 Certificate from Internship Agency/ signed by any authorized person. Evaluation will be carried as per the guidelines of APSCHE
Industrial/Research Internship Two months (Mandatory) after third year (to be evaluated along with 7th Semester end examinations)	-	3	-	100 Certificate from Internship Agency Evaluation will be carried as per the guidelines of APSCHE ***40% for report, 60% Oral Presentation***
Comprehensive Viva (CV) in VII Semester	-	1	-	50
Major Project	-	6	50	100
Technical Seminar	-	1	50	-
6 Months Internship in Industry	-	5	-	Certificate from Internship Agency/ Industry

Note: * Tutorial

Note: ** [Skill Development Course/ Mandatory Learning Course credits will not be considered for the award of division. However, all these courses have to be cleared through internal evaluation by scoring minimum of 40% marks. The credits obtained in Skill development courses will be taken in to account for the award of degree]

Note: - EAA will not carry any credits but attendance requirements of 75% should be fulfilled otherwise they have to reregister to fulfill academic requirements.

4.0 Distribution and Weightage of Marks

4.1. The performance of the student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 75 marks for practical subject. Comprehensive Viva-Voce (CV) shall be evaluated for 50 marks each and the project work shall be evaluated for 100 marks.

4.2. For theory subjects, the distribution shall be 30 marks for Internal Evaluation (20 marks for internal test and 10 marks for assignment or field work/group task / online test) and 70 marks for the End-Examination.

4.3. During the semester there shall be 2 tests for theory subjects. In each Internal test there shall be one compulsory (short answers) question and 3 descriptive questions are to be answered. The duration of internal test will be for 2 hours. First test to be conducted in 3 units and second test to be conducted in the remaining 3 units of each subject. For awarding of 20 Internal marks the performance of the student in two Internal examinations conducted one in the middle of the semester and the other towards the end of the semester giving a weight age of 0.75 for the better score and 0.25 for the other score will be considered. There shall be two assignments (***only online submission of Assignments will be accepted***) in each subject (problem based/ field work/group task/Online test) for award of 10 marks so that internal Component (marks) will be 30 marks (20 marks for internal test+10 marks for assignments / field work/group task). ***Out of these two internal tests one internal test for 20 marks will be conducted in online mode.***

Table 3: Units for Internal Tests

Semester	
3 Units - First Internal test	3 Units - Second Internal test

4.4. In the case of Skill Development Courses/ Mandatory Learning courses, two Internal examinations shall be conducted one in the middle of the semester and the other at the end of the semester for 30 marks and the marks scored by the student in these exams with a weight age of 0.75 for better score and 0.25 for the other score will be awarded as Internal marks for 30. For the remaining 70 marks an end examination will be conducted along with other theory examinations. However, skill development courses/Value added courses/ Mandatory Learning Courses, end examination will be evaluated internally.

4.5. No makeup test for internal examination or assignments/group tasks will be conducted in any subject or practical. The student, who is absent for any test shall be deemed to have scored zero marks in that subject.

4.6. Open and Professional Electives will commence from 3rd year first semester onwards. The open elective offered in 3-1 semester will be based on self-study/MOOCs. All the students have to opt for the MOOCs (Self Study) and should acquire the required credits. If the student fails to opt for MOOCs, (Under unavoidable circumstances) he/she has to write two internal tests besides the end examination conducted by the institute (Elective offered in place of MOOCs by the Dept.) like other subjects. However, he/she has to obtain the certificate from the organization in which he has registered. Any MOOCs course selected by the student should be of more than 45 hours duration / 12 weeks course with a minimum of 3 credits and also from the reputed organization. Attendance of the student who has opted for MOOCs will be taken from the remaining subjects and labs only in that semester while finalizing the attendance for fulfilling the minimum requirements of attendance for promotion to the next semester. Attendance will not be recorded for MOOCs.

{Massive open online Courses (MOOCs') B.Tech students can avail the facility of earning up to a maximum of 5% credits of their degree requirements through MOOCs. MOOC courses eligible for this purpose are the courses offered by NPTEL / SWAYAM / EDX / Course by any other reputed organisation approved by the department only. The student shall obtain prior approval of the Head of the Department before registering for MOOC's. MOOC courses can be taken in lieu of Elective courses such as Open Electives & Professional Electives (pertaining to their branch only) and Employability Enhancement Courses. No Core, Lab or Project Course can be dropped in lieu of MOOC. The student shall submit course Title, institute which offered MOOC, Examination system and Credits of the Course, duration of course. After deciding on the MOOC and a course which is approved as its equivalent in the curriculum a student can enrol for it and clear it any time as per his/her convenience and obtain the assessment certificate.

If the assessment certificate is submitted

i) Before the commencement of the semester in which the equivalent course is offered, the student will be exempted from attending the regular class work and internal assessment exams of the equivalent subject.

ii) During the semester the student is permitted to withdraw from the remaining part of the course work and internal assessment tests.

iii) After the semester is over but before the results of that semester are declared the student can request for considering his performance in the MOOC in lieu of its equivalent.

The student shall submit to the HOD the original certificate issued by MOOC authorities along with a photocopy of the same. The original will be returned after

verification and verification shall be certified by the Head of the Department on the photocopy which shall be kept in records. An equivalent Grade corresponding to grade/marks awarded by MOOC agency shall be determined by a committee consisting of Principal, Controller of Examinations, Dean Student affairs and HOD concerned. This equivalent Grade shall be shown in the grade sheet and accounted in the SGPA and CGPA calculations.

4.7. Gap Year – Concept of student Entrepreneur in Residence shall be introduced and the outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after I/II/III year to pursue full time entrepreneurship. This period may be extended for another one year (two years in total) and this period would not be counted for the maximum duration for completion of graduation. An evaluation committee shall be constituted to evaluate the proposal submitted by the student and committee shall decide on permitting the student for having the Gap Year. The committee consists of Principal as Chairman and all HODs as members.

4.8. In the open electives offered from III year I Sem onwards student has to select the subjects among the list of open elective subjects by the other departments (inter - department). Student has to clear the subject as per norms to get the required credits. At least minimum of 40 students should register for any open elective; otherwise, that open elective will not be offered.

4.9. Out of the professional electives offered from III Year I Semester onwards again one Professional elective in IV Year I Sem will be a MOOCs (Self Study) and the student has to acquire the required credits to clear the subject as specified in 4.6.

4.10. There shall be mandatory student induction program for freshers, with a three-week duration before the commencement of first semester. Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept. / Branch & Innovations etc., shall be included in the guidelines issued by AICTE.

4.11. All undergraduate students shall register for Extra - Academic Activity (EAA) such as

a) NCC/NSS

b) Games and Sports

c) Yoga/Meditation

d) Extension Activities

e) Literary/ Cultural Activities

f) Any other which may be offered in future.

A student will be required to participate in an activity for two hours in a week during second and third semesters. The activities shall be carried out in the allotted hours. The activities will be monitored by the respective faculty in charge, senior faculty

member of the department and the Department HOD. Grades will be awarded on the basis of participation, attendance, performance and behaviour. Grades shall be entered in the marks statement as **Good**, **Satisfactory** and **Unsatisfactory** and shall not be counted towards CGPA calculation. If any student gets an Unsatisfactory Grade, he / she has to repeat the activity in the immediate subsequent Semester / year.

4.12. Courses like Environmental Sciences, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge etc., shall be included in the curriculum as non-credit mandatory courses. Environmental Sciences is to be offered compulsorily as mandatory course for all branches. A student has to secure 40% of the marks allotted in the internal evaluation for passing the course. No marks or letter grade shall be allotted for all mandatory non-credit courses. **Universal Human Values course** shall be included in the curriculum as credit course in place of any open elective as per the convenience of department.

4.13. Students shall undergo **two mandatory summer internships for a minimum of two months** duration at the end of **second and third** year of the Programme. There shall also be **mandatory 6 months internship** in the **final semester** of the Programme along with the project work and seminar.

4.14. **Curricular Framework for Skill oriented**

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

ii) Out of the five skill courses two shall be skill-oriented courses from the same domain and shall be completed in second year. Of the remaining 3 skill courses, one shall be necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

iii) A pool of interdisciplinary job-oriented skill courses shall be designed by a common Board of studies by the participating departments/disciplines and the syllabus along with the pre requisites shall be prepared for each of the laboratory infrastructure requirements. The list of such courses shall be included in the curriculum structure of each branch of Engineering, so as to enable the student to choose from the list.

iv) The student shall be given an option to choose either the skill courses being offered by the college or to choose a certificate course being offered by industries/ Professional bodies /APSSDC or any other accredited bodies as approved by the concerned BoS.

v) The Board of studies of the concerned discipline of Engineering shall review the skill advanced courses being offered by eligible external agencies and

prepare a fresh list every year incorporating latest courses based on industrial demand.

vi) If a student chooses to take a Certificate Course offered by industries/ Professional bodies/ APSSDC or any other accredited bodies, in lieu of the skill advanced course offered by the Department, the credits shall be awarded to the student upon producing the Course Completion Certificate from the agency/professional bodies as approved by the Board of studies.

vii) If a student prefers to take a certificate course offered by external agency, the department shall mark attendance of the student for the remaining courses in that semester excluding the skill course in all the calculations of mandatory attendance requirements upon producing a valid certificate as approved by the concerned Board of Studies, the student is deemed to have fulfilled the attendance requirement of the course and acquire the credits assigned to the course.

viii) A committee shall be formed at the level of the college to evaluate the grades/marks given for a course by external agencies and convert to the equivalent marks/grades. The recommended conversions and appropriate grades/marks are to be approved by the University/Academic Council.

4.15. **Curricular Framework for Honours Programme**

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

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

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

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

v) Of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4

credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12 weeks as recommended by the Board of studies.

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

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

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

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

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

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

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

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

4.16. **Curricular Framework for Minor Programme:**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

INDUSTRIAL COLLABORATIONS (CASE STUDY)

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

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

4.17. All the students have to undergo three mandatory internships namely

i) Summer internship (During 2nd year break)

ii) Industrial/ Research internship (During 3rd year break)

iii) 6 Months internship in industry (During 8th Semester)

The student has to (mandatory) undergo summer internship in II year–II Sem break in a reputed organization for two months. The finalization of the internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the summer internship will be evaluated during the 5th semester which carries 1.5 credits. The student has to undergo research/ industry internship in III year –II Semester break for a period of two months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. The student has to undergo 6 months internship in IV Year, II Semester for a complete period of 6 months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the principal for approval. The outcome of the research/industry internship will be evaluated during 7th semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HOD and Internship in charge to the academic section before the commencement of 3-2 semester.

4.18. The medium of instruction for all Course work, Examination, Seminar Presentations, Project Reports and all academic activities shall be English.

5.0 Question Paper Pattern

5.1. Each Internal Test question paper shall contain 5 questions, of which the First question is compulsory and three questions are to be answered from the remaining four. Compulsory question carries 5 marks (It contains 5 questions of one marks - no choice in first question). The remaining 3 questions carry 5 marks each. Each question shall have a,b,c.... parts.

5.2. The End Examination question paper will have 7 questions and students have to answer 5 questions. However, the first question is compulsory and it consists of 7 short answer questions, each carrying 2 marks. The next 4 questions are to be answered from the remaining 6 questions and each carries 14 marks. Each 14 marks question shall have a, b, c .. parts. Evaluation of answer scripts shall be done by either Internal or External examiners appointed by the principal. A minimum of 50% of subjects will be evaluated by external examiners.

5.3. For practical subjects, there shall be a continuous evaluation during the semester for 25 internal marks and End Examination carries 50 marks. Of the 25 marks for Internal, 15 marks shall be awarded for day-to-day work, 5 marks to be awarded by conducting an internal laboratory test and 05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc. The End Examination shall be conducted by the teacher concerned and an external Examiner from other institutions.

5.4. For the subject having design and/or drawing, (such as Engineering Graphics, Machine Drawing etc.) and estimation, the distribution shall be 30 marks for Internal evaluation (15marks for day-to-day work and 5 marks for Internal tests and 10 marks for assignments) and 70 marks for End Examination. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

5.5. The Engineering drawing, wherever offered is to be treated as a theory subject. Evaluation method adopted for theory subjects shall be followed here as well.

5.6. There shall be comprehensive Viva-Voce examination at the end of 7^{th} semester. Comprehensive Viva Examination shall be conducted by the committee consisting of senior faculty (based on the recommendation of HOD), an external Examiner from other institutions and HOD and evaluated for 50 marks.

5.7. The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV Year, II-Semester. The external project viva voce

examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of one technical seminar (25 marks) and remaining 25 for main project related activities. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.

5.8. For all practical /main project/CV etc. the HOD of the concerned dept. shall submit a panel of 4 external examiners from different institutes and one will be selected by the Chief Superintendent of the Examination for conducting of end examination.

5.9. **Revaluation of End Examination Scripts**: Revaluation of End Examination scripts is allowed for theory subjects only by paying requisite fee. Procedure for Revaluation: The script will be revaluated by an examiner appointed by the principal. The maximum of revaluation and regular end examination grade will be awarded for that subject. Student can apply for revaluation in a subject only once.

Table 4: Distribution of weightages for examination and evaluation

<table>
<tr><th>S.No</th><th>Nature of subject</th><th>Marks</th><th colspan="2">Type of examination and mode of assessment</th><th>Scheme of Examination</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Theory</td><td>70</td><td colspan="2">End Examination. Both internal and external Evaluation (at least a minimum of 50% subjects will be sent for external evaluation)</td><td>End Examination in theory subjects will be for 70 marks.</td></tr>
<tr><td rowspan="2">30</td><td>20</td><td>Internal Examinations (Internal evaluation)</td><td>These 20 marks are awarded to the students based on the performance in two (per semester) Internal examinations with a weightage of 0.75 for better score and 0.25 for the other score.</td></tr>
<tr><td>10</td><td>Assignments/Field work/Group task/Online Test</td><td>Average of two assignments /Field work/group task in a semester each evaluated for 10 marks.</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">Practical</td><td>50</td><td colspan="2">End lab examination (External evaluation)</td><td>This End Examination in practical subjects will be for a maximum of 50 marks.</td></tr>
<tr><td rowspan="2">25</td><td>15</td><td>Internal evaluation</td><td>Day-to-day performance in lab experiments and record.</td></tr>
<tr><td>05</td><td>Internal evaluation</td><td>Internal lab examination at the end of year/semester.</td></tr>
</table>

			05	Internal evaluation	05 marks will be allotted for any creativity/ innovation/ additional learning in lab beyond prescribed set of experiments etc.
4	Comprehensive Viva (CV)	50	External evaluation		This end viva-voce examination in all the subjects for 50 marks
5	Project work	50	Internal evaluation		Project work for 50 marks
		100	External evaluation		This end viva-voce in project work for 100 marks
6	Skill Oriented Courses/ Skill Advanced Courses/ Soft Skill Courses	30	Internal evaluation		These 30 marks are awarded to the students based on the performance of two Internal examinations with a weight age of 0.75 for better score and 0.25 for the other score.
		70	Internal Evaluation		Based on the performance in the end examination.
7	Internship/ Internal Project/ Study Report/ Work shop	100	Internal evaluation		As per the Guidelines of APSCHE
8	Mandatory Learning Courses	-	-		No examinations. Attendance minimum is required.
9	EAA	-	Internal evaluation		Based on performance and committee report.
10	Technical Seminar	50	Internal Evaluation		Based on Seminar Report, performance and committee report.

6.0 Attendance Requirements:

6.1. The student shall be eligible to appear for End examinations of the semester if he acquires a minimum of 75% of attendance in aggregate of all the subjects of that semester.

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

6.3. The student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.

6.4. **Shortage of Attendance below 65% in aggregate shall in <u>NO</u> case be condoned.**

6.5. Students whose shortage of attendance is not condoned in any semester are not eligible to take their End Examination of that class and their registration shall stand cancelled.

6.6. The stipulated fee shall be payable towards Condonation of shortage of attendance to the college.

6.7. A student is eligible to write the University examinations if he acquires a minimum of 50% in each subject and 75% of attendance in aggregate of all the subjects after Condonation. In case of the student having less than 50% of attendance in any one of the courses (**One subject / lab only**) during that particular semester, he/she will not be permitted to register and appear for that particular course in that particular semester end examinations. In such cases, the students need to register for makeup classes which will be notified by the CoE office after the completion of that particular semester or at appropriate time whichever is applicable. The students need to secure **90%** of the attendance in the make-up classes to appear for the supplementary examinations thereafter and this will be treated as a second attempt. The number of makeup classes to be conducted will be at least 35% of the regular class work taken in that particular course. **If the attendance is less than 50% in more than one subject/lab he/she will be completely detained in that semester**.

7.0 Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item No.6.0.

7.1. The student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical or design or CV or drawing subject or Skill Development Courses or project if he secures not less than 35% of marks in the End Examination (If applicable)) and he has to score minimum of 40% marks from internal and external exam marks put together to clear the subject.

7.2. The student shall be promoted from II to III year only if he fulfils the academic requirement of securing a minimum of 50% (41 credits out of 82) credits from all the exams conducted up to and including II Year II-Semester regular examinations irrespective of whether the candidate takes the examination or not.

7.3. The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 50% (62.5 credits out of 125) credits from all the exams conducted up to and including III year II semester regular examinations, whether the candidate takes the examinations or not.

Table 5: Promotion rules

Promotion from	Total credits to register	Minimum credits to obtain for promotion
II year to III year	82	41
III year to IV year	125	62.5

7.4. The student shall register and put up minimum attendance in all 160 credits and earn 160 credits. Grades obtained in 160 credits shall be considered for the calculation of CGPA.

7.5. Students who fail to earn 160 credits as indicated in the course structure in Table-1 within eight academic years from the year of their admission shall forfeit their seat in B.Tech. Course and their admission shall stand cancelled.

8.0 Course pattern:

8.1. The entire course of study is of four academic years. Each academic year consists of two semesters

8.2. The student is eligible to appear for the End Examination in a subject, but absent at it or has failed in the End Examination may appear for that subject at the supplementary examination.

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Table: 6: Course pattern

Year	Sem	No. of Subjects		Number of Labs		Total credits	
		CSE/ CSE(DS) /CSE&BS/ EEE	ECE/ CE/ Mech.	CSE/ CSE(DS) / CSE&BS/ EEE	ECE/ CE/ Mech.		
First	I	1) BSC - LA&AC 2) BSC - AP 3) ESC - PSP 4) ESC - BEE/BEE/BEE/FED 5) ESC - ED	1) BSC - LA &DE/ LA&AC/ LA&AC 2) BSC - MEC/AC/AC 3) ESC - PSP 4) ESC - FEE/EM /ED 5) HSS - English	1) ESC Lab - E&ITW 2) BSC Lab – EP Lab 3) ESC Lab - PSP	1) HSS Lab - DEL Lab 2) BSC Lab - EC Lab 3) ESC Lab - PSP Lab	Subjects - 5X3 = 15 Labs - 3X1.5 = 4.5	19.5
	II	1) BSC - DE&VC 2) BSC - MEC 3) ESC - DS 4) ESC - MFCS/MFCS/MFCS/BEE 5) HSS - English 6) ML - ES	1) BSC - AC&TT/ DE&VC 2) BSC - AP/ EP/ EP 3) ESC - DS 4) ESC - NWA/ BEEE/ MS 5) ESC - ED/ ED/ BEM 6) ML - ES	1) HSS Lab - DEL Lab 2) BSC Lab - EC Lab 3) ESC Lab - DS Lab	1) ESC Lab - E&ITW 2) BSC Lab - EP Lab 3) ESC Lab - DS Lab	Subjects - 5X3 = 15 ML – No Credits Labs - 3X1.5 = 4.5	19.5
Second	I	1) BSC 2) PCC 3) PCC 4) PCC 5) PCC 6) SOC 7) ML	1) BSC 2) PCC 3) PCC 4) PCC 5) PCC 6) SOC 7) ML	1) PCC Lab 2) PCC Lab 3) PCC Lab	1) PCC Lab 2) PCC Lab 3) PCC Lab	Subjects - 5X3 = 15 SOC - 1x2 = 2 ML – No Credits Labs - 3X1.5 = 4.5 EAA - No Credits	21.5
	II	1) ESC 2) BSC/PCC 3) PCC 4) PCC 5) HSS 6) SOC	1) ESC 2) BSC/PCC 3) PCC 4) PCC 5) HSS 6) SOC	1) ESC/PCC - Interdisciplinary Lab 2) PCC Lab 3) PCC Lab	1) ESC/PCC – Interdisciplinary Lab 2) PCC Lab 3) PCC Lab	Subjects - 4X3 = 12 HSS – 1X3 =3 SOC - 1x2 = 2 ML – No Credits Labs - 3X1.5 = 4.5	21.5
Third	I	1) PCC 2) PCC 3) PCC 4) OEC/JOE 5) PEC 6) SAC/SSC 7) ML	1) PCC 2) PCC 3) PCC 4) OEC/JOE 5) PEC 6) SAC/SSC 7) ML	1) PCC Lab 2) PCC Lab 3) Summer Internship/CSP	1) PCC Lab 2) PCC Lab 3) Summer Internship/CSP	Subjects - 3X3 = 9 OEC/JOE - 1X3 = 3 PEC – 1X3 = 3 SAC/SSC - 1x2 = 2 ML – No Credits Labs - 2X1.5 = 3 Internship - 1X1.5=1.5	21.5
	II	1) PCC 2) PCC 3) PCC 4) PEC 5) OEC/JOE 6) SAC/SSC 7) ML	1) PCC 2) PCC 3) PCC 4) PEC 5) OEC/JOE 6) SAC/SSC 7) ML	1) PCC Lab 2) PCC Lab 3) PCC Lab	1) PCC Lab 2) PCC Lab 3) PCC Lab	Subjects - 3X3 = 9 PEC – 1X3 = 3 OEC/JOE - 1X3 = 3 SAC/SSC - 1x2 = 2 ML - No Credits Labs - 3x1.5 = 4.5	21.5
Fourth	I	1) PEC 2) PEC 3) PEC 4) OEC/JOE 5) OEC/JOE 6) SAC/SSC 7) HSSE	1) PEC 2) PEC 3) PEC 4) OEC/JOE 5) OEC/JOE 6) SAC/SSC 7) HSSE	1) Industrial/ Research Internship 2) CVV	1) Industrial/ Research Internship 2) CVV	PEC - 3X3 = 9 OEC/JOE - 2X3 = 6 SAC/SSC - 1X2 = 2 HSSE - 1X2 = 2 Internship - 1X3 = 3 CVV - 1X1 = 1	23
	II	1) Technical Seminar 2) Internship in Industry 3) Major Project	1) Technical Seminar 2) Internship in Industry 3) Major Project			Seminar - 1X1 = 1 Internship - 1X5 = 5 Project - 1X6 = 6	12
						Total Credits	160

Note-1: 1) BSC – Basic Science Course
2) ESC – Engineering Science Course
3) HSS – Humanities and Social Science
4) ML – Mandatory Learning Course
5) SOC – Skill Oriented Course
6) SAC – Skill Advanced Course
7) PCC – Professional Core Courses
8) PEC – Professional Elective Course
9) OEC – Open Elective Course
10) JOE – Job Oriented Elective
11) SSC – Soft Skill Course
12) CSP – Community Service Project

Note-2: **Mandatory Learning Courses**

1) EC - Environmental Science
2) UHV - Universal Human Values
3) IHC - Indian Heritage and Culture
4) CI - Constitution of India

Note-3: 1) Summer Internship Two months (Mandatory) after Second Year (to be evaluated

during 5th Semester).

2) Industrial/Research Internship Two months (Mandatory) after Third Year (to be evaluated during 7th Semester).

3) Internship in Industry (during 8th Semester)

9.0 Transitory Regulations:

Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone this course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered subject to section 2.0 and they continue to be in the academic regulations in which they were readmitted.

10.0 With-holding of results:

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

11.0 Award of Class:

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

Table 7: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA Secured from 160 Credits
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 to < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 to < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 to < 5.5	

12.0 Grading*:*

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student falls.

Table 8: Conversion into Grades and Grade points assigned

Range in which the % of marks in the subject fall	Grade	Grade point Assigned	Performance
90 to 100	O	10	Outstanding
80 to 89.9	A^+	09	Excellent
70 to 79.9	A	08	Very Good
60 to 69.9	B^+	07	Good
50 to 59.9	B	06	Above Average
45 to 49.9	C	05	Average
40 to 44.9	P	04	Pass
<40	F	00	Fail
AB	AB	00	Fail

12.1. Requirement for clearing any subject: The students have to obtain a minimum of 35% in End Examination and they have to score minimum of 40% marks from Internal and external exam marks put together to clear the subject. Otherwise, they will be awarded fail grade.

12.2. F is considered as a fail grade indicating that the student has to reappear for the end supplementary examination in that subject and obtain a non-fail grade for clearing that subject.

12.3. In case of Skill Oriented/ Skill Advanced/ Soft Skill Subjects, as there is no end exam, all 100 marks are for internal assessment only. Student has to score 40% in these courses to complete the subject which will be evaluated internally. Marks obtained in these courses shall not be considered for award of Division.

12.4. To become eligible for the award of degree the student must obtain a minimum CGPA of 4.0

13.0 Supplementary Examinations:

Apart from the regular End Examinations, the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day. For eighth semester, special (Advance) supplementary examinations will be conducted in second week following the results publication date of regular examination of eighth semester only.

14.0 Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA)

The Grade Point Average (GPA) for each semester and Cumulative Grade Point Average (CGPA) up to any semester is calculated as follows:

i) Semester Grade Point Average will be computed as follows:

$$GPA = \frac{\sum_1^n C_j \times GP_j}{\sum_1^n C_j}$$

Where, n is the number of subjects in that semester. C_j is Credits for the subjects. GP_j is the grade point obtained for the subject and the summation is over all the subjects in that semester.

ii) A Cumulative Grade Point Average (CGPA) will be computed for every student at the end of each semester. The CGPA would give the cumulative performance of the student from the first semester up to the end of the semester to which it refers to and is calculated as follows:

$$CGPA = \frac{\sum_1^m GPA_j \times TC_j}{\sum_1^m TC_j}$$

Where 'm' is the number of semesters under consideration. TC_j the total number of credits for a j^{th} semester and GPA_j is the Grade Point Average of the j^{th} semester. Both GPA and CGPA will be rounded off to the second digit after decimal and recorded as such.

While computing the GPA / CGPA, the subjects in which the student is awarded zero grade points will also be included.

For any academic/employment purpose the following formulae shall be used for conversion of CGPA to % of marks. % of marks = (CGPA –0.5) x 10.

15.0 Grade Sheet:

A grade sheet (Memorandum) will be issued to each student indicating his performance in all subjects of that semester in the form of grades and also indicating the GPA and CGPA.

16.0 Award of Degree

After having admitted into the program, B.Tech degree shall be conferred on a student who has satisfied the following conditions.

i) The student joining with Intermediate qualification must have, after admission into the Regular B.Tech programme of the college, pursued a regular course of study for not less than four academic years and not more than eight academic years.

ii) The student joining under lateral entry scheme with diploma qualification must have, after admission into III Semester B.Tech, pursued a regular course of study for not less than three academic years and not more than six academic years.

iii) The student must have satisfied the minimum academic requirements in appropriate branch of engineering in each semester of the program, herein after prescribed.

iv) Students must register for all the courses and earn the credits specified

v) Students who fail to fulfil all the academic requirements for the award of degree within the specified period from the year of their admission shall forfeit their seat in B.Tech course and their admission stands cancelled.

vi) The student shall successfully complete non-credit courses like EAA / ML / Internship.

vii) The student has no dues to the institution, library, hostels etc.

viii) The student has no disciplinary action pending against him/her.

The Degree will be conferred and awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu on recommendations by the Academic council of RGMCET (Autonomous) basing on the eligibility as in clause 6.0 and 7.0.

17.0 Transcripts:

After successful completion of prerequisite credits for the award of degree, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee and also as per norms in vogue.

18.0 Rules of Discipline:

18.1. Any attempt by any student to influence the teachers, Examiners, faculty and staff of Examination section for undue favours in the exams, and bribing them either for marks or attendance will be treated as malpractice cases and the student can be debarred from the college.

18.2. When the student absents himself, he is treated as to have appeared and obtained zero marks in that subject(s) and grading is done accordingly.

18.3. When the performance of the student in any subject(s) is cancelled as a punishment for indiscipline, he is awarded zero marks in that subject(s).

18.4. When the student's answer book is confiscated for any kind of attempted or suspected malpractice, the decision of the Chief Superintendent is final.

19.0 Minimum Instruction Days:

The minimum instruction days for each semester shall be 95 clear instruction days excluding the days allotted for tests/examinations and preparation holidays declared if any.

20.0 Amendment of Regulations:

The college may, from time to time, revise, amend or change the regulations, scheme of examinations and syllabi. However, the academic regulations of any student will be same

throughout the course of study in which the student has been admitted. However, students will continue to be in the academic regulations in which they were readmitted.

21.0 Transfers

There shall be no branch transfers after the completion of admission process.

22.0 General:

22.1. The Academic Regulations should be read as a whole for the purpose of any interpretation.

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

22.3. The Institute may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the Institute.

22.4. Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

Academic Regulations for B.Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2021-2022 onwards)

1.0 The students have to acquire a minimum of 121 credits out of 121 from II to IV year of B.Tech. Program (Regular) for the award of the degree.

2.0 Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

3.0 The same attendance regulations are to be adopted as that of B. Tech. (Regular).

4.0 Promotion Rule:

The student shall be promoted from third year to fourth year only if he fulfils the academic requirements of securing minimum of 43 credits out of 86 credits from all the exams conducted up to and including III-year, II semester regular examinations, whether the candidate takes the examinations or not.

5.0 Award of Class:

After the student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes: The marks obtained in the best 121 credits will be considered for the calculation of percentage and award of class.

Table 1: Award of Division

Class Awarded	% of marks to be secured	Division/ Class	CGPA	
First Class with Distinction	70% and above	First class With Distinction	≥ 7.5	CGPA secured from 121 Credits
First Class	Below 70% but not less than 60%	First Class	≥ 6.5 to < 7.5	
Second Class	Below 60% but not less than 50%	Second Class	≥ 5.5 to < 6.5	
Pass Class	Below 50% but not less than 40%	Pass	≥ 4 to < 5.5	

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

INSTITUTE VISION

- To develop this rural based engineering college into an institute of technical education with global standards
- To become an institute of excellence which contributes to the needs of society
- To inculcate value based education with noble goal of "Education for peace and progress"

INSTITUTE MISSION

- To build a world class undergraduate program with all required infrastructure that provides strong theoretical knowledge supplemented by the state of art skills
- To establish postgraduate programs in basic and cutting edge technologies
- To create conductive ambiance to induce and nurture research
- To turn young graduates to success oriented entrepreneurs
- To develop linkage with industries to have strong industry institute interaction
- To offer demand driven courses to meet the needs of the industry and society
- To inculcate human values and ethos into the education system for an all-round development of students

INSTITUTE QUALITY POLICY

- To improve the teaching and learning
- To evaluate the performance of students at regular intervals and take necessary steps for betterment
- To establish and develop centers of excellence for research and consultancy
- To prepare students to face the competition in the market globally and realize the responsibilities as true citizen to serve the nation and uplift the country's pride.

VISION OF THE DEPARTMENT

- The data revolution has created novel challenges and unprecedented opportunities. The vision of the Department of Data Science is to create a first-class academic department that trains the next generation of students as data scientists who will solve these grand challenges and innovate through world-class research to take advantage of these opportunities.

MISSION OF THE DEPARTMENT

- Educate students in a field that has ushered in a once-in-a-generation revolution, comparable to the industrial revolution and the original computing revolution.
- Provide an environment for leading edge research that has a strong and rapid impact on the economy and that reestablishes RGMCET as a world leader in technological advancement.
- Create a source of scholarship on the many technical, ethical, and privacy issues that ubiquitous data creation is constantly confronting us with.
- Establish a center of technology knowledge and a "go to organization" to service data creators, providers, managers, curators, and users of the State and the Nation

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

Program Educational Objectives (PEOs)

PEO-1: Be prepared with a varied range of expertise in different aspects of data science such as data collection, visualization, processing and modeling of large data sets.

PEO-2: Acquire good understanding of both the theory and application of applied statistics mathematics and computer science based existing data science models to analyse huge data sets originating from diversified application areas.

PEO-3: Be able to create models using the knowledge acquired from the program to solve future challenges and real-world problems requiring large scale data analysis.

PEO-4: Be better trained professionals to cater the growing demand for data scientists and engineers in industry

Program Specific outcomes (PSOs)

PSO-I: Ability to apply mathematical and statistical models, computing theory, the principles of optimization, as well as languages and algorithms, and to appropriately formulate and use data analysis.

PSO-II: Ability to apply the principles and techniques of database design, and implementation to enhance data collection capabilities and decision-support systems.

PSO-III: Ability to invent and use appropriate models of data analysis, assess the quality of input, derive insight from results and investigate potential issues. Also to organize big data sets into meaningful structures, incorporating data profiling and quality standards.

Note: Program Outcomes (POs) and Program Specific Outcomes (PSOs) are mapped with Course Outcomes (COs) and they are correlated in following levels

1: Slight (Low)

2: Moderate (Medium)

3: Substantial (High)

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I B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
THEORY								
A0001201	Linear Algebra and Advanced Calculus	2	1	0	3	30	70	100
A0004201	Applied Physics	2	1	0	3	30	70	100
A0501201	Problem Solving and Programming	2	1	0	3	30	70	100
A0202201	Basic Electrical Engineering	2	1	0	3	30	70	100
A0301201	Engineering Drawing	1	0	4	3	30	70	100
PRACTICALS								
A0592201	Engineering Workshop & IT Workshop	0	0	3	1.5	25	50	75
A0093201	Engineering Physics Lab	0	0	3	1.5	25	50	75
A0591201	Problem Solving and Programming Lab	0	0	3	1.5	25	50	75
	Total	**9**	**4**	**13**	**19.5**	**225**	**500**	**725**

I B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
THEORY								
A0007202	Differential Equations and Vector Calculus	2	1	0	3	30	70	100
A0005201	Modern Engineering Chemistry	2	1	0	3	30	70	100
A0502202	Data Structures	2	1	0	3	30	70	100
A0503202	Mathematical Foundations of Computer Science	2	1	0	3	30	70	100
A0003201	English for Engineers	2	1	0	3	30	70	100
MANDATORY LEARNING COURSE								
A0010202	Environmental Science	2	0	0	0	0	0	0
PRACTICALS								
A0091201	Digital English Language Lab	0	0	3	1.5	25	50	75
A0092201	Engineering Chemistry lab	0	0	3	1.5	25	50	75
A0593202	Data Structures Lab	0	0	3	1.5	25	50	75
	Total	**12**	**5**	**9**	**19.5**	**225**	**500**	**725**

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II B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
THEORY								
A0020203	Probability and Statistics	2	1	0	3	30	70	100
A0504203	Python Programming	2	1	0	3	30	70	100
A0507203	Database Management Systems	2	1	0	3	30	70	100
A0508203	Formal Languages and Automata Theory	2	1	0	3	30	70	100
A3201203	Foundations of Data Science	2	1	0	3	30	70	100
SKILL DEVELOPMENT COURSE								
A0012203	Design Thinking and Innovations	1	2	0	2	30	70	100
MANDATORY LEARNING COURSE								
A0014203	Indian Heritage & Culture	2	0	0	0	0	0	0
PRACTICALS								
A0571203	Python Programming Lab	0	0	3	1.5	25	50	75
A0595203	Database Management Systems Lab	0	0	3	1.5	25	50	75
A0596203	Unix and Shell Programming Lab	0	0	3	1.5	25	50	75
	Total	**13**	**7**	**9**	**21.5**	**255**	**570**	**825**

II B.TECH, II-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/Week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
THEORY								
A0406203	Digital Logic Design	2	1	0	3	30	70	100
A3202204	Essential Mathematics for Computational Sciences	2	1	0	3	30	70	100
A0509204	Java Programming	2	1	0	3	30	70	100
A3203204	Advanced Data Structures and Algorithms	2	1	0	3	30	70	100
A0018203	Engineering Economics and Accountancy	2	1	0	3	30	70	100
SKILL DEVELOPMENT COURSE								
A0019203	Aptitude Arithmetic Reasoning and Comprehension	1	2	0	2	30	70	100
PRACTICALS								
A0493203	Digital Logic Design Lab	0	0	3	1.5	25	50	75
A0597204	Java Programming Lab	0	0	3	1.5	25	50	75
A3291204	Advanced Data Structures and Algorithms Lab	0	0	3	1.5	25	50	75
	Total	**11**	**7**	**9**	**21.5**	**255**	**570**	**825**

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III B.TECH, I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
THEORY								
A3204205	Computer Organization & Operating Systems	2	1	0	3	30	70	100
A0543207	Machine Learning	2	1	0	3	30	70	100
A3206205	Data Wrangling	2	1	0	3	30	70	100
OPEN ELECTIVE-I/JOB ORIENTED ELECTIVE		2	1	0	3	30	70	100
A0513205	Web Programming							
A0520205	R Programming							
A0525205	Android Programming							
PROFESSIONAL ELECTIVE-I		2	1	0	3	30	70	100
A0522205	Compiler Design							
A3207205	Modern Software Engineering							
A3208205	Information Storage Management							
SKILL DEVELOPMENT COURSE								
A3209205	Working with Cloud Services	1	2	0	2	30	70	100
MANDATORY LEARNING COURSE								
A0022203	Constitution of India	2	0	0	0	0	0	0
PRACTICALS								
A3292205	Data Wrangling Lab	0	0	3	1.5	25	50	75
A3293205	Machine Learning Lab	0	0	3	1.5	25	50	75
A0023205	Community Service Project/Summer Internship	0	0	3	1.5	0	100	100
	Total	**13**	**7**	**9**	**21.5**	**230**	**620**	**850**

III B.TECH, II-SEMESTER COURSE STRUCTUR

Subject Code	Name of the Subject	Hours/week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
SUBJECTS								
A3210206	Natural Language Processing	2	1	0	3	30	70	100
A3211206	Deep Learning	2	1	0	3	30	70	100
A3212206	Big Data	2	1	0	3	30	70	100
OPEN ELECTIVE-II/ JOB ORIENTED ELECTIVE / MOOCs		2	1	0	3	30	70	100
A0537206	SAP-ABAP and Basic Applications							
A3446206	Software Application Development using DevOps							
A3403205	Conversational Systems							
PROFESSIONAL ELECTIVE - II		2	1	0	3	30	70	100
A0535206	Computer Graphics							
A0534206	Software Testing Methodologies and Tools							
A3213206	Information Retrieval Systems							
SKILL DEVELOPMENT COURSE								
A3214206	Data Visualization and Presentation	1	2	0	2	30	70	100
PRACTICALS								
A3294206	Natural Language Processing Lab	0	0	3	1.5	25	50	75
A3295206	Deep Learning Lab	0	0	3	1.5	25	50	75
A0572206	Big Data Lab	0	0	3	1.5	25	50	75
	Total	**11**	**7**	**9**	**21.5**	**255**	**570**	**825**

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IV B.TECH. I-SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject	Hours/week			Credits	Marks		
		Theory	Tutorial	Lab		Internal	External	Total
PROFESSIONAL ELECTIVE-III								
A3217207	Software Product Development and Management	2	1	0	3	30	70	100
A3218207	Decision Support Systems							
A0516205	Computer Networks							
PROFESSIONAL ELECTIVE-IV								
A3220207	Time Series Data Analysis	2	1	0	3	30	70	100
A3229207	Concepts of Artificial Intelligence							
A3221207	Nature Inspired Computing for Data Science							
PROFESSIONAL ELECTIVE-V/MOOCS								
A3222207	Knowledge Representation and Reasoning	2	1	0	3	30	70	100
A3225207	Augmented Reality and Virtual Reality							
A3224207	High Performance Computing							
OPEN ELECTIVE-III/JOB ORIENTED COURSE								
A3215207	Essentials of Blockchain Technology	2	1	0	3	30	70	100
A3228207	Cyber Security and Cyber Laws							
A3216207	Fundamentals of Quantum Computing							
OPEN ELECTIVE-IV/JOB ORIENTED COURSE								
A3219207	IT Project Management	2	1	0	3	30	70	100
A3223207	Distributed Databases							
A3226207	Advanced Social, Text and Media Analytics							
SKILL DEVELOPMENT COURSE								
A3227207	Computer Vision with OpenCV	1	2	0	2	30	70	100
HUMANITIES AND SOCIAL SCIENCE								
A0021204	Management Science	2	0	0	2	30	70	100
MANDATORY LEARNING COURSE								
A0015203	Universal Human Values	2	0	0	0	0	0	0
A0094207	Comprehensive Viva	0	0	0	1	0	50	50
A0095207	Industrial / Research Internship	0	0	0	3	0	100	100
	Total	**15**	**7**	**0**	**23**	**210**	**640**	**850**

IV B.TECH., II SEMESTER COURSE STRUCTURE

Subject Code	Name of the Subject Hours/Week					Marks		
		Theory	Tutorial	Lab	Credits	Internal	External	Total
A0096208	Technical Seminar	0	0	0	1	50	0	50
A0097208	Internship in Industry	0	0	0	5	0	100	100
A0098208	Major Project	0	0	0	6	50	100	150
	Total	**0**	**0**	**0**	**12**	**100**	**200**	**300**

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I B.Tech, I-Sem (CSE(DS))

L	P	C
2	1	3

(A0001201) LINEAR ALGEBRA AND ADVANCED CALCULUS

For branches: CE, EEE, ME, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To familiarize the concepts of matrices and mean value theorems and their applications in engineering.
- To equip the students to solve various application problems in engineering through evaluation of Gamma, Beta functions and multiple integrals etc.,

COURSE OUTCOMES:

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

- Understand the use of matrices and linear system of equations in solving Network analysis, encoding and decoding in Cryptography and Quantum mechanics problems.
- Apply the concept of Gamma and Beta functions in digital signal processing, discrete Fourier transform, digital filters and Oscillatory theory in engineering.
- Analyze differential and integral calculus to solve improper integrals and its applications in many engineering disciplines.
- Determine the process to evaluate double and triple integrals and understand its usage to find surface area and volumes of various bodies in engineering.
- Identify the applications of advanced calculus & Linear algebra in electro-magnetic theory and in telecommunication engineering.

MAPPING OF COs & POs:

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

UNIT – I

Matrices: Elementary row transformations – Rank – Echelon form, Normal form – Solutions of Linear System of Homogenous and Non Homogeneous equations.

UNIT – II

Eigen Values, Eigen vectors – Properties – Cayley – Hamilton Theorem – Inverse and Power of a matrix by Cayley – Hamilton theorem.

UNIT – III

Quadratic forms: Linear Transformation – Reduction of quadratic form to canonical form and their nature (Rank, Signature and Index).

UNIT – IV

Mean value theorems: Rolle's Theorem – Lagrange's Mean Value Theorem – (excluding proof). Simple examples of Taylor's and Maclaurin's Series.

Functions of several variables – Jacobian – Maxima and Minima of functions of two variables - Lagrange method of Multipliers with three variables only.

UNIT – V

Multiple integrals: – Evaluation of Double integrals (Cartesian and Polar) – Change of Variables – Change of order of Integration – Changing into Polar coordinates – Evaluation of triple integrals.

UNIT – VI

Special functions: Gamma function – Properties – Beta function – properties – Relation between Gamma and Beta functions – Evaluation of Integrals using Gamma & Beta functions.

TEXTBOOKS:

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S. R .K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol – I, S. Chand & Company.

REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons,2011.
3) Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

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I B.Tech, I-Sem (CSE(DS))

L	T	C
2	1	3

(A0004201) APPLIED PHYSICS
For branches: EEE, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To provide basic concepts of optics, quantum physics, semiconductors and their applications to the engineering students.

COURSE OUTCOMES:
After the completion of the course the students will be able to:
- Understand the concept of signals by studying the properties of light.
- Construct a quantum mechanical model to explain the behavior of a system at the microscopic level.
- Analyze the structures of materials.
- Identify the semiconducting materials for a particular application.
- Develop new optoelectronic devices for various applications.

MAPPING OF COs & POs:

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

UNIT-I: WAVE –OPTICS

Interference: Introduction –Division of amplitude–Newton's rings and its applications.
Diffraction: Introduction – Fraunhofer diffraction at single slit– Diffraction Grating– Grating spectra –Determination of wavelength of light.

UNIT-II: QUANTUM MECHANICS

Introduction to quantum physics – Wave-Particle duality – de Broglie hypothesis – Verification of wave character of Matter waves (Davison–Germer experiment)– Uncertainty principle– Thought experiment (Electron diffraction) – Wave function (ψ) –Schrodinger's one-dimensional time-independent wave equation – Particle in 1D-potential box.

UNIT III: QUANTUM OPTICS & FIBER OPTICS

Lasers: Characteristics – Einstein's coefficients – Radiation processes – Population inversion – Pumping processes Lasing action –Nd-YAG and He-Ne lasers – Engineering applications
Fiber Optics: Structure –Principle – Acceptance angle, Numerical aperture – Propagation of light in Step-index and Graded-index fibers–Applications: Fibre optic communication system (Block diagram).

UNIT IV: THE CRYSTAL STRUCTURE OF SOLIDS

Introduction –Space lattice – Basis – Unit cell (primitive and Non-primitive) – Crystal systems – Bravais lattices –Atomic radius, Nearest neighbouring distance, Coordination numberand packing factor for SC, BCC, FCC lattices – Diamond structure – Crystal planes and directions– Miller Indices – calculation of interplanar distance.

UNIT V: FREE ELECTRON THEORY & BAND STRUCTURE OF SOLIDS

Introduction –Free electron theory–Sources of electrical resistivity – Fermi energy – Fermi level – Effect of temperature on Fermi distribution function –Kronig-Penny model (qualitative)–Energy bands– Effective mass – Classification of materials based on band theory.

UNIT VI: SEMICONDUCTOR PHYSICS & DEVICES

Introduction –Intrinsic and Extrinsic semiconductors–Fermi level (qualitative)– Carrier generation and recombination–Carriertransport: Diffusion and Drift–Hall Effect and its applications–Direct and indirect band gap semiconductors –p-n junction, Band diagram and Working principle –LED – Solar cell.

TEXT BOOKS

1) M. N. Avadhanulu, P.G. Kshirsagar& TVS Arun Murthy" AText book of EngineeringPhysics"- S. Chand Publications, 11thEdition 2019.
2) R. K. Gaur and S.C. Gupta, "Engineering Physics",DhanpatRai Publications, New Delhi.

REFERENCES

1) "Concepts of Modern Physics",Arthus Beiser Tata Mc Graw Hill Publications, New Delhi.
2) "Physics Volume – II", Resnick, Halliday and Krane, Wiley, New Delhi.
3) "Elements of Solid State Physics", J.P. Srivastava, PHI, 4theds.New Delhi.
4) "Semiconductor Devices: Physics and Technology" S. M. Sze,2nd eds. Wiley.
5) "Electronic Devices and Circuits", 2nd eds. Reston Publishing Company, Inc., Reston, Virginia.
6) "Solid State Electronic Devices" Ben G. Streetman, Sanjay Kumar Banerjee, 6th eds. PHI Learning.
7) "Solid State Physics" R.K. Puri and V.K. Babber, S. Chand Publishing,

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I B.Tech, I-Sem (CSE(DS))

L	T	C
2	1	3

(A0501201) PROBLEM SOLVING AND PROGRAMMING
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Introduce the internal parts of a computer, and peripherals.
- Introduce the Concept of Algorithm and use it to solve computational problems
- Identify the computational and non-computational problems
- Teach the syntax and semantics of a C Programming language
- Demonstrate the use of Control structures of C Programming language
- Illustrate the methodology for solving Computational problems

COURSE OUTCOMES:
- Construct his own computer using parts (L6).
- Recognize the importance of programming language independent constructs (L2)
- Solve computational problems (L3)
- Select the features of C language appropriate for solving a problem (L4)
- Design computer programs for real world problems (L6)
- Organize the data which is more appropriated for solving a problem (L6)

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	3	-	2	-	-	-	2	1	-	-
CO2	2	-	-	-	2	-	-	-	-	-	-	-
CO3	3	2	3	2	-	2	-	-	2	-	-	-
CO4	3	-	2	-	-	-	-	-	3	-	-	-
CO5	-	3	3	-	-	2	-	-	-	-	2	-
CO6	-	-	3	-	-	-	2	-	-	-	-	-

UNIT I

Computer Fundamentals: What is a Computer, Evolution of Computers, Generations of Computers, Classification of Computers, Anatomy of a Computer, Memory revisited, Introduction to Operating systems, Operational overview of a CPU.

Introduction to Programming, Algorithms and Flowcharts: Programs and Programming, Programming languages, Compiler, Interpreter, Loader, Linker, Program execution, Fourth generation languages, Fifth generation languages, Classification of Programming languages, Structured programming concept, Algorithms, Pseudo-code, Flowcharts, Strategy for designing algorithms, Tracing an algorithm to depict logic, Specification for converting algorithms into programs.

Learning Outcomes: Student should be able to
1. Identify the different peripherals, ports and connecting cables in a PC (L2)
2. Illustrate the working of a Computer (L3)
3. Select the components of a Computer in the market and assemble a computer (L4)
4. Solve complex problems using language independent notations (L3)

UNIT II

Introduction to computer problem solving: Introduction, the problem-solving aspect, top-down design, implementation of algorithms, the efficiency of algorithms, the analysis of algorithms.

Fundamental algorithms: Exchanging the values of two variables, counting, summation of a set of numbers, factorial computation, sine function computation, generation of the Fibonacci sequence, reversing the digits of an integer.

Learning Outcomes: Student should be able to

1. Solve Computational problems (L3)
2. Apply Algorithmic approach to solving problems (L3)
3. Analyze the algorithms (L4)

UNIT III

C Language Preliminaries: Keywords and Identifiers, Constants, Variables, Data Types, and Input Output Statements with suitable illustrative "C" Programs.

Operators: Assignment Operators, Relational and Logical Operators, Increment and Decrement Operators, Bitwise Operators, Ternary Operator, Type Conversion, Precedence and Associativity with suitable illustrative C Programs.

Learning Outcomes: Student should be able to

1. Understand keywords, data types in C (L2)
2. Use various operators in C program (L6)
3. Apply type conversions and also understand, analyse precedence and associativity (L2)

UNIT IV

Conditional/Decision Statements: if, if-else, Nested if-else, else-if ladder, Switch-Statement and goto statement with suitable illustrative C Programs.

Loop Control Statements: while, do-while and for with suitable illustrative "C" Programs, break, continue statements.

Learning Outcomes: Student should be able to

1. Select the control structures for solving the problem (L4)
2. Apply statements for solving the problem (L3)
3. Understand the statements in C language (L2)

UNIT V

Arrays: Definition, Importance of an array in C language, One-Dimensional Arrays, Two-Dimensional Arrays, Example programs on the topics mentioned above

Strings: Introduction to Strings, String I/O, String Operations and functions.

Functions: Introduction to Functions, benefits of functions, types of functions, Function calls, return vs. exit( ), Parameter Passing mechanisms, Call-by-Value, Recursion.

Learning Outcomes: Student should be able to

1. Design and develop C programs using functions and arrays. (L6)
2. Apply modular approach for solving the problem (L3)
3. Understand and apply various string handling functions (L2)

UNIT VI

Files : Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions(standard library input / output functions for files), file status functions (error handling),Positioning functions, command –line arguments, C program examples.

Storage Classes, pre-processor directives.

Learning Outcomes: Student should be able to

1. Describe the Files types and File operations. (L2)
2. Practice Command line arguments. (L3)
3. Perform Error handling in Filerelated programming in C.(L4)

TEXT BOOKS:

1. PradipDey, and Manas Ghosh, "Programming in C", 2018, Oxford University Press.
2. R.G. Dromey, "How to Solve it by Computer". 2014, Pearson.

3. Brian W. Kernighan, and Dennis M. Ritchie, "The C Programming Language", 2nd Edition, Pearson.

REFERENCE BOOKS:

1) P.Chenna Reddy, "Computer Fundamentals and C Programming" 2018, BS Publications
2) RS Bichkar" Programming with C", 2012, Universities Press.
3) Pelin Aksoy, and Laura Denardis, "Information Technology in Theory", 2017, Cengage Learning.

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I B.Tech, I-Sem (CSE(DS)) L T C
2 1 3

(A0202201) BASIC ELECTRICAL ENGINEERING
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
The course will enable the students to
- Get exposed to the basics in Electrical and Magnetic terms
- Get exposed to the basics in DC and AC circuits
- Briefing of Electrical machines fundamentals.
- Get exposed to real time applications of various types of electrical machines.
- To provide theoretical prerequisites necessary to do lab work on electrical machines and circuits.

COURSE OUTCOMES:
- To understand the basic concepts of electrical and magnetic circuits.
- To analyze DC Circuits with the basics of electrical engineering.
- To evaluate AC Circuits with the basics of electrical engineering.
- To remember the magnetic circuits concept to understand single phase transformers in detail.
- To apply the AC circuits concept to understand three phase induction motor in detail.
- To create an interest to understand DC machines in detail.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	1	-	-	-	1	-	-	1
CO2	3	3	3	-	3	-	-	-	2	2	-	1
CO3	2	2	-	-	-	-	-	-	1	-	-	1
CO4	3	2	1	-	2	-	-	-	1	1	-	1
CO5	3	2	1	-	-	-	-	-	2	1	-	1
CO6	2	3	2	-	2	-	-	-	2	1	-	1

UNIT-I:
Basic Electrical Quantities: Charge – Current – Voltage – Power – Energy – Work Done – Simple Problems.
Electrical Circuits: Ohm's Law and its limitations – Resistor and Resistance – Inductor and Inductance – Capacitor and Capacitance – Energy stored in inductor – Energy stored in capacitor – Simple Problems.
Magnetic Circuits: Magnetic Flux – Magnetic Flux Density – Magneto Motive Force – Faraday's Laws of Electro Magnetic Induction – Lenz's Law – Statically Induced EMF – Dynamically Induced EMF.

UNIT-II
DC Circuits: DC Voltage Source – DC Current Source – Kirchhoff's Voltage Law (KVL) – Kirchhoff's Current Law (KCL) – Simple Problems – Resistors in Series – Resistors in Parallel – Inductors in Series – Inductors in Parallel – Capacitors in Series – Capacitors in Parallel – Simple Problems on Network Reduction.

UNIT-III
Single Phase AC Circuits: AC Voltage Source – AC Current Source – Types of AC Waveforms – Cycle – Time Period – Frequency – Maximum Value, Average Value, RMS Value, Peak Factor and Form Factor of Sine Wave – Definitions of Active Power, Reactive Power, Apparent Power, Power Factor, Reactance and Impedance – Behavior of Resistor –

Behavior of Inductor – Behavior of Capacitor – Behavior of Series RL Circuit – Behavior of Series RC Circuit – Behavior of Series RLC Circuit – Simple Problems.
Three Phase AC Circuits: Introduction to Three Phase AC Circuits – Three Phase AC Waveform

UNIT-IV
DC Machine: Classification – Construction – Working Principle of DC Generator – Generated EMF Equation – Simple Problems on EMF Equation – Types of DC Generators – Applications of each type – Voltage Equations of Series Generator and Shunt Generator – Working Principle of DC Motor – Back EMF Equation – Simple Problems on Back EMF Equation – Types of DC Motors – Applications of each type – Voltage Equations of Series Motor and Shunt Motor.

UNIT-V
Single Phase Transformer: Construction – Classification – Core Type Transformer – Shell Type Transformer – Comparison between Core Type Transformer and Shell Type Transformer – Step Down Transformer – Step Up Transformer – Comparison between Step Down Transformer and Step Up Transformer – Working Principle of Transformer – Applications – EMF Equation – Transformation Ratio – Turns Ratio – Simple Problems on EMF Equation.

UNIT-VI
Three Phase Induction Motor: Classification – Construction – Comparison between Squirrel Cage Induction Motor and Slip Ring Induction Motor – Applications – Rotating Magnetic Field Theory – Working Principle of Induction Motor – Comparison between Induction Motor and Transformer – Synchronous Speed – Slip – Frequency of Rotor Current – Simple Problems on Speed and Slip.

TEXT BOOKS:
1) Electrical and Electronic Technology – 10th Edition – Edward Hughes, Pearson Publications
2) Engineering Circuit Analysis – 8th Edition – W.Hayt&J.E.Kemmerly, McGraw Hill Publications
3) Basic Electrical Engineering – 2nd Edition – Kothari &Nagrath, TMH Publications
4) Introduction to Electrical Engineering – 3rd Edition – M.SNaidu&S.Kamakshaiah, TMH Publ.

REFERENCES:
1) Principles of Electrical Engineering – 1st Edition –V.K.Mehta, S.Chand Publications
2) Electrical Circuit Analysis –3rd Edition – Sudhakar&Shyam Mohan, TMH Publications
3) A Text Book of Electrical Technology–8th Edition-B.L.Theraja&A.K.Theraja, S.Chand Publications

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, I-Sem (CSE(DS))

L	P	C
1	4	3

(A0301201) ENGINEERING DRAWING

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Understand and appreciate the importance of basic concepts and principles of Engineering Drawing
- Realize and appreciate the importance of engineering drawing as a medium of communication to covey ideas in engineering field
- Enable the students to be aquatint with various basic engineering drawing formats
- Learn to take data and transform in to graphic drawings.

COURSE OUTCOMES:

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

- Understand the conventions and the methods adopted in engineering drawing.
- Understand the concepts of orthographic projection.
- Improve their visualization skills and to apply these skill in developing new products
- Improve technical communicative skills in the form of communicative drawings

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	2	2	3	-	-	2	2	3	2	-	3	2	3	2
CO2	3	2	3	2	3	-	-	2	2	3	-	-	3	2	2	2
CO3	3	2	2	1	3	-	-	2	2	3	-	1	1	2	2	2
CO4	3	2	2	2	3	-	-	2	2	3	1	-	1	2	3	2

UNIT I

Geometrical Constructions: Polygons-Construction of Regular Polygons using given length of a side; Conic sections- Ellipse- Arcs of Circles and Oblong Methods, Construction of Parabola and Hyperbola by eccentricity method only.

UNIT II

Projection of Points and Lines: Introduction to Orthographic Projections- Projections of Points-Projections of Straight Lines parallel to both planes; Projections of Straight Lines-Parallel to one and inclined to other plane, inclined to both planes, determination of true lengths, angle of inclinations.

UNIT III

Projections of Planes: Regular Planes, Plane Perpendicular to one plane and Parallel to another Reference plane, Plane inclined to one Reference Plane.

UNIT IV

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis perpendicular to one plane and parallel to the reference plane, Plane inclined to one reference Plane only.

UNIT V

Section of solids: Sectioning of prism, pyramid, cone and cylinder– sectional view – true shape. Solids in simple position and cutting plane inclined to one reference plane only.

Development of surface of solids: Development of truncated prism, pyramid, cone and cylinder – frustum of cone and pyramid.

UNIT VI

Orthographic and Isometric Projections: Introduction to Isometric projections/ views, Construction of Isometric view/ projections of simple solids. Conversion of Isometric Views

to Orthographic Views/Projections-Conversion of Orthographic Views to Isometric Projection/ Views.

TEXT BOOK:

1) Engineering Drawing. K.L Narayana, P. Kannaiah, Scitech Publications, 2011
2) Engineering Drawing by N.D. Bhatt, Chariot Publications,2014

REFERENCE BOOKS:

1) Engineering Drawing, B.V.R Gupta, J.K. Publishers,2008
2) Engineering Drawing and Graphics, Venugopal /New age publications,2007
3) Engineering Drawing by M.B. Shah and B.C. Rana, Pearson Publishers,2009
4) Engineering Drawing, Johle, Tata Mc Graw – Hill, 2008
5) K.V. Natarajan, 'A text book of Engineering Graphics', Dhanalakshmi publishers, Chennai, 2006.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, I-Sem (CSE(DS))

T	P	C
0	3	1.5

(A0592201) ENGINEERING WORKSHOP & IT WORKSHOP

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

ENGINEERING WORKSHOP

COURSE OBJECTIVES:

- To familiarize with the basic manufacturing processes and to study the various tools and equipment used, hands-on training is given in different sections. Essentially student should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work.

COURSE OUTCOMES:

At the end of the Engineering Work Shop:

- A student should know the basic knowledge of various tools and their use in different sections of manufacturing such as fitting, carpentry, tin smithy, welding etc. and basic engineering practices such as plumbing, electrical wiring, electronic circuits, machine shop practice.
- Ability to design and model various basic prototypes in the trade of fitting such as Straight fit, V- fit.
- Ability to make various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder.
- Ability to perform various basic House Wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch, connecting a fluorescent tube, Series wiring, Go down wiring.

MAPPING OF COs& POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	1	2	2	1	-	-	-	2	-	2	1	1	-	-
CO2	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-
CO3	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-
CO4	-	-	-	-	2	1	-	-	2	2	2	-	2	-	-

Note: At least two exercises should be done from each trade.

1. TRADES FOR EXERCISES:

A] Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

B] Fitting

1. Vee Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

C] House Wiring

1. Parallel / Series Connection of two/three bulbs
2. Stair Case wiring
3. Tube Light Wiring
4. Measurement of Earth Resistance/Go down Wiring

D] Tin Smithy

1. Rectangular Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

E] Welding

1. Single V butt joint
2. Lap joint
3. Double V butt joint
4. T fillet joint.
5. Gas Welding

F] Soldering

1. Soldering & Desoldering Practice
2. Series Circuit
3. Parallel Circuit

2. TRADES FOR DEMONSTRATION:

a) Plumbing
b) Machine Shop
c) Bosch Power Tools

REFERENCE BOOKS:

1. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009.
2. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers, 2013
3. Engineering Practices Lab Manual, Jeyapoovan, Saravana Pandian, 4/e Vikas, 2009
4. Dictionary of Mechanical Engineering, GHF Nayler, Jaico Publishing House, 1999.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IT WORKSHOP

COURSE OBJECTIVES:

- The modules include training on PC Hardware, and Productivity tools including text processor, spread sheet, presentation tools. It enables the students to understand and fix the common hardware, software issues & makes the students to install either Windows or UNIX based Operating system in the machines.
- Enable students to understand how computers work, different types of computers, functions of applications, input and data storage devices, different operating systems,
- It makes the students to understand and use the common office suite tools like word, excel etc. effectively in their daily usage.

COURSE OUTCOMES:

By the end of module students will be expected to demonstrate

- PC Hardware- introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer. The students should work on working PC to disassemble and assemble to working condition.
- To do installation of system software like MS Widows and Linux and the required device drivers.
- Productivity tools- module would enable the students in crafting professional word documents; excel spread sheets and power point presentations using the Microsoft suite of office tools.

MAPPING OF COs & POs:

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

PC HARDWARE

Exercise 1 - Identify the peripherals of a computer, components in a CPU and its functions.
Exercise 2 - Every student should disassemble and assemble the PC back to working condition.
Exercise 3 - Everystudent should individually install MS windows on the personal computer and also install Linux as dual boot with boot with Windows.

OFFICE TOOLS

Exercise 4 - Word Orientation: The mentor needs to give an overview of LaTeX and Microsoft (MS) office equivalent tool word: Importance of LaTeX and MS office tool Word as word Processors, Details of the four tasks and features that would be covered in each. Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter in word.
Task 1-Task III: Using Word Processor to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in Word.

SPREAD SHEET

Exercise 5–Spread Sheet Orientation: The mentor needs to tell the importance of MS office 2007,2010/ equivalent tool Excel as a Spreadsheet tool, give the details of the four tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.
Task 1-Task III: Features to be covered: - Gridlines, Format Cells, Summation, auto fill, Formatting Text, Formulas, Functions

PRESENTATION

Exercise 6 -Students will be working on basic presentation utilities and tools which help them create basic power point presentation. Topic covered during this Exercise includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in PowerPoint. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

REFERENCES:

1) Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2) LaTeX Companion – Leslie Lamport, PHI/Pearson.
3) Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
4) Upgrading and Repairing, PC's 18th e, Scott Muller QUE, Pearson Education
5) Comdex Information Technology course tool kit, Vikas Gupta, WILEY Dreamtech
6) IT Essentials PC Hardware and Software Companion Guide, Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, I-Sem (CSE(DS))

T	P	C
0	3	1.5

(A0093201) ENGINEERING PHYSICS LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- The laboratory should help the student to develop a broad array of basic skills and tools of experimental physics and data analysis.
- The laboratory should help students to understand the role of direct observation in physics and to distinguish inferences based on theory and the outcomes of experiments.
- To learn about the optical experiments in establishing the fundamentals in Interference and Diffraction phenomena which will be visualized with the light and laser experiments mentioned in the syllabus.
- To learn about the basic electronic experiments such as energy band gap determination, Hall Effect to know the type of extrinsic semiconductors, Stewart-Gee's experiment in field intensity determination and Solar I-V characteristics.

COURSE OUTCOMES:

After completion of the course the students will be able to

- Operate optical instruments like microscope and spectrometer
- Estimate the wavelength of different colors using diffraction grating
- Study the variation of intensity of the magnetic field due to circular coil carrying current with distance
- Identify the type of semiconductor (i.e., n-type or p-type) using Hall Effect

MAPPING OF COs & POs:

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

LIST OF EXPERIMENTS (Any10 Experiments)

1) Determination of radius of curvature of a given plano-convex lens using Newton's rings method.
2) Determination of thickness of a thin wire/film by Wedge shape method.
3) Determination of wavelength of spectral lines using Transmission Grating and Spectrometer.
4) Determination of wavelength of a sodium light by normal incidence method.
5) Determination of dispersive power of a prism using spectrometer.
6) Determination of wavelength of a laser using transmission grating.
7) Determination of particle size by laser diffraction.
8) Determination of numerical aperture of an optical fiber.
9) Study of variation of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's method.
10) Determination of rigidity modulus of a given wire using Torsional Pendulum.
11) Determination of energy band gap of a Si or Ge semiconductor by Four probe method.
12) Study of B – H Curve of a ferromagnetic material.
13) Determination of carrier density and Hall coefficient or magnetic flux density of an extrinsic semiconductor using Hall effect.
14) Study current (I) and voltage (V) characteristics of a Solar Cell.
15) Measurement of Curie temperature of a given ferroelectric material by studying the temperature dependence of dielectric constant.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, I-Sem (CSE(DS)) T P C
0 3 1.5

(A0591201) PROBLEM SOLVING AND PROGRAMMING LAB
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To learn about different types of operators
- To learn how decision making is done during programming
- To learn about various simple constructs used for programming
- To learn to define functions and call them with appropriate parameters
- To understand the usage of string libraries to do common string operations
- To understand pointer referencing and pointer dereferencing

COURSE OUTCOMES:
At the end of this course, the student would be able to
- Apply the specification of syntax rules for numerical constants and variables, data types
- Know the Usage of various operators and other C constructs
- Design programs on decision and control constructs
- Develop programs on code reusability using functions
- Implement various concepts of arrays and strings

MAPPING OF COs & POs:

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

RECOMMENDED SYSTEMS /SOFTWARE REQUIREMENTS:
Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE 1
Write a C program to demonstrate various operators used in C language.

EXERCISE 2
a) Write a C program to find the roots of a quadratic equation.
b) Write a C program to find both the largest and smallest number in a list of integers.

EXERCISE 3
a) Write a C program, which takes two integer operands and one operator from the user, performs the specified operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
b) Write a C Program to find the reverse of a given number.

EXERCISE 4
a) Write a C program to find the sum of individual digits of a positive integer.
b) Write a C program to generate the first ‘n‘ terms of the Fibonacci sequence.
[**Note:** A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.]
c) Write a C program to generate all the prime numbers between 1 and n, where ‘n‘ value is given by the user.

[**Note:** Develop each of the above programs by using different loop constructs supported by C language. (i.e., while, do while and for Loops)]

EXERCISE 5

a) Write a C Program to mask the most significant digit of the given number.
b) Write a program which Prints the following pattern

EXERCISE 6

a) Write a C program to find all the even numbers in the given one dimensional array.
b) Write a C program to print the elements of an array in reverse order.
c) Write a C program to construct a pyramid of numbers.

EXERCISE 7

Write a C program to perform the following operations:

a) Addition of Two Matrices
b) Multiplication of Two Matrices

[Note: Use functions to implement the above specified operations]

EXERCISE 8

Write C programs that use both recursive and non-recursive functions

a) To find the factorial of a given integer.
b) To find the GCD (greatest common divisor) of two given integers.

EXERCISE 9

a) Write a C Program to solve the Towers of Hanoi problem by using recursive function.
b) Write a C Program to demonstrate the various storage classes, which are supported by the C language. [i.e., automatic, external, static and register]

EXERCISE 10

a) Write a C Program to demonstrate that, how to pass an entire array as an argument to a function with a suitable example.
b) Write a C Program to perform various operations on given two strings using string handling functions.

EXERCISE 11

a) Write a C program that uses functions to perform the following operations:
   i) To insert a sub-string in to a given main string from the specified position.
   ii) To delete '**n**' Characters from a given position in a given string.
b) Write a C program to determine if the given string is a palindrome or not.

EXERCISE 12

a) Write a C program that displays the position or index in the string 'S' where the string 'T' begins, or – 1 if 'S' doesn't contain 'T'.
b) Write a C program to count the lines, words and characters in a given text.

EXERCISE 13

a) Write a C program to reverse the first 'n' characters in a file.
b) Write a C program to merge two files into a third file.

REFERENCE BOOKS

1) Programming in C, Pradeep Dey, Manas Ghosh, Oxford Heigher Education
2) The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
4) Computer Basics and C Programming, V. Raja Raman, PHI Publications

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS))

L	T	C
2	1	3

(A0007202) DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

For branches: CE, EEE, ME, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To familiarize the concepts of ordinary and partial differential equations.
- To equip the students to analyze vector differentiation and the evaluation of line, surface and volume integrals and their applications in electromagnetic theory, transmission lines etc.,

COURSE OUTCOMES:

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

- Obtain the knowledge of first and higher order differential equations and its use in solving Circuit analysis, heat transfer problems in engineering.
- Analyze solving higher order linear differential equations with variable coefficients and its applications.
- Understand about formation and solution of partial differential equations and importance in thermodynamics, continuum mechanics and fluid mechanics.
- Understand about vector differentiation and its applications in Electromagnetic theory.
- Apply the concept of vector integration to solve many problems in field theory, Electromagnetic theory and transmission lines.

MAPPING OF COS & POS:

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

UNIT-I

Differential equations of first order and first degree – Formation of ODEs – Solution of ODEs - Exact, Non – Exact, Linear and Bernoulli's equations – Applications of ODEs to L – R & C – R circuits.

UNIT – II

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type, e^{ax}, Sin ax, Cos ax, Polynomials in x, e^{ax} V(x), xV(x), Method of Variation of parameters.

UNIT – III

Higher Order linear Differential Equations with variable coefficients: Cauchy's and Legendre's linear Differential equations, simultaneous linear differential equations with constant coefficients.

UNIT – IV

Partial Differential Equations of First order: First order partial differential equations, Formation of partial differential equations, solutions of first order linear and non – linear Partial differential equations. Method of separation of variables.

UNIT - V

Vector Differentiation: Introduction of Vector differentiation– Scalar and vector point functions – Gradient of scalar function– Directional derivatives – Divergence of a vector function – Curl of a vector function – Properties of Grad, Div and Curl.

UNIT – VI

Vector integration: Line integral - Potential function – Area, Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss Divergence Theorem (excluding their proof), Verification of Green's, Stoke's and Gauss Theorems.

TEXTBOOKS:

1) B. S. Grewal, Higher Engineering Mathematics, Khanna Publications.
2) R. K. Jain, S. R .K. Iyengar, Advanced Engineering Mathematics, Alpha Science.
3) T.K.V. Iyengar, B. Krishna Gandhi, A Text Book of Engineering Mathematics, Vol – 1, S. Chand & Company.

REFERENCES:

1) G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2) (Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2011.
3) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
4) N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS)) L T C
2 1 3

(A0005201) MODERN ENGINEERING CHEMISTRY
For branches: EEE, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To understand the concepts of molecular structures and bonding.
- To explain the students on the principles and applications of electrochemistry.
- To demonstrate about the preparation and applications of polymers.
- To introduce the advanced concepts about nanomaterials.
- To introduce the basic principles of UV and IR spectroscopy.
- To familiarize about Surface chemistry and its applications.

COURSE OUTCOMES:
At the end of the course, the students will be able to
- Concept of Molecular Orbital Theory and Crystal Field Theory(L2)
- Explain about the conductance and role of electrodes in electrochemistry(L1)
- Explain the preparation, properties, and applications of thermoplastics & elastomers (L2)
- Explain the preparation, properties, and applications of Nano materials.
- Understanding the principles of UV-Visible & IR Spectroscopes(L2)
- Summarize the applications of adsorption in Industries (L2)

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	1	-	-	1	-	-	-	1	1	-	-	1
CO 2	-	1	2	1	-	1	1	-	-	-	-	-
CO 3	1	-	-	2	-	-	1	1	-	-	-	-
CO 4	1	3	-	1	2	1	-	1	-	-	-	1
CO 5	1	1	-	1	2	-	-	1	1	-	-	1

UNIT 1: MOLECULAR STRUCTURE AND BONDING
Molecular orbital theory – bonding in homo and heteronuclear diatomic molecules – Energy level diagrams of O_2 and NO–Crystal field theory and its salient features – splitting in octahedral and tetrahedral geometry - Band theory of solids – band diagrams for conductors, semiconductors and insulators.

UNIT 2: ELECTROCHEMISTRY AND APPLICATIONS
Introduction – Conductance, Specific conductance, Equivalent Conductance and molar conductance –Determination of equivalent conductance by Wheatstone bridge method – Conductometric titrations (acid-base titrations) – Numerical Problems on conductance - Electrodes –Reference electrode (Standard hydrogen electrode) – Daniel cell.

UNIT 3: POLYMER TECHNOLOGY
Classification of polymers – Functionality – Chain growth, step growth polymerization and Copolymerization with specific examples– Mechanisms of additional polymerization.
Plastics**:** Preparation, properties and applications of PVC, Teflon and Bakelite.
Elastomers: Buna-S and Buna-Npreparation, properties and applications.

UNIT-4 ADVANCED ENGINEERING MATERIALS
Nanoparticles: Introduction, preparation methods – Sol-gel method, Chemical reduction method – properties and applications in Graphene and CNT.
Super capacitors: Definition, Classification – Engineering Applications.

UNIT 5: INSTRUMENTAL METHODS AND APPLICATIONS

Electromagnetic spectrum, Absorption of radiation: Beer-Lambert's law, UV-Visible Spectroscopy: Types of electronic transitions, Absorption and Intensity Shifts, Principle, Instrumentation and its applications. IR Spectroscopy: Types of Molecular vibrations, Principle, Instrumentation and its applications.

UNIT 6: SURFACE CHEMISTRY AND APPLICATIONS

Introduction to surface chemistry, Adsorption- Types of adsorption, Adsorption of gases on solids and its applications, Adsorption isotherm-Langmuir adsorption isotherm theory and postulates.

Colloids: Definition, micelle formation, synthesis of colloids (Chemical and Bredigs method with examples).

TEXT BOOKS:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

REFERENCE BOOKS:

1. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. K Sesha Maheswaramma and Mridula Chugh, Engineering Chemistry Pearson India Education Services Pvt. Ltd

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS))

L	T	C
2	1	3

(A0502202) DATA STRUCTURES
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To make students aware about structures and unions in C language.
- To provide exposure on various searching and sorting techniques.
- To provide exposure on various data structures like stacks, queues, circular queues and linked lists etc.,
- To develop solutions for various problems by using C Programming.

COURSE OUTCOMES:
At the end of this course, the student would be able to
- Develop programs with user defined data types.
- Apply various file handling techniques for better data management
- Apply stacks in various applications
- Apply queues in various applications and distinguish between stacks and queues.
- Analyse various dynamic data structures.
- Implement various searching and sorting techniques

MAPPING OF COs & POs:

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

UNIT I
Pointers: Pointer variable and its importance, Pointer variable declaration, initialization of pointer variables, how to access a value from a memory location through it‘s pointer variable. Arithmetic operations on pointer variables, Scale factor length. Pointers and functions - pointers as function arguments (i.e., call-by-reference), Pointers and Arrays, Pointers and Strings, Generic Pointers.
Learning Outcomes: Student should be able to
1) Explain different types of pointers and their usage. (L2)
2) Understand, solving of arithmetic operations on pointer variables (L2)
3) Apply pointers on functions, arrays and strings (L4)

UNIT II
Structure and Unions In C Language: Structures – Introduction, Features of Structures. Declaration and Initialization of Structures, Accessing structure members, structure initialization. Nested Structures, Array of Structures, Arrays within structures and Pointers to Structures, Structures and Functions, Unions, typedef. Example Programs on the topics mentioned above.
Learning Outcomes: Student should be able to
1) Use Structures and Unions in applications using C programming. (L3)
2) Apply the structures and union concepts to solve real world problems. (L2)

UNIT III
Introduction to Data Structures: Classification of data structures, dynamic memory allocation functions in C language.

Stacks: Definition, Various representation methods, operations on stacks and their implementation in C language, applications of stacks.
Learning Outcomes: Student should be able to

1) Apply the concepts of Data structures to solve the real world problems (L4)
2) Understand the concepts of Stacks and also its applications (L2)
3) Describe the operations of Stacks. (L2)

UNIT IV
Queues: Definition, Various representation methods, operations on queues and their implementation in C language, applications of queues. Circular queues- operations on circular queues and their implementation in C language.
Learning Outcomes: Student should be able to

1) Understand the concepts of Queues and also its applications (L2)
2) Describe the operations of Queues. (L2)

UNIT V
Linked Lists: Definition, Various representation methods, operations on linked lists and their implementation in C language.
Learning Outcomes: Student should be able to

1) Understand the concepts of Linked list (L2)
2) Use the linked lists in various operations. (L3)

UNIT VI
Searching and Sorting Techniques: Searching Techniques - Linear search and Binary Search Techniques. Sorting techniques - Bubble Sort, Selection Sort, Insertion Sort. Implementation of all the above mentioned techniques in C language and trace them by giving different test data.
Learning Outcomes: Student should be able to

1) Design the different sorting techniques (L6)
2) Use Linear search and Binary search methods. (L3)

TEXT BOOKS:

1) PradipDey and ManasGhosh, Programming in C, Oxford University Press, 2nd Edition 2011.
2) B.A.Forouzon and R.F. Gilberg, “COMPUTER SCIENCE: A Structured Programming Approach Using C”, Third edition, CENGAGE Learning, 2016

REFERENCE BOOKS:

1) Byron Gottfried, “Programming with C”, Schaum’s Outlines, 2nd Edition, TATA McGraw-Hill.
2) M.T.Somashekara, “Problem Solving Using C”, PHI, 2nd Edition 2009.
3) A.K.Sharma, Computer Fundamentals and Programming in C, 2nd Edition, University Press
4) Rajaraman V., "The Fundamentals of Computers", 4th Edition, Prentice Hall of India, 2006.
5) R S Bichker, "Programming in C", University Press, 2012.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS))

L	T	C
2	1	3

(A0503202) MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To teach students notations used in the discrete mathematics associated with computer science and engineering.
- To teach the rudiments of elementary mathematical reasoning (elementary proofs; proofs by induction).
- To prepare students for the theoretical parts of all further courses in CSE.
- To study logic and Boolean algebra from a mathematical perspective, but relating it to computer engineering applications.
- To introduce basic set-theoretical notions: relations, functions, graphs, equivalence relations and orderings.
- To relate these notions to applications in CSE.

COURSE OUTCOMES:
- Understand the truth tables, the concept of logical equivalence, normal forms. And express English assertions in symbolic form and in predicate calculus using quantifiers.
- Gain knowledge on how to check validity of premises using different methods such as rule-cp, indirect method, and direct method.
- Know the basics of relations, functions and lattices.
- Perceive the Fundamentals of algebraic structures.
- Know the fundamentals of graph theory and traversing techniques of graphs.
- Know the applications of graphs such as Euler circuits, Hamiltonian graphs, Isomorphism, and Chromatic number

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	-	2	-	-	-	-	-	-	-
CO2	2	1	-	-	1	-	-	-	-	-	-	-
CO3	2	1	-	-	1	-	-	-	-	-	-	-
CO4	2	1	-	-	2	-	-	-	-	-	-	-
CO5	1	1	-	-	1	-	-	-	-	-	-	-
CO6	2	1	-	-	1	-	-	-	-	-	-	-

UNIT-I
Mathematical Logic: Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, converse, inverse and contrapositive, equivalence, implication, Normal forms.

UNIT-II
Predicates: Rules of inference, Consistency, Predicate calculus: Free and bounded variable, Quantifiers: Universal Quantifiers, Existential Quantifiers.

UNIT-III
Relations: Relations, Properties of binary Relations, Types of relations: equivalence, compatibility and partial ordering relations, Hasse diagram. Lattices and its properties.
Functions: introduction to Functions, types of functions

UNIT-IV
Algebraic structures: Algebraic systems with examples and general properties, semi groups and monoids, groups & its types, Introduction to homomorphism and Isomorphism (Proof of theorems are not required)

UNIT-V

Graph Theory: Representation of Graph, DFS, BFS, Spanning Trees, planar Graphs.

UNIT-VI

Graph Theory and Applications: Directed Graphs, Graphs, Basic Concepts of Isomorphism and Sub graphs, walks and their classification, Multi graphs and Euler circuits, Hamiltonian graphs, Euler‘s formula & its applications, Chromatic Numbers.

TEXT BOOKS:

1) Discrete Mathematical Structures with applications to computer science Trembly J.P. & Manohar .P, TMH, 2017**.(unit-1 to 4)**
2) Discrete Mathematics for Computer Scientists & Mathematicians, J.L. Mott, A. Kandel, T.P. Baker Prentice Hall, 2008.**(unit-5 to 6)**

REFERENCES:

1) Mathematical foundations of computer science Dr D.S.Chandrasekharaiah Prism books Pvt Ltd, 2012.
2) Discrete Mathematics, R.K. Bisht, H.S. Dhami, Oxford, 7th Edition, 2012.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS))

L	P	C
2	1	3

(A0003201) ENGLISH FOR ENGINEERS

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES

- English for Engineers is prescribed to make students communicate their thoughts, opinions and ideas freely in real life situations.
- To improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- To equip students with professional skills&soft skills
- Develop Communication skills in formal and informal situations.

COURSE OUTCOMES

- Students will be able to use creativity in writing such as E-mails, Reports, Resume writing and Info- Graphics to enhance engineering abilities
- Students will analyze the concepts of critical and analytical Reading skills to understand needs of engineering in society by using modern tools
- Students will be able to develop flair for any kind of writing with rich vocabulary to enhance communicative skills
- Students will understand the basic Grammar techniques and utilize it for language development
- Students will apply the strategies of Soft skills & Ethical components

MAPPING OF COS & POS:

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

UNIT- I

a) Reading: Skimming the text for theme
   Reading Text: Engineering in Society by Sarah Bell
b) Grammar: Types of Sentences - Demonstratives- Articles- Prepositions
c) Writing: Paragraph Writing & Practice
d) Vocabulary: Root words - Word lists from Word power Made Easy by Norman Lewis
   Method of Teaching: Analyzing the theme of Reading Prescribed Text, Worksheets on Articles & Prepositions, Assignment on Short paragraphs, Vocabulary activities through worksheets.

UNIT- II

a) Reading: Scanning the text for specific details
   Reading Text: Sultana's Dream by Begum Rokeya
b) Grammar: Tenses & Usage
c) Writing: Formal Letters and E-mail writing – Tips & Practice
d) Vocabulary: Homonyms - Word lists & Practice
   Method of Teaching: Classroom discussion &critical appreciation of the Reading Lesson, Worksheets on Tenses, Practice of Formal Letters, Vocabulary Quizzes- Assignment.

UNIT- III

a) Reading: Note-making (identifying the main ideas and making notes)

Reading text: Satya Nadella: When Empathy is Good for Business
https://www.morningfuture.com

b) Grammar: Framing questions –Wh Qs - Yes/No questions - Question Tags
c) Writing: Resume & Cover letter Writing- Tips &Practice
d) Vocabulary: Synonyms & Antonyms
Method of teaching: Class room Discussions, Student Activity on Questions,E-mail writing, Vocabulary activities through games- Practice- Assignment.

UNIT – IV

a) Reading: Summarizing
Reading Text: Life is a Pizza by Richard Templar from Rules of Life
b) Grammar: If Clauses – Usage & Practice
c) Writing: Writing Definitions – Process of Writing - Tips & Practice
d) Vocabulary: Idioms & Phrases- Practice
Method of Teaching: Discussion & Assignment, If Clauses from Newspapers, Preparing profiles for Resume, Vocabulary activities through worksheets

UNIT – V

a) Reading: Intensive reading (reading for every detail)
Reading text: What is a Drone: Main Features & Applications of Today's Drones by Jack Brown
b) Grammar: Active Voice –Passive Voice- Usage
c) Writing: Report Writing- Types - Practice
d) Vocabulary: Technical Terms- Word Lists- Practice
Method of Teaching: Assignment on Drones, Worksheets on Active/ Passive voice**,** Watch a Documentary on social issues and draft a Report, Technical Terms- Quiz.

UNIT- VI

a) Reading: Appreciating a poem (focus on genre)
Reading text: Where the mind is without fear by Rabindranath Tagore
b) Grammar: Direct & Indirect Speech - Common Errors- Practice
c) Writing: Info-Graphics- Types- Practice
d) Vocabulary: Foreign Derived Words- Word Lists from Norman Lewis Word Power Made Easy
Method of teaching: Learner's interaction on the poem, Practicing Grammar through on line tests, practice reading and understanding graphs, Quiz & worksheets.

REFERENCE TEXTS:

1) English Language & Communication Skills for Engineers (AICTE Syllabus) by Sanjay Kumar & Pushpa Latha, Oxford University Press, 2018
2) Practical English Usage by Michael Swan, Oxford University Press.
3) Technical Communication, Principles and Practice by Meenakshi Raman & Sangeetha Sharama, Oxford University Press, 2016
4) Word Power Made Easy by Norman Lewis, Goyal Publications.
5) 4000 Essential English Words 3 by Paul Nation, Compass Publishing, 2009.
6) GRE/TOEFL Sources to teach vocabulary

ONLINE SOURCES FOR PRESCRIBED READING TEXTS:

https://www.morningfuture.com
https://www.raeng.org.uk/publications/reports/engineering-in-society

https://digital.library.upenn.edu/women/sultana/dream/dream.html,
https://www.mydronelab.com/blog/what-is-a-drone.html
https://www. Freealbaab.free.fr › The Rules of Life PDF
https://www.poetryfoundation.org ›Gitanjali 35 by Rabindranath Tagore | Poetry Foundation

ONLINE SOURCES FOR PRESCRIBED LISTENING SKILLS:

https://learnenglish.britishcouncil.org/skills/listening
https://agendaweb.org/listening/comprehension-exercises.html
https://www.123listening.com/
https://www.linguahouse.com/learning-english/skill-4-learners/listening
https://www.talkenglish.com/listening/listen.aspx
https://ed.ted.com/

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS))

L	T	C
2	0	0

(A0010202) ENVIRONMENTAL SCIENCE

(Mandatory Learning Course)

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Environmental education should have an interdisciplinary approach by including physical, chemical, biological as well as socio-cultural aspects of the environment. It should build a bridge between biology and technology.

COURSE OUTCOMES:

- Understand environmental problems arising due to developmental activities.
- Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
- Identify the natural resources and suitable methods for conservation of environment.
- Identify the environmental pollutants and abatement devices.
- Adopt practices that help in promoting balance in nature by making judicious utilization of recourses.

UNIT I MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL SCIENCE

Environment -Definition, Scope, Importance and Need for public awareness. Segments of Environment (Atmosphere, Lithosphere, Hydrosphere and Biosphere).

UNIT II RESOURCES AND UTILIZATION

Renewable and Non-renewable resources.

a) Natural Resources: Soil &Water sources (conflicts of over utilization of water Resources - Hydro power project-problems), forest & mineral resources – Utilization-problems.
b) Non-conventional resources of energy (Solar Energy, wind energy and their applications)

UNIT III

a) **CONCEPTS OF ECO-SYSTEM**
   Structure and functions of an ecosystem: Producers, Consumers and Decomposers-Interaction between biotic and abiotic factors in an ecosystem- Trophic levels- Food chain- Food web –Ecological Pyramid.
b) **TYPES OF ECOSYSTEM**
   Understanding the types of ecosystem: (i) Terrestrial (forest)(ii) Aquatic – (Marine)

UNIT IV BIODIVERSITY

Introduction – Definition – Value of biodiversity- Biodiversity at global, National and Local levels-India as a mega diversity nation-Hot-spots of biodiversity-Threats to biodiversity-IUCN Red data book - Conservation of bio diversity (Insitu and Exsitu conservation methods).

UNIT V ENVIRONMENTAL POLLUTION

Introduction- Causes, effects and control measures of

a) Air pollution
b) Water pollution
c) Soil pollution
d) Noise pollution
e) Plastic pollution

Disaster management: Floods, Earthquake.

UNIT-VI

HUMAN POPULATION ISSUES

a) Demography-problems related to Population explosion- Age structure-Family welfare and family planning programme
b) Diseases- AIDS, Malaria, COVID, Cancer.
c) Human rights, Fundamental duties and Value of education.

ENVIRONMENTAL ISSUES

a) Climatic changes
b) Greenhouse effect and global warming.
c) Ozone layer depletion.
d) Acid rain

TEXT BOOKS:

1) Deswal, S and Deswal A., (2004), A Basic Course in Environmental Studies, Dhanpat Rai& Co. Delhi.
2) Anubha Kousik and C P Kousik., New age international publishers.

REFERENCES:

1) Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,
3) Ahmedabad –380 013, India, Email:mapin@icenet.net (R)
4) Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5) Clark R.S., Marine Pollution, Clanderson Press Oxford (TB)

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS)) P 3 C 1.5

(A0091201) DIGITAL ENGLISH LANGUAGE LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

The Digital English Language Lab focuses on the production and practice of sounds of language and equips students with the use of English and vocabulary in everyday situations and contexts.

COURSE OBJECTIVES:

- To facilitate the students to use language effectively in everyday social conversations
- To expose the students to the blend of self-instructional and modes of language learning teacher assisted through digital lab
- To improve the fluency and intelligibility of student in spoken English and neutralize their mother tongue influences
- To help the students to participate in group discussions, to face interviews and shape the individual language learning

COURSE OUTCOMES:

- Social interactions, greetings, self-introductions and group talk
- Improving standard pronunciation patterns and neutralize the mother tongue impact
- Developing communication through listening, reading, speaking and writing activities
- Enhancing vocabulary and grammar to develop professional language
- Improving life skills through GD and role plays practices

MAPPING OF COS& POS:

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

Digital English Language Lab consists of two parts:

1) CALL (Lab): Computer Assisted Language Learning
2) ICS (Lab): Interactivity Communication Skills

EXERCISE-I

a) Introduction to Phonetics - Speech Sounds - Vowels - Phonetic Transcription -CALL Lab
b) Ice Breaking Activity - Self Introductions (SWOT) -Social Interactions -Pair work - ICS Lab

EXERCISE-II

a) Diphthongs - Consonants - Phonetic Transcription - CALL Lab
b) Just A Minute (JAM) - ICS Lab

EXERCISE-III

a) Listening Comprehension (audio) - IELTS Testing Exercises -CALL Lab
b) Speaking Activity - Group talk - ICS Lab

EXERCISE-IV

a) Vocabulary Building - Synonyms & Antonyms - Analogy - Testing Exercises -CALL Lab
b) Narration of a Story/Event/ Describing an Object - ICS Lab

EXERCISE-V

a) Situational Dialogues - CALL Lab
b) Role Play **-** ICS Lab

EXERCISE-VI

a) Pronunciation Evaluation Testing Exercises through EPD - CALL Lab
b) Group Discussion **-** ICS Lab
   - Any student based activities

PRESCRIBED SOFTWARE:

K-VAN Solutions (licensed software)

1) Advance Communication Skills Lab
2) English Language Communication Skills Lab
3) Cambridge Advanced Learners' English Dictionary with CD
4) IELTS Academic Preparation and Practice with CD

BOOKS SUGGESTED FOR DELL: (CENTRAL LIBRARY)

1) Skill Pro – A Course in Communication Skills and Soft Skills by Prof. K. Sumakiran et.al, EMESCO.
2) Skill Pro-I Foundation Course - 4 - by Dr. G. Gulam Tariq et.al, Maruthi Publications.
3) Strengthen YourSteps – A Multimodal Course in Communication skills by Dr. M. Hari
4) Prasad et.al
5) English Pronouncing Dictionary Daniel Jones Current Edition with CD
6) English Dictionary for Advanced Learners, (with CD) International edn.Macmillan 2009.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS))

L	P	C
0	3	1.5

(A0092201) ENGINEERING CHEMISTRY LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Verify the fundamental concepts with experiments

COURSE OUTCOMES:

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

- Learning the analytical skills while doing the experiments (L3)
- prepare simple and advanced polymer materials (L2)
- Measure the concentration of the solutions by conductometric titrations (L3)
- Analyse the IR and UV-Visible Spectra of some organic compounds (L3)

MAPPING OF COs & POs:

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

LIST OF EXPERIMENTS:

1) Preparation of standard $K_2Cr_2O_7$ solution
2) Estimation of Hardness of Water by using Standard EDTA solution
3) Estimation of Copper by using Standard EDTA solution
4) Estimation of Magnesium by using Standard EDTA solution
5) Estimation of Ferrous Ion by Dichrometry.
6) Determination of Strength of given Hydrochloric Acid against standard sodium hydroxide solution by Conductometric titrations
7) Determination of Strength of given Acetic Acid against standard sodium hydroxide solution by Conductometric titrations
8) Determination of strength of mixture of acids against standard sodium hydroxide solution by conductometric method.
9) Verification of Beer-Lambert's law
10) Determine the strength of Cu(II) ion by colorimeter
11) Preparation of a simple polymer(PVC)
12) Preparation of Bakelite
13) Thin layer chromatography
14) Identification of simple organic compounds by IR and UV-Visible Spectroscopy graphs.
15) HPLC method in separation of liquid mixtures.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

I B.Tech, II-Sem (CSE(DS))

L	P	C
0	3	1.5

(A0593202) DATA STRUCTURES LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To understand how to use structures and unions as a compound data types
- To understand various basic file operations
- To understand various stack and queue operations
- To understand various linked list operations
- To understand basic searching and sorting techniques

COURSE OUTCOMES:

At the end of this course, the student would be able to

- Develop applications on user defined data types
- Apply dynamic memory allocation through pointers
- Use different data structures for create/update basic data files
- Implement linear data structures through stacks and queues
- Implement various searching and sorting techniques, Linked lists.

MAPPING OF COs & POs:

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

RECOMMENDED SYSTEMS /SOFTWARE REQUIREMENTS:

Intel based desktop PC with ANSI C Compiler and Supporting Editors

EXERCISE 1

a) Write a C Program to perform various arithmetic operations on pointer variables.
b) Write a C Program to demonstrate the following parameter passing mechanisms:
   i) Call-by-value ii) Call-by-reference

EXERCISE 2

a) Write a C Program to copy the contents of one structure variable to another structure variable.
b) Write a C program to implement nested structure to store and display the student information. The structure student contains the field‘s S.no, name, and date. Date is the nested structure and it contains the fields day, month and year.

EXERCISE 3

a) Write a C program to add two distances which is in feet and inches
b) Write a C program to illustrate passing the whole structure as argument to a function.

EXERCISE 4

a) Write a C program that uses functions to perform the following operations:
b) Writing a complex number
c) Addition of two complex numbers
d) Multiplication of two complex numbers (Note: represent complex number using a structure.)

EXERCISE 5

a) Write a C program to implement Union Concept.
b) Write a C program which copies last ‘n‘ characters from one file to another.

EXERCISE 6

Write a C program to implement the following operations on Stack using array representation

a) Push b) Pop c) Display

EXERCISE 7

Write a C program to implement the following operations on Queue using array representation

a) Insert b) Delete c)Display

EXERCISE 8

Write a C program to implement the following operations on Singly Linked list using linked representation

a) Insert b) Delete c) Display d) Search

EXERCISE 9

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order.

a) Bubble sort b) Selection sort c) Insertion sort

EXERCISE 10

Write C program to implement the following searching methods to search an element in a given list of integers

a) Linear Search b) Binary Search

REFERENCE BOOKS:

1) Programming in C, Pradeep Dey, Manas Ghosh, Oxford Higher Education
2) Computer programming and Data Structures, E.Balaguruswamy, Tata Mc Graw Hill. 2009 revised edition.
3) Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS))

L	T	C
2	1	3

(A0020203) PROBABILITY AND STATISTICS
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To familiarize the students with the foundations of probability and Statistical methods.
- To impart probability concepts and Statistical methods in various applications in Engineering.

COURSE OUTCOMES:
After completion of the course the student will be able to:
- Understand the basic probability concepts and random variables that have numerous applications in computer science.
- Apply the concept of distribution functions in web data and traffic network modeling in computer science engineering.
- Analyze statistics and its applications in simulation, data mining and reliability theory.
- Determine the process constructing linear and non-linear curves through the method of least square and understand its usage in binary mixtures.
- Identify the concept of statistical quality control in computer science and mechanical engineering.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	-	-	-	-	-	-	-	2	1	
CO2	3	3	2	2	3	-	-	-	-	-	-	-	1	2	1
CO3	2	3	2	3	2	-	-	-	-	-	-	-	1	1	2
CO4	3	2	3	2	3	-	-	-	-	-	-	-	1		1
CO5	2	3	2	3	3	-	-	-	-	-	-	-	1	1	

UNIT – I:
Data classification and Representation – Diagrammatic and Graphical representation – Measures of Central Tendency, Dispersion and its importance.
Basic concept of probability – Random variables – Expectation – Discrete and continuous distributions.

UNIT – II:
Distribution functions: Binomial Distribution – Poison Distribution and Normal Distribution – Related properties.

UNIT – III:
Test of Hypothesis: population and sample – Confidence interval of mean from normal distribution – Statistical Hypothesis – Null and Alternative hypothesis- level of significance. Test of significance – Test based on normal distribution –Z test for means and proportions.

UNIT-IV:
Small samples – t – test for one sample and two sample problem, F – testand Chi – square test (Testing of goodness of fit and independence).

UNIT – V:
Curve fitting: Fitting a straight line – Second degree curve – Exponential curve-Power curve by method of least squares.

UNIT – VI:
Correlation and Regression: Correlation: Rank correlation – Correlation Coefficient –

Karl Pearson's Coefficient Correlation – Spearman Rank Correlation.
Regression: Regression lines – Standard Error of estimation – Classification of Regression techniques – Linear Regression (LR) Model.

TEXTBOOKS/REFERENCES:

1) Probability and Statistics, T.K.V. Iyengar, B. Krishna Gandhi and Others S. Chand & Company, 2012.
2) Higher Engineering Mathematics by B.S.Grewal, Khanna Publishers, 2010.
3) Erwin kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, 2017.
4) Statistical methods by S.P.Gupta, S.Chand Publications, 2011.
5) Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2017.
6) Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.
7) https://www.barnesandnoble.com/w/advanced-engineering-mathematics-kreyszig/1100520690

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS)) L T C
2 1 3

(A0504203) PYTHON PROGRAMMING

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES: This course will enable students to:

- Learn Syntax and Semantics of various Operators used in Python.
- Understand about Various Input, Output and Control flow statements of Python.
- Understand Strings, List, Tuple, Set and Dictionary in Python.
- Implement Object Oriented Programming concepts in Python.
- Understand Exception handling and File I/O in Python.
- Understand Functions, Modules and Regular Expressions in Python.

COURSE OUTCOMES: The students should be able to:

- Examine Python syntax and semantics and be fluent in the use of various Operators of Python.
- Make use of Flow Control statements, Input / Output functions and Strings of Python.
- Demonstrate proficiency in handling of data structures like List, Tuple, Set and Dictionary.
- Demonstrate the use of Functions, Modules and File I/O operations in in Python.
- Interpret the Concepts of Object-Oriented Programming in Python.
- Interpret the various issues of Exception handling mechanisms and Regular Expressions in Python.

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1			2				1	1		1	1	1	
CO2	3	2	1		2				1	1		1	1	1	
CO3	3	3	2	1	2				1	1		2	1	2	2
CO4	3	2	1	1	2				1	1		1	1	1	1
CO5	3	3	2	1	2	1			1	1		2	2	2	2
CO6	3	3	2	1	2	2			1	1		2	2	2	2

UNIT – I:

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation. Overview on Fundamental data types of Python.

Operators in Python: Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Shift Operators, Ternary operator, Membership Operators, Identity Operators, Expressions and order of evaluations. Illustrative examples on all the above operators.

UNIT – II:

Input and Output statements: input() function, reading multiple values from the keyboard in a single line, print() function, 'sep' and 'end' attributes, Printing formatted string, replacement operator ({}). **Control flow statements:** Conditional statements. Iterative statements. Transfer statements.

Strings: Operations on string, String slicing, important methods used on string.

UNIT – III:

Lists: Operations on List, important methods used on list. List comprehensions

Tuples: Operations on tuples, important methods used on tuple.

Sets: Operations on sets, important methods used on set.

Dictionaries: Operations on Dictionaries, important methods used on dictionaries.

UNIT – IV:

Functions – Defining Functions, Calling Functions, Types of Arguments - Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful functions, Scope of the Variables in a Function. Recursive functions.

Modules: Creating modules, import statement, from Import statement.

File I/O: Need of files concept, Types of files, Opening and Closing a Text file, Reading & Writing operations on files, Setting offsets in a file, Traversing a Text file.

UNIT – V:

Object Oriented Programming (OOP) in Python: Classes and Objects, 'self-variable', Types of Variables and Methods used in Classes, Constructor Method, Inheritance, Overriding Methods, Abstract Classes, Data hiding.

UNIT – VI:

Error and Exceptions: Difference between an Error and Exception, Types of Exceptions, Handling Exceptions, try, except, else and finally blocks, control flow in try-except-else-finally blocks, Raising Exceptions, Customized Exceptions.

Regular Expressions: Character matching in regular expressions, extracting data using regular expressions.

TEXT BOOKS

1) Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2) Martin C.Brown, "The Complete Reference: Python", McGraw-Hill, 2018.

REFERENCE BOOKS

1) R.Nageswara Rao, "Core Python Programming", 2nd edition, Dreamtech Press, 2019Core Python Programming, 2016 W.Chun, Pearson.
2) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
3) https://www.w3schools.com/python/python_reference.asp
4) https://www.python.org/doc/

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS)) L T C
2 1 3

(A0507203) DATABASE MANAGEMENT SYSTEMS
For branches: EEE, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Advantages applications of DBMS and Database system structure.
- Schema design: ER model and conceptual design.
- Relational Model, Formal Query Languages and SQL basis.
- Storage and efficient retrieval of data: various indexing techniques.
- Schema refinement: normalization and redundancy removal and functional dependant.
- Transaction management: locking protocols, serializability concepts etc.

COURSE OUTCOMES: The students should be able to:
- Discuss about the need for Database, applications and its structure.
- Understand about storage and efficient retrieval of large Information, constraints and formal query languages.
- Apply the basic Queries and analyse the concepts primary key, foreign key and triggers on the given data.
- Illustrate the concepts about functional dependency and explain the need for schema refinement (normalization) to remove redundancy of data.
- Define and examine about transaction management concurrency Control on the data.
- Describe about various storage and indexing methods and RAID concepts.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				1							1	1		
CO2	1											1	1	2	2
CO3	1	1	2	1								1	1	3	
CO4	2	1	1	3	1						2	1	1		1
CO5	1	1	1	1	1							1	1	1	1
CO6	2	1	1	1	2							1	1	1	1

UNIT I:
Database System Applications, database System VS file System – View of Data – Data Abstraction –Instances and Schemas – data Models – the ER Model – Relational Model – Database Languages – DDL – DML – Database Access for applications Programs – Database Users and Administrator – Transaction Management – Database System Structure – Storage Manager – the Query Processor- Data base design and ER diagrams – Beyond ER Design- Entities, Attributes and Entity sets – Relationships and Relationship sets – Additional features of ER Model – Conceptual Design with the ER Model, Data Types.

UNIT II:
Introduction to the Relational Model – Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data – Logical database Design – Introduction to Views – Destroying /altering Tables and Views. Relational Algebra – Selection and projection set operations – renaming – Joins – Division – Examples of Algebra queries – Relational calculus – Tuple relational Calculus – Domain relational calculus.

UNIT III:
The Form of a Basic SQL Query – Examples of Basic SQL Queries – Introduction to Nested Queries – Correlated Nested Queries, Set – Comparison Operators – Aggregate Operators – NULL values – Comparison using Null values – Logical connectivity's – AND, OR and NOT

– Impact on SQL Constructs – Outer Joins – Disallowing NULL values – Complex Integrity Constraints in SQL, Triggers and Active Data bases.

UNIT IV:

Schema refinement – Problems Caused by redundancy – Decompositions – Problems related to decomposition – Functional dependencies-reasoning about FDS – FIRST, SECOND, THIRD Normal forms – BCNF – Lossless join Decomposition – Dependency preserving Decomposition – Schema refinement in Data base Design – Multi valued Dependencies – FORTH Normal Form.

UNIT V:

Overview Of Transaction Management: The ACID Properties, Transactions and Schedules, Concurrent Execution of transactions-Lock Based Concurrency Control, Performance of Locking, Transaction Support in SQL.

Concurrency Control: 2PL, Serializability and recoverability, Introduction Lock Management, Lock Conversions, Dealing with Deadlocks, Concurrency control without locking.

UNIT VI:

Data on External Storage – File Organizations and Indexing – Cluster Indexes, Primary and Secondary Indexes – Index data Structures – Hash Based Indexing – Tree base Indexing – Comparison of File Organizations – The Memory Hierarchy, RAID, Disk Space Management, Buffer Manager, Files of Records, Page Formats, record Formats.

TEXT BOOKS:

1. Data base Management Systems, Raghu Ramakrishna, Johannes Gehrke, TATA McGraw Hill 3rd Edition 2017
2. Data base System Concepts, Silberschatz, Korth, McGraw hill, 6 edition, 2013.

REFERENCES:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 11th Edition, 2016.
2. Fundamentals of Database Systems, ElmasriNavathe Pearson Education.
3. Introduction to Database Systems, C.J.Date Pearson Education.
4. https://www.oreilly.com/library/view/concepts-of-database/9789332537422/xhtml/bibliography.xhtml
5. https://en.wikipedia.org/wiki/Database
6. https://www.sanfoundry.com/best-reference-books-database-management-systems/

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS)) L T C
2 1 3

(A0508203) FORMAL LANGUAGES AND AUTOMATA THEORY
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
The purpose of this course is to acquaint the student with an overview of the theoretical foundations of computer science from the perspective of formal languages.
- ❖ Classify machines by their power to recognize languages.
- ❖ Employ finite state machines to solve problems in computing.
- ❖ Explain deterministic and non-deterministic machines.
- ❖ Comprehend the hierarchy of problems arising in the computer sciences.

COURSE OUTCOMES: The students should be able to:
- ❖ Understand abstract models of information processing machines and limits of digital computation.
- ❖ Prepare for the study of programming languages and compilers.
- ❖ Design structural description of language statements.
- ❖ Develop the skills of formal and abstract reasoning as needed; for example, when designing, analysing, and / or verifying complex software/hardware systems.
- ❖ Illustrate analytical and intuitively thinking for problem-solving situations in related areas of theory in computer science.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												1		
CO2	2											1			
CO3	1		2									1			
CO4	1	2	2	1	1						2	1	1	1	
CO5	2	3		1								1	1	1	3

UNIT I:
Automata: Why study Automata Theory: introduction to FA, Structural Representations, Automata and complexity.
The central concepts of Automata: Alphabet**,** Strings, Language and Operations.
Deterministic finite automaton: definition, How DFA processes Strings, Simpler notations for DFA's, extending the transition Function to Strings, The Language of a DFA and minimization of FSM.

UNIT II:
Non deterministic finite automaton: An informal view of NFA, Definition, The extended Transition Function, The language of an NFA, Equivalence of DFA and NFA.
Finite Automata with € transitions: use of € transitions, Notation, Epsilon closures, Eliminating € Transitions: €-NFA to DFA conversion.
Finite Automata with output: Moore and Melay machines.

UNIT III:
Regular Languages: Regular expressions, identity rules for regular expressions, Arden's Theorem.
Finite Automata and regular expressions: Converting a regular expression to a finite automata, Converting finite automata to a regular expression, Converting DFA's to Regular Expressions by Eliminating States(state elimination method), Converting finite automata to a regular expression using Algebraic method (using Arden's theorem), Equivalence of two finite

automata. Pumping lemma of regular sets, Applications of pumping lemma, closure properties of regular sets (proofs not required).

UNIT IV:

Context free grammar and Languages- Chomsky hierarchy of languages, Definition of CFG, Right most and leftmost derivations, The language of a grammar, Sentential Forms.

Regular grammars: construction of Regular grammar generating for a given DFA. Constructing a FA for given RG.

Parse Trees: Constructing Parse Trees, Application of CFG.

Ambiguity in grammars and Languages: Ambiguous grammars.

UNIT V:

Properties of CFL-Normal Forms for CFG: Eliminating Useless Symbols, Computing the generating and reachable symbols, Eliminating €- productions, Eliminating unit productions, Chomsky normal form, Greibach normal form, Pumping Lemma for CFL and Closure properties of CFL (proofs are not required).

Push Down Automata- PDA: definition, model, graphical notation for PDA's, Instantaneous Descriptions of a PDA and The Language of a PDA.

UNIT VI:

Introduction to Turing Machines-TM: notation for the Turing Machine, Instantaneous Descriptions for TM, Transition Diagrams for TM, The language of a TM.

Extensions to the basic TM: Multi-tape TM, NDTM, Restricted Turing machines: Multi-stack machines, Counter Machines. Universal Turing Machine, Church's thesis, Linear bounded automata and context sensitive languages, Undecidability, Recursive and recursively enumerable languages, Post's Correspondence Problem.

TEXT BOOKS:

1) "Introduction to Automata Theory Languages and Computation". John E. Hopcroft, Rajeev Motwani and Jeffery D. Ullman. Pearson Education – third edition 2008.
2) Formal Language and Automata Theory by KVN Sunitha ,Tata McGraw Hill Education 2010

REFERENCES:

1) "Theory of Computer Science (Automata languages and computation)" K. L. P. Mishra and N. Chandra Shekaran, 2nd edition, 2006 PHI. (UNIT II)
2) Theory of Computation, Vivek Kulkarni, Oxford, 7 Edition
3) Formal Languages and Automata Theory, C.K. Nagpal.
4) https://www.oreilly.com/library/view/introduction-to-automata/9788131793510/xhtml/references.xhtml
5) https://www.ics.uci.edu/~goodrich/teach/cs162/notes/

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS)) L T C
2 1 3

(A3201203) FOUNDATIONS OF DATA SCIENCE
For branches: CSE & CSE(DS)

COURSE OBJECTIVES:
- To provide fundamentals for data science and application areas related to data science and understand the underlying core concepts in data science.

COURSE OUTCOMES:
- Explore the fundamental concepts of data science.
- Understand data pre-processing and data analysis techniques for data oriented applications.
- Understand various model development algorithms used in data science.
- Visualize and present the inference using various tools
- Understand various measures to evaluate the model for decision support system.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3												2		
CO2	1	1		1								1	1	1	3
CO3	1	1	2	1								1	1	2	1
CO4	1	1	2	1	2							1	1		1
CO5	1	1	1	1	1							1	1	3	1

UNIT – I: INTRODUCTION
Introduction to Data Science – Evolution of Data Science – Data Science Roles – Stages in a Data Science Project – Applications of Data Science in various fields – Data Security Issues.

UNIT – II: DATA COLLECTION AND DATA PRE-PROCESSING
Data Collection Strategies – Data Pre-Processing Overview – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization.

UNIT – III: EXPLORATORY DATA ANALYTICS
Descriptive Statistics – Mean, Standard Deviation, Skewness and Kurtosis – Box Plots –Scatter Plot, Pivot Table – Heat Map – Correlation Statistics – ANOVA.

UNIT – IV: MODEL DEVELOPMENT
Simple and Multiple Regression – Model Evaluation using Visualization – Residual Plot – Distribution Plot – Polynomial Regression and Pipelines – Measures for In-sample Evaluation – Prediction and Decision Making.

UNIT – V:
Classification: Classification Vs. Prediction, preparing data for classification and prediction, comparing classification and prediction methods, overview of classifiers (Bayes Classifier, Decision Tree Classification, Nearest Neighbour Classifier, Neural Networks). Definition of cluster, cluster requirements, types of data in cluster analysis, overview of clustering methods (K-Means).

UNIT –VI: MODEL EVALUATION
Generalization Error – Out-of-Sample Evaluation Metrics – Cross Validation – Overfitting – Under Fitting and Model Selection – Prediction by using Ridge Regression – Testing Multiple Parameters by using Grid Search

TEXT BOOKS:

1) Jojo Moolayil, "Smarter Decisions: The Intersection of IoT and Data Science", PACKT, 2016.
2) Cathy O'Neil and Rachel Schutt, "Doing Data Science", O'Reilly, 2015.
3) David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013.
4) Data Mining – Concepts and Techniques, Jiawei Han & Micheline Kamber, 3rd Edition, Elsevier,2011
5) Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS)) L T C
1 2 2

(A0012203) DESIGN THINKING AND INNOVATIONS
(Skill Development Course)
For branches: CE, EEE, ME, ECE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To create awareness of design thinking among students of engineering
- To teach a systematic approach to identifying and defining a problem before brainstorming for a solution
- To instil a sense of significance towards applying creativity to product and service design
- To motivate students to apply design thinking while implementing a project focusing on local or global societal problems

COURSE OUTCOMES: After completion of this course, the student will be able to
- Identify design principles from an engineering perspective
- Cultivate sensitivity towards design aspects of Activities, Environments, Interactions, Objects, and Users (A-E-I-O-U) in daily life.
- Validate problem statements through user empathisation with societal and environmental consciousness.
- Devise visual design and documentation to communicate more effectively.
- Develop project management skills in a multidisciplinary environment

STUDENTS' RESPONSIBILITIES:
1. Forming diverse teams of 3–5 members each to work collaboratively throughout the semester.
2. Proactively engaging to observe the objects and interactions in their daily life and society from a design perspective.
3. Identifying general societal and social problems that may be effectively addressed using design thinking principles
4. Presenting and reporting the tasks to the concerned faculty members using their creative communication and people skills.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								1	2	2	1			2	
CO2				1		2	1				1		2		1
CO3		1	1			2	1				1		1		2
CO4						1				1			1		1

UNIT – I
Introduction, what is design thinking, the traditional model of innovation, The model of design thinking, Design thinking is not old, Design thinking is to innovation, The sweet spot of design thinking.
Why design thinking now?: Products & Services, Multifaceted problems, fast becoming B2C, wide spread digitization, Customer knowledgeable, Clash of business models, Challenging markets.

UNIT – II
Key tenets of Design thinking, Human centric, Focus on subject not object, Problem solving with the customer not for the customer, Thinking beyond products, Striking balance, Think Broad, Solution Generation, validation, root causes, What else, visualize your thinking, Fail

often.
Inspire: Create a stretch, Get the design brief right, Adopt the power of metaphors, Widen the aperture, Bring on diversity, The learning personas, the organizing personas, the building personas,.

UNIT - III
Empathize and Define: The traditional market research is broken, Create new channels to listen to customers, Be the customer you wish to serve, Leverage technology, Get to the customers, Do not limit empathy to customers, Engineering empathy, Mind mapping, Stake holder map, Customer journey map, Empathy map, Picking problem worth solving, Framing problem sharply, Innovating in absence of customer.

UNIT - IV
Ideate: Ideas are like Lego blocks, Hybrid brain storming, Intersection of disciplines, Imitate with grace, Braking the pattern, Challenging assumptions, Value chain, Looking beyond current users, Designing for extreme, Analogous design, Triggering ideation.
Prototype and Test: The high cost of just doing it, seeking clarity, Be quick and dirty, Manageable hypotheses, Doing last experiment first, Visualize through storyboarding and scenarios, Engaging through stories, Is dogfooding enough?, Solicit feedback, Inventory prototypes.

UNIT - V
Scale: Keep the main thing as the main thing, cut some slack, Leaders must show up, Provide 'air cover', cultivate innovation evangelists, Measure for impact, Don't confuse empathy with good business sense.
Design Thinking in action: A two day Design thinking workshop, session objectives, Ground rules, workshop flow, mentoring programme, Build your own version of design thinking programme, offer avenues to practice design thinking, think beyond, Juggad, pay attention to the physical space, trust the process

UNIT - VI
How to be a Design Thinker Live curious, Listen with intent, observe with purpose, Defer your judgement, Hone multiple affiliations, Be a T-shaped person, develop failure tolerance.
Case studies of Design thinking like Chota Cool, Indian post box, Big Bazar, Reliance, royal Enfield etc. (Any other case studies may also be considered).

TEXT BOOKS:

1) Pavan Soni, Design your thinking, Penguin Random house India, 2020.
2) Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization", John Wiley & Sons (2012) (ISBN: 978-1118083468)
3) Jeanne Liedtka and Tim Ogilvie , Designing for Growth: A Design Thinking Tool Kit for Managers, Columbia Business School Publishing, E-ISBN 978-0-231-52796-5
4) B. K. Chakravarthy, Janaki Krishnamoorthi, Innovation By Design: Lessons from Post Box Design & Development, Springer India, 2013
5) Donald A. Norman, "The Design of Everyday Things", MIT Press, 2013 (ISBN: 978-0262525671)
6) Tom Kelly, Jonathan Littman, "The Art of Innovation", HarperCollins Business, 2002 (ISBN: 978-0007102938)

REFERENCE BOOKS:

1) Kishore Biyani, It happened in India: The story of Pantaloons, Big Bazar, Central and the Great Indian Consumer, Rupa Publications, New Delhi, 2007.

2) V. Kasturi Rangan and Mona Sinha, Hindustan Unilever's "Pureit" water purifier, a Harvard Business School case Study, 1 February 2011.
3) Kelley and Littman, The Ten Faces of Innovation: IDEO's Strategies for Beating the Devil's Advocate and Driving Creativity Throughout Your Organization
4) Ravi Arora, Igniting Innovation: The Tata Way, Harper Business, New Delhi, 2019.
5) Ashton, How to fly a Horse: The Secret History of Creation, Invention, and Discovery.
6) Kelley, The Art of Innovation: Lessons in Creativity From IDEO, America's Leading Design Firm.
7) Rishika T. Krishnan, From Juggad to Systematic innovation: the challenge for India, The Utpreraka Foundation, 2010.
8) Eric Schmidt and Jonathan Rosenberg, How Google Works, Grand Central Publising, New York, 2014.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS))

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(A0014203) INDIAN HERITAGE & CULTURE
(Mandatory Learning Course)

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

INTRODUCTION:

Indian Heritage is an ancient facet pertaining to bygone ages. It reflects strong ethical culture and embodiment of nature in life style. It had its deep roots in great Indian epics and Upanishads. It has been transformed and strengthened by many kings and queens. It is revived by erudite writers. The glory of Indian Heritage & culture have been ignored or distorted in wake of western culture. The present generation ought to know their indigenous culture and heritage and apply the wisdom to the current core working aspects.

COURSE OBJECTIVES:

- To enable the students to have an insight into and understanding of the great heritage and culture of India.
- To sensitize them towards preservation and progression of the composite culture of India
- To make students learn soft skills and life skills from ancient treatise
- Relevance of architecture & ancient principle to the current engineering scenario

COURSE OUTCOMES:

- Equip learners with knowledge of the heritage and culture of India.
- Acquire Leadership & Soft skills from great leaders of India
- Apply the ancient wisdom to become successful professionals
- To make them understand diversity of culture and national integrity

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						2	1						1		
CO2						2	1		1	2			1		
CO3						2	1	1						1	
CO4						2	1		1						1

UNIT-I:

Origin of Indian Culture & Heritage –Indus valley Civilization - Time line of Indian empires - Cultural & social conditions of India under Mauryas, Guptas & the Sathavahanas

UNIT-II:

Influence of Islam on Indian Culture - Leadership skills from Akbar the Great & Krishnadeva Raya - World Heritage Sites in India

UNIT-III:

Great Indian Epics – Life skills from Ramayana and Mahabharata – Ethics from Upanishads &- Vedas - Pathanjali Yoga -Principles of Jainism, Buddhism & Sufism

UNIT-IV:

Indian Art Forms –Literature - Rabindranath Tagore - RK.Narayan - Sri Sri - Jashuva – Music - Saint Tyagaraja, Annamayya -Purandhara Das - Kabir Das- Dance Forms of India

UNIT-V:

Social awakening and Social reform movements -Theosophical Society - Emancipation of Women in pre-independent era

UNIT-VI:

Mahatma Gandhi – Non-violence and Satyagraha – Great leaders of Freedom struggle – Subhash Chandra Bose – Bhagath Singh –Moulana Abul Kalam Azad – B.R.Ambedkar - Post Independent Era.

TEXT BOOK

1) Madanlal Malpani & ShamsunderMalpani (2009), ***Indian Heritage and Culture,*** New Delhi: Kalyani Publishers.

REFERENCE BOOKS

1) Romila Thapar (2018), Indian Cultures as Heritage: Contemporary Pasts, India.
2) Anurag Mathur (2017), Indian Culture & Heritage, Create space independent publishing Platform, 2017.
3) P.R.Rao & P. Raghavendra, Indian Heritage and culture, Sterling Publication Pvt. Ltd.
4) Madhukar kumar Bhagat, Indian Heritage and culture, Access Publications.
5) Dhirendra Singh, Indian Heritage and culture, APH Publications.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS))

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(A0571203) PYTHON PROGRAMMING LAB

For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To be able to introduce core programming basics and various Operators and flow control statements of Python programming language through proper practice.
- To demonstrate about various Python fundamental data structures such as int, float, complex, bool and strings.
- To demonstrate about Python data structures like Lists, Tuples, Sets and dictionaries.
- To demonstrate about Functions, Modules and File Input - Output operations in Python programming language.
- To demonstrate about Object Oriented Programming in Python Programming.
- To understand about and Exception handling mechanisms and Regular Expressions in Python Programming.

COURSE OUTCOMES:

- Student should be able to understand the basic concepts of scripting and the contributions of scripting language.
- Student should be able to explore Fundamental data structures in Python.
- Student should be able to explore python data structures like Lists, Tuples ,Sets and dictionaries.
- Student should be able to explore Functions, Modules and File input – Output Operations in Python programming language.
- Student should be able to explore Object Oriented Programming in Python Programming.
- Student should be able to create practical and contemporary applications using Exception handling mechanisms and Regular Expressions.

MAPPING OF COs & POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	3	1			1				1	1		1	2	1	1
CO 2	3	3	2		2				1	1		1	1	1	1
CO 3	3	2	2	1	2				1	1		2	1	2	1
CO 4	3	2	1		2				1	1		1	1	2	
CO 5	3	3	1	1	1				1	1		2	2	2	2
CO 6	3	3	1	1	1				1	1		2	2	2	2

S.No	Name of the Experiment
1	a) Demonstrate about Basics of Python Programming.
	b) Demonstrate about fundamental Data types in Python Programming. (i.e., int, float, complex, bool and string types)
	c) Demonstrate the working of following functions in Python. i) id( ) ii) type( ) iii) range( )
	d) Write a Python program to demonstrate various base conversion functions.
	e) Write a Python program to demonstrate various type conversion functions.
2	a) Demonstrate the following Operators in Python with suitable examples. i) Arithmetic Operators ii) Relational Operators iii) Assignment Operator iv) Logical Operators v) Bit wise Operators vi) Ternary Operator vii) Membership Operators viii) Identity Operators

3	a) Write Python programs to demonstrate the following: i) input( ) ii) print( ) iii) 'sep' attribute iv) 'end' attribute v) replacement Operator ({ })
	b) Demonstrate the following Conditional statements in Python with suitable examples. i) if statement ii) if else statement iii) if – elif – else statement
	c) Demonstrate the following Iterative statements in Python with suitable examples. i) while loop ii) for loop
	d) Demonstrate the following control transfer statements in Python with suitable examples. i) break ii) continue iii) pass
4	Write Python programs to print the following Patterns:
	i) A A B A B C A B C D A B C D E ii) * * * * * * * * * * * * * * *
	iii) E E E E E E E E E D D D D D D D C C C C C B B B A iv) 4 4 3 4 3 2 4 3 2 1 4 3 2 1 0 4 3 2 1 4 3 2 4 3 4
	v) 4 3 4 2 3 4 1 2 3 4 0 1 2 3 4 1 2 3 4 2 3 4 3 4 4 vi) * * ** ** *** *** **** **** **********
	vii) ** ** **** **** ****** ****** ******** ******** ********** ********** viii) E D E C D E B C D E A B C D E B C D E C D E D E E
5	a) Write a Python program to demonstrate various ways of accessing the string. i) By using Indexing (Both Positive and Negative) ii) By using Slice Operator

	b) Demonstrate the following functions/methods which operates on strings in Python with suitable examples: i) len( ) ii) strip( ) iii) rstrip( ) iv) lstrip( ) v) find( ) vi) rfind( ) vii) index( ) viii) rindex() ix) count( ) x) replace( ) xi) split( ) xii) join( ) xiii) upper( ) xiv) lower( ) xv) swapcase( ) xvi) title( ) xvii) capitalize( ) xviii) startswith() xix) endswith()
6	a) Demonstrate the different ways of creating list objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on lists in Python with suitable examples: i) list( ) ii) split( ) iii) len( ) iv) count( ) v) index ( ) vi) append( ) vii) insert( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )
	c) Demonstrate the following with suitable example programs: i) List slicing ii) List Comprehensions
7	a) Demonstrate the different ways of creating tuple objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on tuples in Python with suitable examples: i) len( ) ii) count( ) iii) index( ) iv) sorted( ) v) min ( ) vi)max( ) vii) cmp( ) viii) extend() ix) remove( ) x) pop( ) xi) reverse( ) xii) sort( ) xiii) copy( ) xiv) clear( )
8	a) Demonstrate the different ways of creating set objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on sets in Python with suitable examples: i) add( ) ii) update( ) iii) copy( ) iv) pop( ) v) remove( ) vi)discard( ) vii) clear( ) viii) union() ix) intersection( ) x) difference( )
9	a) Demonstrate the different ways of creating dictionary objects with suitable example programs.
	b) Demonstrate the following functions/methods which operates on dictionary in Python with suitable examples: i) dict( ) ii) len( ) iii) clear( ) iv) get( ) v) pop( ) vi)popitem( ) vii) keys( ) viii) values() ix) items( ) x) copy( ) xi) update( )
10	a) Demonstrate the following kinds of Parameters used while writing functions in Python. i) Positional Parameters ii) Default Parameters iii)Keyword Parameters iv) Variable length Parameters
	b) Write a Python program to return multiple values at a time using a return statement.
	c) Write a Python program to demonstrate Local and Global variables.
	d) Demonstrate lambda functions in Python with suitable example programs.
11	a) Python program to perform read and write operations on a file.
	b) Python program to copy the contents of a file to another file.
	c) Python program to count frequency of characters in a given file.
	d) Python program to print each line of a file in reverse order.
	e) Python program to compute the number of characters, words and lines in a file.

12	Demonstrate various Object Oriented Programming Concepts in Python Programming with illustrative examples.
13	Demonstrate about Exception Handling in Python Programming with illustrative examples.
14	a) Demonstrate the following in-built functions to use Regular Expressions very easily in our applications. i) compile( ) ii) finditer( ) iii) match( ) iv) fullmatch( ) v) search( ) vi) findall( ) vii) sub( ) viii) subn( ) ix) split( )
	b) Write a Regular Expression to represent all RGM language (Your own language) identifiers. **Rules**: 1. The allowed characters are a-z,A-Z,0-9,#. 2. The first character should be a lower case alphabet symbol from a to k. 3. The second character should be a digit divisible by 3. 4. The length of identifier should be at least 2. Write a python program to check whether the given string is RGM language identifier or not?
	c) Write a Regular Expression to represent all 10 digit mobile numbers. **Rules:** 1. Every number should contains exactly 10 digits. 2. The first digit should be 7 or 8 or 9 Write a Python Program to check whether the given number is valid mobile number or not?

TEXT BOOKS

1. Learning Python, Mark Lutz, Orielly, 3 Edition 2007.
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson, 2017.

REFERENCE BOOKS

1) Think Python, 2 Edition, 2017 Allen Downey, Green Tea Press
2) Core Python Programming, 2016 W.Chun, Pearson.
3) Introduction to Python, 2015 Kenneth A. Lambert, Cengages
4) https://www.w3schools.com/python/python_reference.asp
5) https://www.python.org/doc/

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS))

L	P	C
0	3	1.5

(A0595203) DATABASE MANAGEMENT SYSTEMS LAB
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
Student will be able to:
- Create and delete database schemas and execute SQL queries
- Inserting data, Altering and dropping the tables.
- Various types of data conversions using the functions.
- Make Use of PL/SQL variables and Language Components.
- Make Use of Identifiers in PL/SQL.
- Make Use of Anchored Data type.

COURSE OUTCOMES:
Upon completion of the lab, the student should be able to:
- Map the model into a relational database system.
- Implement the given schema on a relational DBMS.
- Design, develop, and maintain Oracle Database Objects.
- Use a database language for manipulating and querying data.
- Develop advanced packages, stored procedures, and triggers.
- Develop various functions definitions and procedures using PL/SQL.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				1							1	1		
CO2	1											1	1	2	2
CO3	1	1	1	1								1	1	3	
CO4	2	1	1	1	1							1	1		1
CO5	1	1	1	1	1							1	1	1	1
CO6	2	1	1	1	1							1	1	1	1

Recommended Systems/Software Requirements:
- Intel based desktop PC
- Mysql /Oracle latest version Recommended.

EXPERIMENTS:
1) Creation, altering and dropping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2) Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
   Example:- Select the roll number and name of the student who secured fourth rank in the class.
3) Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4) Nested Queries and correlated nested queries
5) Table alterations
6) Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date)
7) Creating procedures
8) Creating functions and packages

9) Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers.
10) Introduction to ORACLE reports.
11) Illustrate how you can embed PL/SQL in a high-level host language such as C/Java, and demonstrates how a banking debit transaction might be done.

REFERENCES:

1. ORACLE PL/SQL by example. Benjamin Rosenzweig, Elena Silvestrova, Pearson Education 3rd Edition.
2. ORACLE DATA BASE LOG PL/SQL Programming SCOTT URMAN, Tata Mc-Graw Hill.
3. SQL & PL/SQL for Oracle 10g, Black Book, Dr.P.S. Deshpande.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. I-Sem (CSE(DS))

L	P	C
0	3	1.5

(A0596203) UNIX AND SHELL PROGRAMMING LAB

For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:

Students are expected to know most aspects of UNIX commands that are needed by a program developer or UNIX user, and some system administration. Although it is not required for this course, students are encouraged to install Linux on their personal computers.

COURSE OUTCOMES:

The student will be able to:

- Discuss the development of UNIX system over time.
- Use line and screen text editors with regular expressions.
- Explain UNIX file system including advanced file processing.
- Practice pipelining and IO redirecting.
- Explain process concepts and cooperating processes.
- Manage UNIX base networks.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		2										2		
CO2	1	1	1	1	1							1		1	
CO3	1	1	1		1							1			
CO4	2	1	1	1								1	1	1	1
CO5	1	1	1		1							1		1	1
CO6	2	1	2	1								1	1	2	2

Week 1:

1. a) Login to the system
   b) Use the appropriate command to determine your login shell
   c) Use the /etc/passwd file to verify the result of step b.
   d) Use the who command and redirect the result to a file called myfile1. Use the more command to see the contents of myfile1.
   e) Use the date and who commands in sequence (in one line) such that the output of date will display on the screen and the output of who will be redirected to a file called myfile2. Use the more command to check the contents of myfile2.
2. a) Write a sed command that deletes the first character in each line in a file.
   b) Write a sed command that deletes the character before the last character in each line in a file.
   c) Write a sed command that swaps the first and second words in each line in a file.

Week 2:

a) Pipe your /etc/passwd file to awk, and print out the home directory of each user.
b) Develop an interactive grep script that asks for a word and a file name and then tells how many lines contain that word.
c) Repeat
d) Part using awk

Week 3:

a) Write a shell script that takes a command –line argument and reports on whether it is directory, a file, or something else.

b) Write a shell script that accepts one or more file name as arguments and converts all of them to uppercase, provided they exist in the current directory.
c) Write a shell script that determines the period for which a specified user is working on the system.

Week 4:

a) Write a shell script that accepts a file name starting and ending line numbers as arguments and displays all the lines between the given line numbers.
b) Write a shell script that deletes all lines containing a specified word in one or more files supplied as arguments to it.

Week 5:

a) Write a shell script that computes the gross salary of a employee according to the following rules:
   i) If basic salary is < 1500 then HRA =10% of the basic and DA =90% of the basic.
   ii) If basic salary is >=1500 then HRA =Rs500 and DA=98% of the basic
   The basic salary is entered interactively through the key board.
b) Write a shell script that accepts two integers as its arguments and computes the value of first number raised to the power of the second number.
c) Write a shell program to generate multiplication table

Week 6:

a) Write an interactive file-handling shell program. Let it offer the user the choice of copying, removing, renaming, or linking files. Once the user has made a choice, have the program ask the user for the necessary information, such as the file name, new name and so on.
b) Write shell script that takes a login name as command – line argument and reports when that person logs in , if he/she is logged in, find out on which terminal he is working.
c) Write a shell script which receives two file names as arguments. It should check whether the two file contents are same or not. If they are same then second file should be deleted.

Week 7:

Session 1

a) Write a shell script that displays a list of all the files in the current directory to which the user has read, write and execute permissions.
b) Develop an interactive shell script that asks for a word and a file name and then tells how many times that word occurred in the file.
c) Write a shell script to perform the following string operations:
   i. To extract a sub-string from a given string.
   ii. To find the length of a given string.
d) Write a shell script to find the files which have read, write and execute permissions in the current directory.

Session 2:

a) Write a shell program to perform the following operations insertion , deletion , searching and sorting on arrays.
b) Write a shell program to reverse the rows and columns of a matrix.

Week 8:

Write a C program that takes one or more file or directory names as command line input and reports the following information on the file:

i. File type
ii. Number of links
iii. Time of last access (Note: Use stat/fstat system calls)

Week 9:
Write C programs that simulate the following unix commands: **mv, cp, ls**, (Use system calls)

Week 10:
(a) Write a C program to emulate the Unix ls –l command.
(b) Write a C program that demonstrates redirection of standard output to a file. Ex: ls > f1.
(c) Write a C program to create a child process and allow the parent to display "parent" and the child to display "child" on the screen.

Week 11:
(a) Write a shell program to demonstrate "at" command.
(b) Write a shell program to demonstrate "batch" command.

TEXT BOOKS:
1) Introduction to UNIX & SHELL programming, M.G. Venkatesh Murthy, Pearson Education.
2) Unix concepts and applications, Sumitabha Das, 4th Edition, TMH.
3) Unix for programmers and users, Gaham Glass & K. Ables, 3rd edition,Pearson education.
4) Unix and shell Programming –A text book, B.A. Forouzan & R.F. Giberg, Thomson.
5) Beginning shell scripting, E. Foster – Johnson & other, Wiley, India.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS))

L	T	C
2	1	3

(A0406203) DIGITAL LOGIC DESIGN
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Understand the different number system, its conversions and binary arithmetic.
- Know the fundamentals of Boolean algebra and theorems, Karnaugh maps including the minimization of logic functions to SOP or POS form.
- Analysis of logic circuits and optimization techniques to minimize gate count, signals, IC count, or time delay
- To strengthen the principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.
- To fortify the documentation standards for logic designs, standard sequential devices, including counters and registers.
- To understand design of logic functions using PLDs (ROM, RAM, PAL, PLA).

COURSE OUTCOMES: The student should be able to:
- Differentiate between analog and digital representations.
- Convert a number from one number system to its equivalent in of the other number system.
- Cite the advantages of the octal and hexa decimal number systems and to understand the difference between BCD and straight binary.
- Perform the three basic logic operations and construct the truth tables for the different types of gates. And Implement logic circuits using basic AND, OR and NOT gates.
- Use De-Morgan‘s theorem to simplify logic expressions and describe the concept of active LOW and active HIGH logic signals and Use Boolean algebra and K- map as tool to simplify and design logic circuits and Design simple logic circuits without the help of truth tables.
- Construct and analyze the operation of flip-flop and troubleshoot various types of flip-flop circuits.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1												1		
CO2	1	1											1		1
CO3	1	1		1	1								1		1
CO4	2	2	2	1	1							1	1	1	
CO5	2	2	2	2	1							1	1	1	
CO6	2	1	1	1								1		1	

UNIT-I

BINARY SYSTEMS: Digital Systems, Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Signed binary numbers, Binary codes, Binary Storage and Registers, Binary logic.

BOOLEAN ALGEBRA : Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions canonical and standard forms, other logic operations.

UNIT-II

LOGIC GATES AND GATE – LEVEL MINIMIZATION: Digital logic gates, and their integrated circuit numbers. The map method, Four-variable map, Five-Variable map, product of sums simplification Don‘t-care conditions, NAND and NOR implementation other Two-level

implementations, Exclusive – OR function.

UNIT - III

COMBINATIONAL LOGIC: Combinational Circuits, Analysis procedure Design procedure, Binary Adder-Substractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, Introduction to HDL,VHDL code for basic and universal logic gates, Half adder ,full adder circuits.

UNIT - IV

SYNCHRONOUS SEQUENTIAL LOGIC: Sequential circuits, latches, Flip-Flops Analysis of clocked sequential circuits, State Reduction and Assignment, Design Procedure**.**

UNIT-V

ASYNCHRONOUS SEQUENTIAL LOGIC: Introduction, Analysis Procedure, Circuits with Latches, Design Procedure .Registers, shift Registers, Ripple counters synchronous counters other counters. Sequential Programmable Devices, VHDL code for Flip-flops, decade counter.

UNIT-VI

PROGRAMMABLE LOGIC DEVICES: Introduction, Random-Access Memory, Memory Decoding, Error Detection and correction Read-only memory, Programmable logic Array, programmable Array logic, Sequential Programmable Devices.

TEXT BOOKS:

1) Digital Design –5 Edition, 2013, M.Morris Mano, Pearson Education/PHI.
2) Fundamentals of Logic Design, Roth, 7th Edition, 2020 Thomson.

REFERENCES:

1) Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.
2) Switching and Logic Design, C.V.S. Rao, Pearson Education 2005.
3) Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, 5 Edition, 2005.
4) Fundamentals of Digital Logic & Micro Computer Design, 5th Edition, 2005 M. Rafiquzzaman John Wiley.
5) https://www.computer.org/csdl/journal/lt/2015/02/06897963/13rRUxE04q2

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS)) L T C
2 1 3

(A3202204) ESSENTIAL MATHEMATICS FOR COMPUTATIONAL SCIENCES
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To understand fundamental concepts of Computational Science
- To demonstrate the proficiency on topics of linear algebra
- To learn optimization techniques for Computational Science
- To create & validate regression models & least square estimators

COURSE OUTCOMES: After completion of the course the student will be able to:
- Understand the fundamental concepts of statistics that have numerous applications in data science.
- Apply the concept of linear algebra(Algebraic &Geometric View) in data science
- Analyse various optimization techniques for data optimization
- Determine the process simple linear regression and multi linear regression in the process of data optimization
- Identify the concepts of statistical quality control in data science and and computer science engineering.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2													1	3
CO2	2	1	2	2	1							1	2	1	1
CO3	2	1	2	2	1							1	1	2	1
CO4	2	1	2	1	1							1	1	1	1
CO5	1	1	1									1	3	1	1

UNIT-I: Concepts of Linear Algebra
Matrices for Data Science – Data Representation with Example, Identification of independent Attributes, Rank, Linear relationships among attributes – Null space for Data Science, Data Matrix – Rank Nullity Theorem, Solving Linear equations – An Optimization perspective.

UNIT-II: Vector Spaces and Eigen Value problems
Vectors, Vector Addition and Multiplication by a Scalar, Vector Spaces, Dot Product, Orthogonality, Linear Transformation, Eigen Values & Singular Value Decomposition. Dimensionality Reduction – Principle Component Analysis.

UNIT-III: Linear Programming
Introduction of Linear Programming, Formation of Linear Programming problems. The Graphical Method, Simplex Method, Dual Simplex Method

UNIT-IV: Optimization techniques
Unconstrained Optimizations, Constrained Multivariate optimization, Gradient and Descent methods, Multivariate Optimization.

UNIT-V: Simple Linear Regression
Simple Linear Regression Model, Estimate Regression Coefficient, Problems, Statistical Properties of Least Square Estimators, Estimation of $\sigma 2$, Confidence Intervals and Test for $\beta 0$ & $\beta 1$, ANNOVA, Coefficient of Determination.

UNIT-VI: Multiple Linear Regression
Estimation of Model Parameters, Properties of Least Square Estimators, Test for Significance of Regression, Problems, Selecting the best Regression Model, Model Adequacy Checking.

TEXT BOOKS:

1) S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons.
2) S.P.Gupta, Statistical Methods, 33rd Edition, Sultan Chand & Sons.
3) Linear Algebra and its applications by Gilbert Strang, Cengage learning.
4) Operations Research by Er. Prem Kumar Gupta, Dr. D. S. Hira, S. Chand Publications.

REFERENCE BOOKS:

1) Miller and John E Freund, Probability and Statistics for Engineers, 5th Edition.
2) S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, 11th Edition, Sultan Chand & Sons.
3) Roxy Peck, San Luis Obispo and lowa Jay L. Devore, Introduction to Statistics and Data Analysis, 5th Edition, Cengage Learning.
4) Introduction to Data Mining, Pearson India Edition Services Ltd, 2016

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS))

L	T	C
2	1	3

(A0509204) JAVA PROGRAMMING
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
After taking this course, the student should be able to:
- To understand the concepts and skills to apply OOP in Java programming in problem solving.
- To understand the concept of polymorphism, inheritance and abstraction.
- To understand the creation of user defined packages and input output streams.
- To learn java's exception handling mechanism, and various String operations.
- To learn java's multithreading by communicating different tasks.
- To learn the collection frame work implementation.

COURSE OUTCOMES: After completion of the course the student should able to:
- Write programs using classes and objects for various client problems.
- Discover relationships among classes needed for a specific problem for understanding the inheritance, polymorphism and interfaces.
- Build directories and to develop programs that manage input/output streams.
- Understand various string handling function and error handling techniques.
- Understand to write multitasking programs by synchronization and get the knowledge on collection framework.
- Implement different forms of data structures with collection framework.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1		2							1	3	1	1
CO2	2	2	2	1	1							1	1	1	
CO3	1	1	2	1	2							1	2	1	1
CO4	1	1											1	1	
CO5	1	1											1	1	
CO6	2	2	2	1	2							1	2	1	2

UNIT-I
Introduction To Java – Overview of Java, data types, type conversion and casting, enumerated types, scope and life time of variables, operators, expressions, control statements, command line arguments, arrays, overview of classes, creations of objects, instant variables and methods, use of static, constructors, access control, usage of this, overloading methods and constructors, garbage collection.

UNIT-II
Inheritance – overview, Super and Sub classes, Member access rules, types of Inheritance, super uses, method overriding, Dynamic method dispatch, abstract classes and methods, use of final, the Object class and its methods.
Interfaces – Interfaces vs. Abstract classes, defining interfaces, implementing and extending interfaces, allowing method definitions in interfaces (Java8).

UNIT-III
Packages- Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, access protection.
Input/ Output exploring of java.io: The Java I/O Classes and Interfaces, File class, The Byte Streams and Character Streams, The Console Class, Using Stream I/O, Serialization

UNIT-IV

Strings: Strings, string functions.

Exception handling: Fundamentals, exception types, usage of try, catch, throw, throws and finally, built in exceptions, creating your own exceptions subclasses.

UNIT-V

Multithreading – overview, Main thread, creating threads, thread life cycle, creating multiple threads, use of isAlive() & join(), thread priorities, thread synchronization, inter-thread communication.

Collections Framework-1: Collections Overview, Collection Interfaces: Collection, List, Set, Sorted-Set.

UNIT-VI

Collections Framework-2: Collection Classes: Array-List, Linked-List, Hash-set, Linked-Hash-Set, TreeSet Class. Accessing a Collection via Iterator, Sorting User-Defined Classes in Collections. working with Maps, HashMap, TreeMap, and Comparator. Brief on: Enumeration, Vector, and Stack.

TEXT BOOKS:

1. Java; the complete reference, 11th edition, 2018 Herbert Scheldt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson education.

REFERENCES:

1. An Introduction to programming and OO design using Java, 2015, J.Nino and F.A.Hosch, John Wiley & sons.
2. Programming in Java, Sachin Malhotra, Saurabh Choudhary, 6th Edition, 2018.
3. An Introduction to OOP,3 edition, 2001, T. Budd, Pearson education.
4. Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.
5. An introduction to Java programming and object oriented application development, R.A. Johnson- Thomson.
6. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Education.
7. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
8. https://www.w3schools.com/JSREF/DEFAULT.ASP
9. https://dzone.com/articles/top-10-websites-advanced-level

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS)) L T C
2 1 3

(A3203204) ADVANCED DATA STRUCTURES AND ALGORITHMS
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
The objectives of this course is students need to
- ❖ Learn asymptotic notations, and analyze the performance of different algorithms.
- ❖ Understand and implement linear and non-linear data structures.
- ❖ Give orientation on Linear Data Structures in Python
- ❖ Learn and implement greedy, divide and conquer, dynamic programming and backtracking algorithms using relevant data structures.
- ❖ Understand about non-deterministic algorithms, polynomial and non-polynomial problems.

COURSE OUTCOMES: After completion of the course the student should able to:
- ❖ Learn and analyze the complexity of algorithms, able to apply asymptotic notations for any task.
- ❖ Apply linear data structure and non-linear data structure operations, hash table structure and hash functions.
- ❖ Understand and apply greedy, divide and conquer, and dynamic programming algorithms.
- ❖ Understand and apply back tracking algorithms, non-deterministic algorithms, polynomial and non-polynomial problems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2		2	1	1	1					1	3	1	
CO2	1	2	2	1	1	1						1	1	2	1
CO3	1	2	2	1	1	1						1	1	2	1
CO4	1	2	2	1	1	1						1	1	2	1

UNIT I
Introduction to Algorithms: Algorithm, Pseudo code for expressing algorithms, Performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh, Omega, Theta notation and Little oh notation, Polynomial Vs. Exponential Algorithms, Average, Best and Worst Case Complexities, Analyzing Recursive Programs.

UNIT-II
Linear Data Structures: Data Structure- Definition and Classification, Stack: Stack Operations and Applications, Queues: Operations of Queues, Circular Queues, Priority Queue, Deques, Applications of Queues, Linked Lists: Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists.

UNIT III
Non-Linear Data Structures: Trees and Binary Trees: Representation of Trees, Representation of Binary Trees, Binary Tree Traversals, BST -Searching, Insertion and Deletion, Graphs - Representations of Graphs, Graph Traversals.
Hash Tables:
Dictionaries, Hash Table Structure, Hash functions.
String Matching, Pattern Matching.

UNIT-IV
Divide and conquer: General method, applications-Binary search, Finding Maximum and

minimum, Quick sort, Merge sort, Strassen's matrix multiplication.
Greedy method: General method, applications-Job sequencing with deadlines, knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT V
Dynamic Programming: General method, applications- 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

UNIT VI
Backtracking: General method, applications-n-queen problem, sum of subsets problem, graph coloring, Hamiltonian cycles.
Introduction to NP-Hard and NP-Complete problems: Basic Concepts, Non Deterministic algorithms.

TEXT BOOKS:
1) Data Structures and algorithms: Concepts, Techniques and Applications, G A V Pai
2) Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.

REFERENCE BOOKS:
1) Classic Data Structures by D. Samanta, 2005, PHI
2) Design and Analysis of Computer Algorithms by Aho, Hopcraft, Ullman 1998, PEA.
3) Introduction to the Design and Analysis of Algorithms by Goodman, Hedetniemi, TMG.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS))

L	T	C
2	1	3

(A0018203) ENGINEERING ECONOMICS AND ACCOUNTANCY
For branches: CSE & CSE(DS)

COURSE OBJECTIVES:
- To understand the principles and techniques of managerial economics.
- To understand the demand elasticity and demand forecasting by using statistical techniques.
- To understand fixation of price of a product and analyze the BEP concept.
- To understand the various types of business organizations.
- To understand the methods and techniques of costing.
- To understand financial statements and analyze the position of the company.

COURSE OUTCOMES: After completion of the course student should be able to
- Practical insight of the concepts of managerial economics
- Apply the techniques of demand forecasting in the present economic scenario.
- Understand to fix product price and know how to reach break-even.
- Relate the concepts to the performance of different businesses, in the changing environment.
- Apply and interpret the different situations with the help of corporate finance techniques.
- Analyze the financial position of the company.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2												2
CO2			3	2	1										
CO3		2	3	1									1		
CO4					1		2	1						2	
CO5			3	2	1									2	
CO6								1			3	2			

UNIT I

Introduction to managerial economics: Definition, Nature and scope of managerial economics, Demand analysis, Demand determinants, law of demand and its exceptions.

UNIT II

Elasticity of Demand: Definition, types, measurement and significance of elasticity of Demand. Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiment, judgemental approach to demand forecasting)

UNIT III

Break even analysis and pricing strategies: Break even analysis-Determination of breakeven point (simple problems)- managerial significance and limitations of BEA.

Objectives and policies of pricing-methods of pricing: cost plus pricing, sealed bid pricing, going rate pricing, market skimming pricing, penetration pricing, Two part pricing, Block pricing, Bundling pricing, Peak load pricing, cross subsidization.

UNIT IV

Business and New economic policy: Characteristics of business , features and evaluation of forms of business organization based on ownership, Nature of the economy, structure of the economy, economic policies, new economic policy 1991 ,economic conditions.

UNIT V

Cost Accounting: introduction- classification of costs –methods of costing – techniques of costing – preparation of cost sheet.

UNIT VI

Accountancy: Accounting principles, procedure-Double entry system-journal-ledger, Trail balance –cash book-preparation of trading, profit and loss account-Balance sheet.

TEXT BOOKS:

1) Management Economics and Financial Analysis, Aryasri, 4/e, TMH, 2009.
2) Managerial Economics, Varshney & Maheswari, Sultan Chand, 2009.

REFERENCES:

1) AgarwalA N, “Indian Economy” Wiley Eastern Ltd,New Delhi
2) Jain and Narang “Accounting part-1”Kalyani publishers
3) Arora M.N. “Cost Accounting”, Vikas publications
4) Ashwatappa. K “Business Environment”
5) Aryasri “ManagerialEconomics and Financial Accounting”

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS)) L T C
1 2 2

(A0019203) APTITUDE ARITHMETIC REASONING AND COMPREHENSION
(Skill Development Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To familiarize the students about the concepts of aptitude, arithmetic and reasoning
- To cope up the students to improve their employable skills

COURSE OUTCOMES:
After completion of the course the student will be able to:
- Understand number system which helps to become well trained for recruitment drives.
- Analyse permutations and combinations concept.
- Obtain the knowledge of coding and decoding concept.
- Understand the topics related to clock and probability.
- Identify the topics related to Venn diagrams, reasoning and Non-verbal reasoning.

MAPPING OF COs & POs:

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

UNIT I
Numbers, Number Systems, Simple Equations, Ratio, Proportion, Variation Quadratic Equations, Progressions, Percentages.

UNIT II
Profit and Loss, Partnerships, Averages, Mixtures & Allegations, Simple Interest, Compound Interest, Time and Work, Pipes, indices, surds, inequalities ,Cisterns Time and Distance Geometry and Mensuration.

UNIT III
Permutations and Combinations, Probability, Data Interpretation & Data Sufficiency.

UNIT IV
Number & Letter Series, Analogies, Coding and Decoding, Odd Man Out, Blood Relations.

UNIT V
Direction Sense, Symbols and Notations, Deductions & Connectives, Clocks, Calendars Analytical.

UNIT VI
Reasoning (Verbal and Non-Verbal), Venn Diagrams, Analytical Puzzles and Octal number system.

REFERENCES:
1) R.S.Agarwal. Quantitative Techniques. S.Chand Series.
2) Shankuntala Devi. Techniques of Reasoning. S.Chand Series.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS))

L	P	C
0	3	1.5

(A0493203) DIGITAL LOGIC DESIGN LAB
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Know the fundamentals of Boolean algebra and theorems, Karnaugh maps including the minimization of logic functions to SOP or POS form.
- To strengthen the principles of logic design and use of simple memory devices, flip-flops, and sequential circuits.
- To fortify the documentation standards for logic designs, standard sequential devices, including counters and registers, combinational devices, includes decoder, multiplexer.

COURSE OUTCOMES:
- Perform three basic logic operations and construct the truth tables for the different types of gates and implement logic circuits using basic AND ,OR and NOT gates.
- Use De-Morgan's theorem to simplify logic expressions and describe the concept of active LOW and active HIGH logic signals and use boolean algebra and K-map as tool to simplify and design logic circuits and Design simple logic circuits without the help of truth tables.
- Construct and analyze the operation of flip-flop and troubleshoot various types of flip-flop circuits, decoder, multiplexer.
- Analyze the operation of each IC in various logical systems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1								1	1		
CO2	1	1	1	1	1							1	1		
CO3	1	1	1	1	1							1	1	1	
CO4	2	2	2	1	1							1	1	1	1

EXPERIMENTS
1) Basic Logic Gates AND,OR,NOT and their applications
2) Universal gates NAND and NOR
3) Study of combinational circuits 1 Half Adder and Full Adder
4) Study of combinational circuits 1 Half Sub tractor and Full sub tractor.
5) Study of Flip flops
   a) S-R F/F b) J-K F/F c) D-F/F d)T - F/F
6) Design of four bit ring counter using Flip Flop
7) 3 – bit synchronous counter using Flip Flop
8) 4-bit Johnson Ring counter using Flip Flop
9) MOD-5 Synchronous counter using F/F
10) 2-4 decoder
11) 4 to 1 Multiplexer
12) 3 – bit up/down counter using F/F

REFERENCES:
1) Digital Design –5 Edition, 2013, M.Morris Mano, Pearson Education/PHI.
2) Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS))

L	P	C
0	3	1.5

(A0597204) JAVA PROGRAMMING LAB
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To make the student operating systems.
- Learn object oriented way of solving problems.
- To teach the student to write programs in Java to solve the problems

COURSE OUTCOMES: After Completion of the Lab Course student should be able:
- Write programs using classes and objects.
- Develop the polymorphic behaviour of objects.
- Design software using object oriented approach.
- Implement the programs handling built in exceptions and creating custom Exceptions.
- Develop the Mutli thread programming.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1		2							1	3	1	1
CO2	2	2	2	1	1							1	1	1	
CO3	1	1	2	1	2							1	2	1	1
CO4	1	1											1	1	
CO5	1	1											1	1	

Level 1:
1. Write a Java Program to find the reverse of a given number. And also check whether it is palindrome or not.
2. Write a Java Program to print Fibonacci sequence (rule: The first two values in the sequence are 0 and 1. Every subsequent value is the sum of the two values preceding it.)
3. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
4. Write a Java program to find both the largest and smallest number in a list of integers.
5. Write a Java program to multiply two given matrices
6. Write a Java program to implement all arithmetic operations with class methods for each operation. User must provide values from Keyboard.
7. Write a Java program to implement parameter passing techniques:
   a) call-by-value b) call-by-reference
8. Write a Java program to sort a list of names in ascending order.
9. Write a Java program that checks whether a given string is a palindrome or not.
   Ex: MADAM is a palindrome
10. Write a Java program that reads a file name from the user, then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes.
11. Write a Java program that creates three threads. 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

Level: 2
1. Write a Java program to find the volume of a box by creating objects.
2. Write a Java program to implement the following:
   a) Overloading methods b) overloading constructorsc) recursion

3. Write a Java program to implement multi-level inheritance and also demonstrate super keyword.
4. Write a Java program to demonstrate method overriding by implementing dynamic method dispatch?
5. Write a Java program to create and abstract class called Shape which inherits Rectangle and triangle to calculate area of each shape by implementing abstract method of Shape class by implementing hierarchical inheritance.
6. Write a Java program to implement multiple-inheritance?
7. Write a Java program to import user defined packages to display results for any mathematical operations like addition, subtractions, multiplications and division (class methods) from one package and also producing results square, cube and square-root of a given number (instant methods) from another package.
8. Write a Java program to handle multiple exceptions and also use finally?
9. Write a Java program to handle user-defined exceptions?
10. Write a Java program that displays the count of number of characters, lines and words in a text file.(user provide file using cmd line args)
11. Write a Java program that correctly implements producer consumer problem using the concept of inter-thread communication
12. Write a Java program that implements a simple client/server application. The client sends data to a server. The server receives the data, uses it to produce a result, and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle. (Use java.net)
13. Write a Java program to retrieve the information from the given URL? (**Note:** Read the URL from Command Line Arguments).
14. Write a java program to create a sample TCP chat application where client and server can chat with each other?

REFERENCES:

1. Java; the complete reference, 11th editon,2018 Herbert schildt, TMH.
2. An Introduction to programming and OO design using Java, 2015 , J.Nino and F.A. Hosch, John wiley & sons Programming in Java, Sachin Malhotra, Saurabh Choudhary, Second Edition.
3. An Introduction to OOP, second edition, T. Budd, pearson education.
4. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

II B.Tech. II-Sem (CSE(DS)) L P C
0 3 1.5

(A3291204) ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVE:

The objectives of this course is students need to

- Learn to create python applications using linear and non-linear data structures.
- Develop python applications for different operations of data structures by optimizing the performance.
- Learn to develop applications for greedy, divide and conquer, dynamic programming and backtracking algorithms using relevant data structures.

COURSE OUTCOMES: After Completion of the Lab Course student should be able:

- Learn and analyze the complexity of algorithms, able to apply asymptotic notations.
- Apply linear data structure and non-linear data structure operations, hash table structure and hash functions.
- Understand and apply greedy, divide and conquer, and dynamic programming algorithms.
- Understand and apply back tracking algorithms, non-deterministic algorithms, polynomial and non-polynomial problems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2		2	1	1	1					1	3	1	
CO2	1	2	2	1	1	1						1	1	2	1
CO3	1	2	2	1	1	1						1	1	2	1
CO4	1	2	2	1	1	1						1	1	2	1

Level - 1

1) Write a python program to find Maximum and Minimum of the given set of integer values.
2) Write a python program to perform Binary Search for a given set of integer values recursively and non- recursively.
3) Write the python programs to perform following for the given list of integer values.
   a) Quick Sort b) Merge Sort
4) Write a python program to implement stack and queue using list and dequeue.
5) Write a python program that convert the given expression from Infix to prefix.
6) Write a python program to evaluate the given Postfix expression.

Level - 2

1) Write a python program that implement the operations on Circular Queue
2) Write a python program to implement the following Priority Queue.
3) Write python program to implement Doubly Linked List.
4) Write a python program to implement the following operations on Binary Tree
   a) Insert b) Delete c) Search d) Display
5) Write a python program to implement the following operations on Binary Search Tree
   a) Insert b) Delete c) Search d) Display
6) Write a python program to find solution for knapsack problem using greedy method.
7) Write a python program to find minimum cost spanning tree using following Algorithms.
   a) Prim's algorithm b) Kruskal's algorithm
8) Write python programs to find Single source shortest path problem for a given graph.

9) Write a python program to find solution for job sequencing with deadlines problem.
10) Write a python program to find solution for 0-1 knapsack problem using dynamic programming.
11) Write a python program to solve Sum of subsets problem for a given set of distinct numbers.

TEXT BOOKS:

1) Data Structures and algorithms: Concepts, Techniques and Applications, G A V Pai
2) Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Galgotia publications pvt. Ltd.

REFERENCE BOOKS:

1) Y Daniel Liang, "Introduction to Programming using Python", Pearson.
2) Benjamin Baka, David Julian, "Python Data Structures and Algorithms", Packt Publishers,2017.
3) Rance D. Necaise, "Data Structures and Algorithms using Python", Wiley Student Edition.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS)) L T C
2 1 3

(A3204205) COMPUTER ORGANIZATION & OPERATING SYSTEMS
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Conceptualize the basics of organizational and architectural issues of a digital computer and Classify and compute the performance of machines & to help students in understanding various memory devices
- Summarize the Instruction execution stages, how to design the pipeline for uniprocessor and multiprocessor systems & concepts associated with distributed, grid and cluster computing.
- Identify the role of Operating System & describe the various features of processes, including scheduling, creation, and termination.
- Understanding CPU Scheduling, Synchronization, Deadlock Handling and Comparing CPU Scheduling Algorithms. Solve Deadlock Detection Problem
- Describe the role of paging, segmentation and virtual memory in operating systems.
- Defining Device Management Policies and Secondary Storage Structure and Evaluation of various Disk Scheduling Algorithms.

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
- Understand the theory and architecture of the central processing unit & analyze some of the design issues in terms of speed, technology, cost, and performance.
- Design a simple CPU by applying the theory concepts & Learn the concepts of parallel processing, pipelining, and interprocess communication.
- Analyze the architecture and functionality of the central processing unit.
- Interpret the different services provided by the operating system at different levels.
- Apply the different process scheduling algorithms and synchronization techniques to avoid deadlock.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1						1		2		
CO2	1	2	3	1									2		
CO3	1	1	2	1	1								2		
CO4	1	1	1	1	1						1	1	1		
CO5	2	2	1	1	1								1		

UNIT-I
BASIC STRUCTURE OF COMPUTERS: Computer Types, Functional unit, Basic operational concepts, Bus structures, Software, Performance, multiprocessors and multi computers.
Introduction to Operating Systems- what operating systems do, process management, memory management, protection and security, distributed systems, special purpose systems.

UNIT-II:
Input/Output: External Devices, I/O Modules, Programmed I/O, Interrupt-Driven I/O, Direct Memory Access, I/O Channels and Processors.
The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Size speed and cost, Cache Memories, Performance Considerations, Virtual Memories, Memory management requirements, secondary Storage

UNIT-III

Pipeline and vector processing: Parallel processing, Arithmetic pipeline, Instruction Pipeline, RISC Pipeline, Vector processing, Array Processors.

Multi Processors: Characteristics of Multiprocessors, Interconnection structures, Inter-processor arbitration, Inter-processor communication and Synchronization, cache coherence.

UNIT-IV

Process concepts - overview, process scheduling, operations on process, inter-process communication.

Process scheduling – basic concepts, scheduling criteria, process scheduling algorithms, algorithm evaluation.

UNIT-V

Concurrency - Process synchronization, the critical-section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors

Principles of deadlock: system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock.

UNIT-VI

Memory Management Strategies –back ground, Swapping, contiguous memory allocation, paging, segmentation

Virtual memory management – background, demand paging, copy-on-write, page-replacement algorithms-FIFO, LRU, Optimal, LFU, MFU, Second chance algorithm

TEXT BOOKS:

1. Computer Systems Architecture – M. Moris Mano, 3rd Edition, Pearson/PHI
2. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, Vth Edition, McGraw Hill.
3. Operating System Concepts - Abreham Silberchatz, Peter B. Galvin, Greg Gagne, 8th Edition, John Wiley.
4. Computer Organization and Architecture - William Stallings 8th Edition, Pearson

REFERENCE BOOKS:

1. Structured Computer Organization - Andrew S. Tanenbaum, 4th Edition, PHI
2. Operating Systems: Internals and Design Principles, Stallings, Sixth Edition–2009, Pearson Education.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

L	T	C
2	1	3

(A0543207) MACHINE LEARNING

For branches: ECE, CSE & CSE(DS)

COURSE OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using various Supervised and Unsupervised Concepts of Machine Learning for solving practical problems.
- To gain experience of doing independent study and research for real time applications.

COURSE OUTCOMES:

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

- Identify various machine learning algorithms and terminologies and perform data pre-processing using standard ML library.
- Design a predictive model using appropriate supervised learning algorithms to solve any given problem.
- Develop an application using appropriate unsupervised learning algorithms for performing clustering and dimensionality reduction.
- Solve complex problems using artificial neural networks and kernel machines
- Understand and Implement association rules and the Machine Learning Issues.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	3	3	2	3	2	2	1	2	1		
CO2	3	2	3	2	2	3	1	2	2	1	1	2	2	2	
CO3	3	2	3	3	2	3	1	3	2	1	1	1	2		
CO4	2	2	2	3	2	2	1	2	1	1	1	1	1		
CO5	2	1	2	3	2	2	1	2	1	1	1	1	1		1

UNIT I:

Introduction to Machine Learning: Machine Learning Fundamentals –Types of Machine Learning - Supervised, Unsupervised, Reinforcement- The Machine Learning process. Terminologies in ML- Testing ML algorithms: Overfitting, Training, Testing and Validation Sets Confusion matrix -Accuracy metrics- ROC Curve- Basic Statistics: Averages, Variance and Covariance, The Gaussian- The Bias-Variance trade off- Applications of Machine Learning.

UNIT II:

Bayesian Learning: Bayes Theorem, Bayes theorem and concept learning, Maximum Likelihood and Least-Squared Error Hypotheses, Maximum Likelihood Hypotheses for Predicting Probabilities, Minimum Description Length Principle, Bayes optimal classifier, Gibbs algorithms, Naive Bayes Classifier, Bayesian belief networks, The EM algorithm.

UNIT III:

Supervised Learning: Regression: Linear Regression – Multivariate Regression- Classification: Linear Discriminant Analysis, Logistic Regression- K-Nearest Neighbor classifier. Decision Tree based methods for classification and Regression- Ensemble methods.

UNIT IV:

Unsupervised Learning: Clustering- K-Means clustering, Hierarchical clustering - The Curse of Dimensionality -Dimensionality Reduction - Principal Component Analysis - Probabilistic PCA- Independent Components analysis

UNIT V:

Artificial Neural Networks and Kernel Machines: Perceptron- Multilayer perceptron- Back Propagation – Initialization, Training and Validation, Support Vector Machines (SVM). Reinforcement Learning: The Learning Task, Q Learning, Nondeterministic Rewards and Actions.

UNIT VI:

Learning Association Rules: Mining Frequent Patterns - basic concepts -Apriori algorithm, FP- Growth algorithm, Association based Decision Trees.

Machine Learning in Practice: Design, Analysis and Evaluation of Machine Learning Experiments, Other Issues: Handling imbalanced data sets.

TEXT BOOKS

1. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective", MIT Press, 2012.
2. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009.
3. Tom Mitchel, Machine Learning, McGraw Hill (1997) 2nd ed.
4. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, "Machine Learning", Pearson Education, 2018.
5. Jiawei Han, Micheline Kamber and Jian Pei, Data Mining: Concepts and Techniques, 3rd Edn, Morgan Kaufmann Publishers, 2011.

REFERENCE BOOKS

1. Andreas C. Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", O'Reilly, 2016.
2. Sebastian Raschka, "Python Machine Learning", Packt Publishing, 2015.
3. Hastie, Tibshirani, Friedman, "The Elements of Statistical Learning: Data Mining, Inference, and Prediction", 2nd Edition, Springer, 2017.
4. Ethem Alpaydin, "Introduction to Machine Learning", 2nd Revised edition, MIT Press, 2010.
5. Christopher Bishop, "Pattern Recognition and Machine Learning" Springer, 2011.

E BOOKS

1. https://www.ibm.com/downloads/cas/GB8ZMQZ3

MOOC

1. https://www.edx.org/course/machine-learning-fundamentals-2
2. https://www.coursera.org/learn/machine-learning

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

L	T	C
2	1	3

(A3206205) DATA WRANGLING

COURSE OBJECTIVES:

- To understand the need an importance of Data Wrangling.
- To understand various formats of data and its importance.
- To understand the applications of Web scraping.
- To know the importance of Data Exploratory and Analysis
- To gain the knowledge on various APIs towards to work on data as part of Wrangling.

COURSE OUTCOMES:

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

- Identify and execute the basic data format.
- Perform the computations with Excel and pdf files
- Understand the concepts of data cleanup
- Explore and analyze the Image and video data
- Understand the concepts web scraping

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1			2	1	1	1	1	1		
CO2	1	1	1	1	1			1			1	1	1		
CO3	1	1	1	1	1			1				1		2	
CO4	2	1	1	1	1			1				1			2
CO5	1	1	1	1	1			1				1	1		

UNIT I: INTRODUCTION TO DATA WRANGLING

What Is Data Wrangling?- Importance of Data Wrangling -How is Data Wrangling performed?- Tasks of Data Wrangling-Data Wrangling Tools-Introduction to Python-Python Basics-Data Meant to Be Read by Machines-CSV Data-JSON Data-XML Data.

UNIT II: WORKING WITH EXCEL FILES AND PDFS

Installing Python Packages-Parsing Excel Files-Parsing Excel Files -Getting Started with Parsing-PDFs and Problem Solving in Python-Programmatic Approaches to PDF Parsing-Converting PDF to Text-Parsing PDFs Using pdf miner-Acquiring and Storing Data-Databases: A Brief Introduction-Relational Databases: MySQL and PostgreSQL-Non-Relational Databases: NoSQL-When to Use a Simple File-Alternative Data Storage.

UNIT III: DATA CLEANUP

Why Clean Data?- Data Cleanup Basics-Identifying Values for Data Cleanup-Formatting Data-Finding Outliers and Bad Data-Finding Duplicates-Fuzzy Matching-RegEx Matching-Normalizing and Standardizing the Data-Saving the Data-Determining suitable Data Cleanup-Scripting the Cleanup - Testing with New Data.

UNIT IV: DATA EXPLORATION AND ANALYSIS

Exploring Data-Importing Data-Exploring Table Functions-Joining Numerous Datasets-Identifying Correlations-Identifying Outliers-Creating Groupings-Analyzing Data-Separating and Focusing the Data Presenting Data-Visualizing the Data-Charts-Time-Related Data-Maps-Interactives-Words-Images, Video, and Illustrations-Presentation Tools-Publishing the Data Open Source Platforms.

UNIT V: WEB SCRAPING

What to Scrape and How-Analyzing a Web Page-Network/Timeline-Interacting with

JavaScript-In-Depth Analysis of a Page-Getting Pages-Reading a Web Page-Reading a Web Page with LXML-XPath-Advanced Web Scraping-Browser-Based Parsing-Screen Reading with Selenium-Screen Reading with Ghost. PySpidering the Web-Building a Spider with Scrapy-Crawling Whole Websites with Scrapy.

UNIT VI: APIs

API Features – REST Versus Streaming APIs, Rate Limits, Tiered Data Volumes, API Keys and Tokens. A Simple Data Pull from Twitter's REST API, Advanced Data Collection from Twiter's REST API and Streaming API.
Automation and Scaling: Why Automate, Steps to Automate, What Could Go Wrong, Where to Automate, Special Tools for Automation – Using Local Files, argv and Config Files, Using the Cloud for Data Processing, Parallel Processing, Distributed Processing, Simple Automation – CronJobs, Web Interfaces, Jupyter Notebooks, Large-Scale Automation, Monitoring Your Automation.

TEXT BOOKS:

1. Jacqueline Kazil & Katharine Jarmul," Data Wrangling with Python", O'Reilly Media, Inc, 2016.

REFERENCE BOOKS

1. Dr. Tirthajyoti Sarkar, Shubhadeep," Data Wrangling with Python: Creating actionable data from raw sources", Packt Publishing Ltd,2019.
2. Stefanie Molin," Hands-On Data Analysis with Pandas", Packt Publishing Ltd,2019
3. Allan Visochek," Practical Data Wrangling", Packt Publishing Ltd,2017
4. Tye Rattenbury, Joseph M. Hellerstein, Jeffrey Heer, Sean Kandel, Connor Carreras," Principles of Data Wrangling: Practical Techniques for Data Preparation", O'Reilly Media, Inc,2017.

E BOOKS

1. http://www.gbv.de/dms/ilmenau/toc/827365454.PDF.

MOOC

1. https://www.udemy.com/course/data-wrangling-with-python/
2. http://www.openculture.com/free-online-data-science-courses
3. https://www.classcentral.com/course/dataanalysiswithpython-11177

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

L	T	C
2	1	3

(A0513205) WEB PROGRAMMING

(Open Elective-I)

For branches: EEE, ECE, CSE & CSE(DS)

COURSE OBJECTIVES:

- To learn various HTML tags to develop a web page.
- To learn database access to work for dynamic web pages.
- To learn various web servers and servlets for creating web pages and web sites.
- To gain knowledge for developing JSP and also on PHP.

COURSE OUTCOMES:

The student should be able to:

- Understanding hierarchy of objects in HTML.
- Installing and configuring a web server.
- Integrate Servlets, JSPs and Databases in J2EE application.
- Master an understanding of PHP concepts
- Writing dynamic web pages, accessing data bases and using web services.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1			1				1	1		
CO2	1	1	1	1	1			1				1	1		
CO3	2	1	1	1	1			1				1		1	
CO4	1	1	1	1	1			2				1		1	
CO5	1	1	1	1	1			1				1			1

UNIT I

HTML – JAVA SCRIPT

HTML: Basic tags, List, Tables, images, forms, Frames; Cascading Style sheets.

Java Script: Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script.

UNIT II

DATABASE ACCESS: Components of JDBC, JDBC Architecture, working with JDBC Statement objects, Result set, result set metadata, accessing a Database from a JSP Page.

UNIT III

WEB SERVERS AND SERVLETS: Tomcat web server, Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking.

UNIT IV

INTRODUCTION TO JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC Setting Up and JSP Environment: Installing the Java Software Development Kit, Tomcat Server & Testing Tomcat.

UNIT V

JSP APPLICATION DEVELOPMENT: Generating Dynamic Content, Using Scripting Elements Implicit JSP Objects, Conditional Processing – Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods Error Handling and Debugging Sharing Data Between JSP pages, Requests, and Users Passing Control and Date between Pages – Sharing Session and Application Data

UNIT VI:

Basic PHP Programs - Introduction to PHP, Numbers and Strings, Literals and Variables, Operators and Functions, arrays.

PHP Database Connectivity and Manipulating Data: Connecting to MySQL Server, Selecting Databases, Checking for Errors, Closing the MySQL Server Connection, Inserting, Viewing, Updating and Deleting Records, Manipulating joined tables.

TEXT BOOKS:

1. HTML,CSS,Java Script,Perl,Python & PHP(web standards) by Steven M.Schafer, WILEY India.
2. Java Server Pages –Hans Bergsten, Second Edition, SPD O'Reilly, 2002.

REFERENCE BOOKS:

1. Internet and World Wide Web – How to program by Dietel and Nieto PHI/Pearson Education Asia.
2. An Introduction to web Design and Programming –Wang-Thomson.
3. Programming world wide web-Sebesta, Pearson.
4. Java Server Pages, Pekowsky, Pearson.
5. Python Web Programming, Steve Holden and David Beazley, New Riders Publications.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

L	T	C
2	1	3

(A0520205) R PROGRAMMING
(Open Elective-I)
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Understand the fundamentals of 'R' programming
- Learn how to carry out a range of commonly used statistical methods including analysis of variance and linear regression.
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests.

COURSE OUTCOMES:
After completing the course, students will able to learn:
- The purpose of R language and working with its tool
- about R objects, their data operations and descriptive statistical functions
- Functions to apply data distribution and hypothesis testing
- Functions for applying data using graphs and complex statistics like anova
- Functions to apply summarizing data and regression modelling
- About to export graphs and writing the scripts

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				2								1		
CO2	2	2	1											1	
CO3	2	2	2	1								1		1	
CO4	2	2	2	1								1			1
CO5	2	2	2	2								1			1
CO6	1				2							2			1

UNIT-I
INTRODUCING R: Getting the Hand of R, Running the R Program, Finding Your Way with R, Command Packages.
BECOMING FAMILIAR WITH R: Reading and Getting Data into R, Viewing Named Objects, Types of Data Items, The Structure of Data Items, Examining Data Structure, Working with History Commands, Saving your Work in R.

UNIT-II
WORKING WITH OBJECTS: Manipulating Objects, Viewing Objects within Objects, Constructing Data Objects, Forms of Data Objects: Testing and Converting.
Data: Descriptive statistics and tabulation: Summary Commands, Summerizing Samples, Summary Tables.

UNIT-III
Data: DISTRIBUTION: Looking at the Distribution of Data
SIMPLE HYPOTHESIS TESTING: Using the Student's t-test, The Wilcoxon U-Test (Mann-Whitney), Paired t- and U-Tests, Correlation and Covariance, Tests for Association.

UNIT-IV
INTRODUCTION TO GRAPHICAL ANALYSIS: Box-whisker Plots, Scatter Plots, Pairs Plots(Multiple Correlation Plots) Line Charts, Pie Charts, Cleveland Dot Charts, Bar Charts, Copy Graphics to Other Applications.
FORMULA NOTATION AND COMPLEX STATISTICS: Examples of Using Formula, Syntax for Basic tests, Formula Notation in Graphics, Analysis of Variance (ANOVA).

UNIT-V

MANIPULATING DATA AND EXTRACTING COMPONENTS: Creating Data for Complex Analysis, Summarizing Data.

REGRESSION (LINEAR MODELING): Simple Linear Regression, Multiple Regression, Curvilinear Regression, Plotting Linear Models and Curve Fitting, Summarizing Regression Models.

UNIT-VI

MORE ABOUT GRAPHS: Adding elements to existing plots, Matrix plots, multiple plots in one window, exporting graphs.

LEARN TO WRITE R SCRIPTS:

BEGINNING TO R PROGRAM: Creating Simple Functions- One-Line Functions, Using Default Values in Functions, Simple customized Functions with multiple lines, Storing customized Functions; Making Source Code- displaying the Results of customized Functions and Scripts, Displaying Messages as Part of Script Output; Copy and Paste Scripts.

TEXT BOOKS:

1) "Beginning R the statistical programming language" Dr. Mark Gardener, Wiley Publications, 2015.

REFERENCES BOOKS:

1) Hands-On Programming with R Paperback by Grolemund (Author), Garrett (Author), SPD, 2014.
2) The R Book, Michael J. Crawley, WILEY,2012.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

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2	1	3

(A0525205) ANDROID PROGRAMMING
(Open Elective-I)
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Build your own Android apps and explain the differences between Android and other mobile development environments
- Understand how Android applications work, their life cycle, manifest, Intents, and using external resources
- Design and develop useful Android applications with compelling user interfaces by Using, extending, and creating your own layouts and Views and using Menus.
- To know the advantages of Android's APIs for data storage, retrieval, user preferences, files, databases, and content providers.
- To know location-based services, geocode, compass sensors, and create rich map-based Applications.
- Utilize the power of background services, threads, and notifications.
- Use Android's communication APIs for SMS, telephony, network management, and Internet resources (HTTP).

COURSE OUTCOMES:

After completing the course, students will able to:

- Understand the Android Framework and architecture. Installation on Android studio and its project development environment.
- Display proficiency in coding on a mobile programming platform and accessing the User
- Interfaces built-in application tools.
- Storage tools, Webview and Telephony concepts for the Android platform.
- Design and develop Multimedia application in android.
- Create a Mobile app with a significant programming component Tap into Built-in Services.
- Create a Mobile app with a significant programming component to Google map locations, Content Provider and dialog box.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1			1				1	1		
CO2	2	1	2	1	1	1		1	1		1	1	1		
CO3	1	1	1	1	2	1		1	1		1	1	1		
CO4	1	1	1	1	2	1		1	1		1	1		2	
CO5	1	1	1	1		1		1	1		1	1			3
CO6	1	1	1	1	2	1		1	1		1	1			3
CO7	1	1	1	1	2	1		1	1		1	1			3

UNIT-I

Introduction to Android, Types of Mobile Applications, Android Architecture(About DVM, Linux kernel, Java libraries & Native libraries, application frame work), Android Framework(Activity, Service, Broadcast Receiver, Content Provider), Android Studio Environment(how to Install, install in emulator, real device) Project Structure(R.Java, res folder, manifest.xml and .apk file), Android features, History, Layout UI groups(Leaner Layout, Relative Layout, Table Layout, Frame Layout, Grid Layout), Width and height properties(Match parent, Wrap content, Pixel, Density pixel and Scaled pixel).

UNIT-II

Activity, Activity lifecycle, Life cycle Methods, Intents, Intent Methods, layout file and its child elements and attributes, Basic UI Components (Text View, Button, Edit Text, Radio Button, Check Box), Advanced UI Components (Auto Complete Text View, Spinner, List View) Adapters (Array Adapter, Custom Adapter), Toast.

UNIT-III

WebView, WebView-HTML Communication, Fragment, Fragment Life Cycle. **Storage Methods:** shared preferences, SQLite Database (insert, read, update, delete). **Telephony:** send SMS, Call, Attaching File, and Send E-Mail.

UNIT-IV

Multimedia in Android: Media Player, Video View, Audio Recording, Video recording, Camera, Gallery. **Service:** Service, Service lifecycle methods.

UNIT-V

Built-in Services (location service, Notification service, Sensor Service, WIFI Service, Bluetooth Service, Vibrator Service), Broadcast Receivers.

UNIT-VI

Content Provider, Dialog Boxes (Custom dialog, Alert dialog, date Picker, Time Picker, Progress dialog, dialog Fragment), Google Maps.

TEXT BOOKS:

1. Android Application Development (with Kitkat Support), Black Book by Pradeep Kothari.
2. Android Programming: Pushing the Limits by Erik Hellman.

REFERENCES:

1. Beginning Android 4 Application Development by Wei-Meng Lee
2. Android Application Development for Dummies by Michael Burton

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

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2	1	3

(A0522205) COMPILER DESIGN

(Professional Elective -I)

For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Thorough understanding of the overall architecture of a modern compiler.
- Being familiar with both top-down and bottom-up parsing paradigms.
- Fluent with syntax-directed translation scheme and different compiler-compilers.
- Knowledgeable with assembly language and code-block based code generation scheme.
- Knowing the inner details of compilers, libraries, operating systems/platforms, and how they interact with each other to form modern computing environments.

COURSE OUTCOMES:

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

- Describe the theory and practice of compilation.
- Applying the top down ad bottom approaches of parsing, and the lexical analysis.
- Generate code generation and optimization phases of compilation
- Design a compiler for a concise programming language.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1	1	1		1	1		1	1	3		
CO2	2	2	1	1		1		1	1		1	1		2	
CO3	1	1	1	1		1		1	1		1	1			1
CO4	1	1	1	1	2	1		1	1		1	1	1		

UNIT-I

Introduction to compilers: compilers, cousins of the compiler, phases of a compiler, interpreter, grouping of phases into pass, bootstrapping

Lexical analysis: role of the lexical analyzer, input buffering, a language for specifying lexical analyzers

UNIT-II

Syntax analysis: the role of the parser, context free grammars, writing a grammar: eliminating ambiguity, elimination of left recursion, elimination of left factoring

Top-down parsing: Recursive descent parsing, first and follow, predictive parsing, construction of predictive parsing table.

UNIT-III

Bottom up Parsing: handles, handle pruning, shift reduce parsing, viable prefixes, conflicts during shift reduce parsing

LR Parsers: SLR Parsing: LR (0) items, SLR Parse table. CLR Parser: CLR (1) Items, CLR (1) Parsing table. LALR (1) parser: LR (1) items, LALR (1) parsing table.

UNIT-IV

Semantic analysis: type checking: type checking of expressions, type checking of statements, type checking of functions, type conversions

Syntax directed translation: form of a syntax directed definition, synthesize attributes, inherited attributes, dependency graph, annotated parse tree.

Intermediate code generation: intermediate code forms: abstract syntax tree, polish notation, three address code .implementation of three address code statements: quadruples, triples, indirect triples.

UNIT-V

Symbol table and Runtime environments: symbol table format, storage organization, storage allocation strategies, parameter passing, activation trees, activation records, storage allocation for arrays, strings and records.

UNIT-VI

Code optimization: Consideration for Optimization, Scope of Optimization, principle sources of optimization: function preserving transformations, local Optimization, loop Optimization, global Optimization

Data flow analysis: construction of flow graph, loops in flow graph,

Code generation: object code forms, issues in code generation, a simple code generator algorithm, generic code from DAGS.

TEXT BOOKS:

1. Compilers principles, techniques, &tools- A.V.Aho. J.D.Ullman; pearson Education. Second edition.

REFERENCES:

1. Compiler design: Theory, Tools and examples by Seth D. Bergmann.
2. Compiler design, K. Muneeswaran, Oxford.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS)) L T C
2 1 3

(A3207205) MODERN SOFTWARE ENGINEERING
(Professional Elective - I)

COURSE OBJECTIVES:
- To concentrates on how applications are planned and developed towards the process.
- To teach software engineering primarily as a requirements-to-design activity towards the design.
- To encourage software engineering as a code-oriented activity towards Programming and agile methods.
- To know Theory and principles: focuses on foundations.
- To have Hands-on projects and case studies: utilizes active team or individual project examples to facilitate understanding theory, principles, and practice.

COURSE OUTCOMES:
After the completion of this course, the students will be able to:
- Understand the basic principles of Software Engineering.
- Explore the fundamentals of Agile Concepts.
- Understand the basic elements of Software Project Organization along with metrics for verification and validation.
- Explore the requirement analysis for any product or project towards Software Engineering.
- Determine the goal of Software Design and its related use cases.
- Differentiate Agile and Non-Agile Software Engineering Models.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	1		3	1	1	2	2	1		
CO2	2	1	1	1	1	1		3	1	1	2	2	1	2	1
CO3	2	1	1	1	1	1		3	3	1	3	2	1	1	1
CO4	1	1	1	1	1	1		3	1	1	2	2	1	1	1
CO5	1	1	1	1	1	1		3	1	1	1	2	1		1
CO6	1	1	1	1	1	1		1	1	1	1	1	1		2

UNIT – 1:
What is Software Engineering, Software Disasters, Software Failures or Successes, Software Engineering Activities, Software Engineering Principles, Ethics in Software Engineering.
Meaning of Software Quality, Defects in Software, Verification and Validation, Planning for Quality, Metrics, Activities of Software Process, Software Process Models

UNIT – 2:
Agile History and Agile Manifesto, Agile Principles, Agile Methods, Agile Processes, Integrating Agile with Non-Agile Processes
Principles of Managing Quality, Managing Quality in Agile Processes, Quality Planning, Inspections, QA Reviews and Audits, Defect Management, Process Improvement and Process Metrics, Organization- Level Quality and the CMMI
Software Configuration Management Goals, SCM Activities, Configuration Management Plans, Configuration Management Systems

UNIT – 3:
Software Project Organization, Team Size, Geographically Distributed Development, Team Software Process, Software Project Tools and Techniques, Risk Management
Cost Estimation, Scheduling, Software Project Management Plan

Cultivating and Planning Internal Quality, Project Metrics, Using Metrics for Improvement, Software Verification and Validation Plan

UNIT – 4:

Value of Requirements Analysis, Sources of Requirements, High-level vs. Detailed Requirements, Types of Requirements, Non-functional Requirements, Documenting Requirements, Traceability, Agile Methods and Requirements, Updating the Project to Reflect Requirements Analysis

Meaning of Detailed Requirements, Organizing Detailed Requirements, User Interfaces: Detailed Requirements, Detailed Security Requirements, Error Conditions, Using Detailed Requirements to Manage Projects, Prioritizing Requirements, Associating Requirements with Tests, Agile Methods for Detailed Requirements,

Quality of Requirements for Agile Projects, Accessibility of Requirements, Comprehensiveness of Requirements, Understandability of Requirements, Unambiguity of Requirements, Consistency of Requirements, Prioritization of Requirements, Security and High-Level Requirements, Self-Completeness of Requirements, Testability of Requirements, Traceability of Requirements, Metrics for Requirements Analysis, Inspecting Detailed Requirements

UNIT – 5:

Goals of Software Design, Integrating Design Models, Frameworks, IEEE Standards for Expressing Designs

Relating Use Cases, Architecture, and Detailed Design, Road Map for the Detailed Design Process, Object-Oriented Design Principles, Designing against Interfaces, Specifying Classes , Functions, and Algorithms, Reusing Components, Sequence and Data Flow Diagrams for Detailed Design, Detailed Design and Agile Processes, Design in the Unified Development Process, IEEE Standard 890 for Detailed Design, Updating a Project with Detailed Design

Degree of Understandability, Cohesion, and Coupling, Degree of Sufficiency as a Quality Goal, Degree of Robustness as a Quality Goal, Degree of Flexibility as a Design Quality Goal, Degree of Reusability as a Design Quality Goal, Degree of Time Efficiency as a Design Quality Measure, Degree of Space Efficiency as a Design Quality Measure, Degree of Reliability as a Design Quality Measure, Degree of Security as a Design Quality Measure, Assessing the Quality of Detailed Designs

UNIT – 6:

Agile and Non-Agile Approaches to Implementation, Choosing a Programming Language, Identifying Classes, Defining Methods, Implementation Practices, Defensive Programming, Coding Standards, Comments, Tools and Environments for Programming

Quality of Implementation, Code Inspections and Related Quality Procedures

Testing Early and Often; and the Agile Connection, Retesting: Regression Testing, Black Box and White Box Testing, Unit Testing vs. Post-Unit Testing, Testing Object-Oriented Implementations, Documenting Tests, Test Planning, Testing Test Suites by Fault Injection, Types of Software Maintenance, Issues of Software Maintenance, Maintenance Process,

TEXT BOOK:

1. Eric J. Braude, Michael E. Bernstein, “Software Engineering: Modern Approaches”, Waveland Press, Inc, USA, 2nd edition, 2016.

REFERENCES:

1. Roger S. Pressman, Bruce R. Maxim, "Software Engineering: A Practitioner_s Approach", 8 Edition, McGraw-Hill Education, India, 2019.
2. Jalote Pankaj, "An Integrated Approach to Software Engineering", 3 Edition, Narosa Publishing House, New Delhi, 2000.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS)) L T C
2 1 3

(A3208205) INFORMATION STORAGE MANAGEMENT
(Professional Elective - I)

COURSE OBJECTIVES:
- To teach the components of Storage infrastructures and also understand various storage architectures along with network technologies.
- To learn different storage virtualization technologies along with security issues also.

COURSE OUTCOMES:
At the end of the course, students should be able to:
- Identify each component and technologies implemented in storage infrastructures
- Evaluate storage architectures; understand logical and physical components of a storage infrastructure including storage subsystems, RAID and Intelligent storage systems
- Understand storage networking technologies such as FC SAN, NAS, IP-SAN, FCoE and data archival solution – CAS
- Recognize different storage virtualization technologies and their benefits
- Comprehend and articulate business continuity solutions, including, backup technologies, and local and remote replication solutions
- Identify parameters of managing and monitoring storage infrastructure and describe common storage management activities and solutions
- Apply the storage technology principles and design for various applications

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1			2	3					1	2		
CO2	1	1		3			2		3				1		
CO3		1	2		2			3				1	1	2	
CO4	1	3		1		2				3					1
CO5	1	2	1			2	3					1	1	1	
CO6	1	1		3			2		3				1		
CO7		1	2		2			3				1			2

UNIT I:
Storage Systems - Storage Evolution and Data Center infrastructure. Host components, Connectivity, Storage, and Protocols. Components of a disk drive, physical disk and factors affecting disk drive performance. RAID level performance and availability considerations.

UNIT II:
Direct Attached Storage- Direct Attached Storage (DAS) architecture, Storage Area Network (SAN) attributes components, topologies, connectivity options and zoning. FC protocol stack, addressing, flow control, and classes of service.

UNIT III:
Networked Attached Storage- Networked Attached Storage (NAS) components, protocols, IP Storage Area Network (IP SAN) iSCSI, FCIP and FCoE architecture. Content Addressed Storage (CAS) elements, storage, and retrieval processes.

UNIT IV:
Storage Virtualization - Forms of Virtualization Memory Virtualization Network Virtualization Virtual SAN (VSAN) Server Virtualization Storage Virtualization Types of Storage Virtualization.
Business Continuity - Backup designs, architecture, topologies, and technologies in SAN and

NAS environments. Local and Remote replication using host and array based replication technologies such as Synchronous and Asynchronous methods.

UNIT V:

Storage Security and Management - Securing the Storage Infrastructure - Storage Security Framework -Risk Triad -Assets -Threats -Vulnerability - Storage Security Domains Securing the Application Access Domain - Securing the Management Access Domain - Securing Backup, Recovery, and Archive (BURA).

UNIT VI:

Storage Management Activities - Storage Management Activities -Availability management - Capacity management Performance management -Security Management -Reporting-Storage Management Examples Storage Infrastructure Management Challenges.

TEXT BOOKS:

1. Somasundaram Gnanasundaram, Alok Shrivastava, Information Storage and Management, Wiley Publishing Inc, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Data Storage Networking: Real World Skills for the CompTIA Storage+ Certification and Beyond Nigel Poulton John Wiley & Sons, 2014.
2. Storage Networks Explained Ulf Troppens, Rainer Erkens, Wolfgang Muller-Friedt, Rainer Wolafka, Nils HausteinJohn Wiley & Sons, 24-Aug-2011.
3. Securing Storage: A Practical Guide to SAN and NAS Security Himanshu Dwivedi ,Prentice Hall, 2012.

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III B.Tech. I-Sem (CSE(DS)) L T C
1 2 2

(A3209205) WORKING WITH CLOUD SERVICES
(Skill Development Course)
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To explain the importance and benefits of Cloud computing and the need for its rapid adoption
- To explain roadmap for transformation from classic to cloud environment
- To Identify and differentiate various infrastructure components of classic and virtualized data center
- To explain virtualization requirements and available tools at each layer of IT infrastructure
- To explain business continuity options in a virtualized environment
- To discuss effective cloud computing deployment model for businesses/IT organizations

COURSE OUTCOMES:
After Completion of the course, students should be able to:
- Identify the global infrastructure components of AWS/Azure/GCP
- Describe security and compliance measures
- Create the Virtual Private Cloud (Amazon VPC) using various cloud services
- Demonstrate when to use Amazon Elastic Compute Cloud (EC2), and AWS Lambda, Amazon S3
- Explore key concepts to Elastic Load Balancing (ELB), and Auto Scaling

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3	2	2						2	1	1		
CO2	1	1	2	2	2						1	1		2	
CO3	2	2	2	1	2						2	2	1		2
CO4	2	2	2	1	2						2	2	1		
CO5	2	2	2	2	2						2	2	1		1

UNIT 1:
Introduction:
Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Biocomputing, Mobile Computing, Quantum Computing, Optical Computing, Nanocomputing, Network Computing.
Cloud Deployment Models: Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud.
Cloud Service Models: Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models.

UNIT 2:
AWS global infrastructure overview: AWS global infrastructure map, regions and availability zones, AWS data centres, data replication , communication, AWS infrastructure features: elasticity and scalability, fault tolerance, high availability, **AWS foundational services:** compute-virtual, automatic scaling, and load balancing; networking; storage-object, block, and archive
Management and Governance service category: AWS management console, AWS config.

UNIT 3:

AWS Compute service category: Amazon EC2, Amazon EC2 auto scaling, Amazon elastic container service- Amazon ECS, Amazon EC2 container registry, AWS elastic beanstalk, AWS lambda, Amazon elastic Kubernetes service, AWS Fargate, Compute services overview, Amazon EC2, Amazon EC2 optimization, Container services, Introduction to AWS Lambda, Introduction to AWS Elastic Beanstalk

UNIT 4:

AWS Storage service category: Amazon simple storage service – Amazon S3, Amazon elastic block storage-Amazon EBS, Amazon elastic file system- Amazon EFS, Amazon simple storage service glacier, Amazon Elastic block store (Amazon EBS), Amazon simple storage service (Amazon – S3), Amazon elastic file system (Amazon EFS), Amazon simple storage service glacier, Amazon relational database service (Amazon RDS), Amazon RDS DB instances, Amazon RDS in a virtual private cloud, When to use Amazon RDS, Amazon RDS: Storage, Amazon RDS : Deployment and data transfer, Amazon DynamoDB, Amazon Redshift, Amazon Aurora

UNIT 5:

Microsoft Azure: Introduction to Azure core concepts and Services, Azure platform Services, Azure storage Services, Setting up a workspace, Microsoft Azure fundamental concepts and architectural components, Microsoft Azure Database, Analytics, & Compute Services: Azure Cosmos DB, Azure, SQL Database, Azure SQL Managed Instance, Azure Database for MySQL, and Azure, Database for PostgreSQL

UNIT 6:

Google Cloud Platform: Introduction to Google Cloud Platform (GCP) Services, Virtual Machines in the GC, Designing for Technical Requirements: High Availability, Scalability, Designing Compute Systems: Compute Services and Use Cases, Compute System Provisioning, Additional Design Issues, Designing Storage Systems: Overview of Storage Services, Object Storage with Google Cloud Storage, Network-Attached Storage with Google Cloud Filestore, Databases, Data Retention and Lifecycle Management, Networking and Latency.

REFERENCES:

1. Mark Wilkins , Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud, Addison-Wesley, First Edition, 2019
2. Essentials of cloud Computing: K. Chandrasekhran, CRC press, 201
3. Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley, 2011.
4. https://www.awsacademy.com
5. Official Google Professional Cloud Architect Study Guide by Dan Sullivan, Sybex, 1st edition.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

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2	0	0

(A0022203) CONSTITUTION OF INDIA
(Mandatory Learning Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- Study the structure and composition of Indian Constitution
- Learn about the federalism in the Indian context.
- Study the Panchayathi Raj Institutions as a medium of decentralization
- Learn about the three organs of the state in the contemporary scenario.

COURSE OUTCOMES:
After Completion of the course, students should be able to:
- Understand historical background of the constitutional making and its importance for building a democratic India.
- Be aware of the History, features of Indian constitution, the role Governor and Chief Minister, role of state election commission, the decentralization of power between central, state and local self-government.
- Aware of Indian government, the structure of state government, the local Administration.
- Able to evaluate Preamble, Fundamental Rights and Duties, Zilla Panchayat, block level organization, various commissions.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	2		1	1	1	1		
CO2	1	1	1	1		1	1	2		1	1	1	1	1	
CO3	1	1	1	1		1	1	2		1	1	1	1		
CO4	1	1	1	1		1	1	2		1	1	1	1		

UNIT I
History of Indian Constitution: History of Making of the Indian Constitution - History Drafting Committee - Composition & Working of Constitution.

UNIT II
Philosophy of the Indian Constitution: Preamble Salient Features of Indian Constitution.

UNIT III
Contours of Constitutional Rights & Duties: Fundamental Rights: Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and Educational Rights - Right to Constitutional Remedies - Directive Principles of State Policy.

UNIT IV
Organs of Governance: Parliament - Composition - Qualifications and Disqualifications Powers and Functions of Executive - President - Governor - Council of Ministers – Judiciary – Qualifications, Appointment and Transfer of Judges.

UNIT V
Local Administration: Role and Importance of Municipal Corporation Role and Importance Pachayati raj: Role and Importance Zilla Pachayat: Position and role - Village level: Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT VI
Election Commission: Role and Functioning of Election Commission Role and Functioning

of Chief Election Commissioner and Election Commissioners - Role and Functioning of State Election Commission.

TEXT BOOKS

1) Introduction to Constitution of India, D.D. Basu, Lexis Nexus
2) The Constitution of India, PM Bhakshi, Universal Law

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. I-Sem (CSE(DS))

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0	3	1.5

(A3292205) DATA WRANGLING LAB

COURSE OBJECTIVES:

- To teach various types of data formats and also how to read the data from different type file types.
- To know various visualization tools and also about web scraping.

COURSE OUTCOMES:

Upon completion of this course, the students should be able to

- Perform Read and write operations on CSV, JSON and XML files
- Process the Excel file using Pandas
- Parse and Extract the Tables using Python library
- Apply the basis of Data cleanup operation on the given dataset
- Explore the web scraping in Python

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1			2	1	1	1	1	1		
CO2	1	1	1	1	1			1			1	1	1		
CO3	1	1	1	1	1			1				1	1		
CO4	2	1	1	1	1			1				1	1		
CO5	1	1	1	1	1			1				1	1		

PREREQUISITE: PYTHON PROGRAMMING

LIST OF EXPERIMENTS:

1. Write a Python script to read each row from a given csv file and print a list of strings.
2. Write a Python program to read a given CSV file as a dictionary.
3. Write a Python program to convert Python dictionary object (sort by key) to JSON data. Print the object members with indent level 4
4. Write the python script to Read the XML file
5. Write a Pandas program to import excel data (child labour and child marriage data.xlsx) into a Pandas data frame and process the following
   a) Get the data types of the given excel data
   b) Display the last ten rows.
   c) Insert a column in the sixth position of the said excel sheet and fill it with NaN values
6. Develop the python script to parse the pdf files using pdfminer.
7. Extract the Table from the child labour and child marriage data.xlsx using pdtables library
8. Write a Python data wrangling scripts to insert the data into SQLite database
9. Develop the Python Shell Script to do the basic data cleanup on child labour and child marriage data.xlsx
   a) Check duplicates and missing data
   b) Eliminate Mismatches
   c) Cleans line breaks, spaces, and special characters
10. Import the data into `agate` then explores the table using agate methods and perform statistical correlations
11. Draw the chart between perceived corruption scores compared to the child labour percentages using matplotlib.
12. Write the python script to Map the Child Labour Worldwide using pygal.
13. Write a Python program to download and display the content of robot.txt for en.wikipedia.org

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III B.Tech. I-Sem (CSE(DS)) | L | P | C
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(A3293205) MACHINE LEARNING LAB

COURSE OBJECTIVES:

- The objective of this lab is to get an overview of the various machine learning techniques such as Supervised and Unsupervised learning concepts along with metrics and can able to demonstrate those using python.

COURSE OUTCOMES:

Upon completion of this course, the students should be able to:

- Apply and understand to perform various numerical operations on numbers.
- Understand the process of working on .CSV files and also able to perform on Multidimensional arrays using Pandas.
- Find and use various measures for evaluating a classifier and also differentiate various models using the measures of Confusion Matrix.
- Learn various applications of Machine Learning.
- Understand and analyze the performance of various classification algorithms.
- Understand and apply the Clustering for the given data.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3	2	3	3	2	3	2	2	1	2	2		
CO2	3	2	3	2	2	3	1	2	2	1	1	2		1	
CO3	3	2	3	3	2	3	1	3	2	1	1	1		3	
CO4	2	2	2	3	2	2	1	2	1	1	1	1			2
CO5	2	1	2	3	2	2	1	2	1	1	1	1		2	
CO6	2	1	2	3	2	2	1	2	1	1	1	1			2

1. Program to demonstrate on NumPy – use, Indexing, slicing, matrix operations.
2. Programs to demonstrate Pandas:
   a. Basics – getting started, Series, DataFrames, Read CSV, Read JSON, Analyze Data
   b. Cleaning Data - To Clean Data, Empty Cells, Wrong Format, Wrong Data, Remove Duplicates.
   c. Advanced – Correlations, Plotting
3. Programs on Matplotlib – Pyplot, Plotting, Markers, Line, Labels, Grid, Subplot, Scatter, Bars, Histograms, Pie Charts.
4. Programs on Mean, Median, Mode, Standard Deviation, Distribution and also Categorical Data.
5. Program to demonstrate Regression.
6. Program on splitting train/test data.
7. Program to demonstrate Decision Tree Classifier.
8. Program to demonstrate Confusion Matrix.
9. Program to demonstrate on K-Means Clustering.
10. Program to demonstrate Cross Validation.

REFERENCES:

1. Abhishek Vijayvargia, Machine Learning for Python: An Approach to Applied Machine Learning, BPB Publications.
2. https://www.w3schools.com/python/pandas/default.asp
3. The WEKA Workbench Eibe Frank, Mark A. Hall, and Ian H. Witten Online Appendix for “Data Mining: Practical Machine Learning Tools and Techniques” Morgan Kaufmann, Fourth Edition, 2016

Note: This is only the suggested list of Practicals. Instructor may frame additional Practicals relevant to the course contents.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) L T C
2 1 3

(A3210206) NATURAL LANGUAGE PROCESSING
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To teach the fundamentals of NLP, and also to make them for understanding CFG, PCFG in NLP.
- To know the role of semantics of sentences and pragmatic.
- To teach the basic concepts of speech processing along with analysis and modeling.

COURSE OUTCOMES:
After Completion of the course, students should be able to:
- learn the fundamentals of natural language processing
- understand the use of CFG and PCFG in NLP
- understand the role of semantics of sentences and pragmatic
- Introduce Speech Production And Related Parameters Of Speech.
- Show The Computation And Use Of Techniques Such As Short Time Fourier Transform, Linear Predictive Coefficients and Other Coefficients in The Analysis Of Speech.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	2		1	1	1	1		
CO2	1	1	1	1		1	1	2		1	1	1		2	
CO3	1	1	1	1		1	1	2		1	1	1		2	
CO4	1	1	1	1	2	1	1	2		1	1	1			2
CO5	1	1	1	1		1	1	2		1	1	1			1

UNIT I:
Introduction: Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT II
Word Level Analysis: Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III
Syntactic Analysis: Context Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs – Feature structures, Unification of feature structures.

UNIT IV
Semantics And Pragmatics: Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V

Basic Concepts of Speech Processing: Speech Fundamentals: Articulatory Phonetics – Production And Classification Of Speech Sounds; Acoustic Phonetics – Acoustics Of Speech Production; Review Of Digital Signal Processing Concepts; Short-Time Fourier Transform, Filter- Bank And LPC Methods.

UNIT VI

Speech-Analysis: Features, Feature Extraction And Pattern Comparison Techniques: Speech Distortion Measures– Mathematical And Perceptual – Log–Spectral Distance, Cepstral Distances, Weighted Cepstral Distances And Filtering, Likelihood Distortions, Spectral Distortion Using A Warped Frequency Scale, LPC, PLP And MFCC Coefficients, Time Alignment And Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths.
Speech Modeling: Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-Estimation, Implementation Issues.

TEXT BOOKS:

1. Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with Python, First Edition, OReilly Media, 2009.
3. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals Of Speech Recognition", Pearson Education, 2003.
4. Daniel Jurafsky And James H Martin, "Speech And Language Processing – An Introduction To Natural Language Processing, Computational Linguistics, And Speech Recognition", Pearson Education, 2002.

REFERENCE BOOKS:

1. Frederick Jelinek, "Statistical Methods of Speech Recognition", MIT Press, 1997.
2. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015
3. Richard M Reese, ―Natural Language Processing with Java, OReilly Media, 2015.
4. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
5. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval, Oxford University Press, 2008.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS))

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(A3211206) DEEP LEARNING

For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To teach the basic neural network architectures along with various activation functions.
- To know the sequential steps in CNN, RNN and importance of auto encoders and decoders.
- To know the concepts of Reinforcement learning along with its applications.

COURSE OUTCOMES:

After Completion of the course, students should be able to:

- Explain the basic principles behind neural networks and deep learning.
- Implement simple neural network algorithms.
- Compare modeling aspects of various neural network architectures
- Apply and evaluate deep learning on real data sets
- Understand the importance and need of encoders and decoders.
- Understand various case studies and applications of Deep Learning.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	2		1	1	1	3		
CO2	1	1	1	1		1	1	2		1	1	1	2	3	
CO3	1	1	1	1		1	1	2		1	1	1			2
CO4	1	1	1	1		1	1	2		1	1	1	1		
CO5	1	1	1	1		1	1	2		1	1	1			2
CO6	1	1	1	1		1	1	2		1	1	1	1		

UNIT I

Introduction: Introduction to machine learning- Linear models (SVMs and Perceptrons, logistic regression)- Intro to Neural Nets: What a shallow network computes- Training a network: loss functions, back propagation and stochastic gradient descent- Neural networks as universal function approximates, Curse of Dimensionality.

UNIT II

Introduction to Deep Learning & Architectures**:** Machine Learning Vs. Deep Learning, Representation Learning, Width Vs. Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines.

UNIT III

Convolutional Neural Networks**:** Architectural Overview – Motivation - Layers – Filters – Parameter sharing – Regularization, Popular CNN Architectures: ResNet, AlexNet.

UNIT IV

Sequence Modelling – Recurrent and Recursive Nets: Recurrent Neural Networks, Bidirectional RNNs – Encoder-decoder sequence to sequence architectures - BPTT for training RNN, Long Short Term Memory Networks.

UNIT V

Auto Encoders: Under complete Autoencoders – Regulraized Autoencoders – stochastic Encoders and Decoders – Contractive Encoders.

Deep Generative Models**:** Deep Belief networks – Boltzmann Machines – Deep Boltzmann Machine - Generative Adversarial Networks.

UNIT VI

Deep Reinforcement Learning: Deep Reinforcement Learning - Masters Atari Games- Markov Decision Processes-Policy Versus Value Learning.

Case Study and Applications**:** Image net- Detection-Audio Wave Net- Joint Detection Bioinformatics- Face Recognition- Scene Understanding- Gathering Image Captions.

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press, 2017.
2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017
3. Umberto Michelucci “Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks” Apress, 2018.
4. Giancarlo Zaccone, Md. Rezaul Karim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
5. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
6. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

REFERENCE BOOKS:

1. “Deep Learning: Methods and Applications (Foundations and Trends (R) in Signal Processing)”, Li Deng and Dong Yu, New Publishers, 2013.
2. “Advanced Data Analysis from an Elementary Point of View”, Cosma Rohilla Shalizi, Cambridge University Press, 2015.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS))

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(A3212206) BIG DATA

COURSE OBJECTIVES:

- To teach the fundamentals of Big Data along with its characteristics, challenges and its data models.
- To understand and know various concepts of Big Data like Map Reduce, Hadoop and other architectures and its technologies and frameworks.

COURSE OUTCOMES:

After Completion of the course, students should be able to:

- Understand the need of Big Data, challenges and different analytical architectures
- Understand the principles behind the NoSQL databases; know architectures and common features of the main types of NoSQL databases
- Manage Job Execution in Hadoop Environment
- Develop Big Data Solutions using Hadoop Eco System
- Understand the working environment of Pig and Hive for processing the structured and unstructured data.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	2		1	1	1	1		1
CO2	1	1	1	1		1	1	2		1	1	1		3	
CO3	1	1	1	1		1	1	2		1	1	1		3	
CO4	1	2	3	2		1	1	2		1	1	1			2
CO5	1	1	1	1	2	1	1	2		1	1	1			3

UNIT I:

Introduction: Distributed file system – Big Data and its importance, Four Vs, Drivers for Big data, Big data analytics, Big data applications, Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce. Apache Hadoop– Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization, Problems with traditional large-scale systems-Requirements for a new approach-Hadoop – Scaling-Distributed Framework-Hadoop v/s RDBMS-Brief history of Hadoop.

UNIT II:

NoSQL Data Management: Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships –graph databases – schema less databases – materialized views – distribution models – sharding — version – Map reduce –partitioning and combining – composing map-reduce calculations

UNIT III:

CONFIGURATIONS OF HADOOP: Hadoop Processes (NN, SNN, JT, DN, TT)-Temporary directory – UI-Common errors when running Hadoop cluster, solutions. Setting up Hadoop on a local Ubuntu host: Prerequisites, downloading Hadoop, setting up SSH, configuring the pseudo-distributed mode, HDFS directory, Name Node, Examples of MapReduce, Using Elastic MapReduce, Comparison of local versus EMR Hadoop. Understanding Map Reduce:Key/value pairs, The Hadoop Java API for MapReduce, Writing MapReduce programs, Hadoop-specific data types, Input/output. Developing MapReduce Programs: Using languages other than Java with Hadoop, Analysing a large dataset.

UNIT IV:

ADVANCED MAPREDUCE TECHNIQUES: Simple, advanced, and in-between Joins,

Graph algorithms, using language-independent data structures. Hadoop configuration properties - Setting up a cluster, Cluster access control, managing the Name Node, Managing HDFS, MapReduce management, Scaling.

UNIT V:

HADOOP STREAMING: Hadoop Streaming - Streaming Command Options - Specifying a Java Class as the Mapper/Reducer - Packaging Files with Job Submissions - Specifying Other Plug-ins for Jobs.

UNIT VI:

HIVE & PIG: Architecture, Installation, Configuration, Hive vs RDBMS, Tables, DDL & DML, Partitioning & Bucketing, Hive Web Interface, Pig, Use case of Pig, Pig Components, Data Model, Pig Latin.

TEXT BOOKS

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Professional Hadoop Solutions, Wiley, 2015.
2. Tom White, Hadoop: The Definitive Guide, O'Reilly Media Inc., 2015.
3. Garry Turkington, Hadoop Beginner's Guide, Packt Publishing, 2013.
4. Eric Sammer, "Hadoop Operations",1st Edition, O'Reilley, 2012.

REFERENCE BOOKS:

1. Pethuru Raj, Anupama Raman, Dhivya Nagaraj and Siddhartha Duggirala, High Performance Big-Data Analytics: Computing Systems and Approaches, Springer, 2015.
2. Jonathan R. Owens, Jon Lentz and Brian Femiano, Hadoop Real-World Solutions Cookbook, Packt Publishing, 2013.
3. Tom White, HADOOP: The definitive Guide, O Reilly, 2012.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) L T C
2 1 3

(A0537206) SAP-ABAP AND BASIC APPLICATIONS

(Open Elective-II)

For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Student will learn about the SAP ABAP Programming Language and how to use the SAP ABAP Workbench tools to develop basic applications.
- The course objective is to understand the concepts of Procedure and Object Oriented Programming in SAP ABAP to develop various applications, and to understand the concepts of ABAP Objects.
- It allows understanding the Data Dictionary and Open SQL which include in basic concepts of SAP ABAP to manipulate the data in database.

COURSE OUTCOMES:

- Understand and use the basic programming concepts of SAP ABAP.
- Design, develop the code, check, activate and run the programs and database tables using SAP ABAP Workbench tools.
- Understand and use the basic SAP ABAP application concepts to be able to develop the applications.
- After completing the course, participants should able to: Understand the advantage of ERP tools, working with SAP ABAP Workbench Tools, basic programming concepts in ABAP.
- Working with database through ABAP data dictionary, Open SQL and Internal Tables, Understand and develop the basic applications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
CO1		2	1							3			1	1	
CO2	1							3			2		2	3	1
CO3		1							2		1		2	1	
CO4				1			2						1		
CO5	2		1		3									1	2
CO6						1				2			2	2	

UNIT - I

What is ERP?, Why we need ERP?, Advantages of ERP, Major ERP Packages, What is SAP?, History & Features of SAP, SAP R/2 Architecture (Limitations of R/2 Architecture), SAP R/3 Architecture (Types of work processes), SAP R/3 Application Modules, SAP Landscape, What is ABAP?, Logon to SAP Environment, Transaction Codes. Programming Concepts: ABAP/4 Editor (SE38), Steps for Creating a Program, Elements in R/3 Screen, ABAP Syntax, Comments, Errors, Write Statements, Data, Data types, variables, parameters, system variables, control statements, string operations.

UNIT - II

ABAP Dictionary: Introduction, Exploring Domain, Data types, Types Groups, Database Tables, structures, append structures, views, and search helps, lock object, Primary key and foreign key. Internal Table: Introduction, types of internal table, Declaring Internal Table, Populating Internal Table, Processing Internal Table, Initializing Internal Tables, Control Break processing.

UNIT – III

OPEN SQL: Accessing Database Tables, Reading data using select statement, insert, update,

modify, delete. Modularization Techniques: Working with subroutines, Macros, Function Modules.

UNIT - IV

REPORTS: Working with classical reports, interactive reports, ALV Reports.

UNIT – V

ABAP User Dialogues: Introduction, introducing dialog programming, screen painter, menu painter, working with selection screens. Forms in SAP: Exploring the SAP script tool, The SAP smart Forms Tool, Comparing SAP Script and smart Forms, migrating SAP script forms to smart Forms.

UNIT - VI

OOPS Concepts: Encapsulation, Abstract, Polymorphism, Inheritance, Defining OOPS Concepts local and Global.

TEXT BOOKS:

1) SAP ABAP/4, Covers SAP ECC 6.0 Black Book, Kogent Learning Solutions Inc., DreamTech Press.
2) "Introduction to ABAP/4 programming for SAP" by Gareth M.de.Bruyn & Robert Lyfareff; Publisher: Golgotia pub.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) L T C
2 1 3

(A3446206) SOFTWARE APPLICATION DEVELOPMENT USING DEVOPS
(Open Elective-II)

For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

The course is designed to

1. Explain the DevOps Concepts for business cases
2. Prepare the model canvas for DevOps use cases
3. Introduce the virtual machines and containers for designing of applications
4. Familiar with cloud provisioning and management services
5. Testing the code with various aspects in continuous deployment / development

COURSE OUTCOMES:

After completion of the course, students will be able to

1. Understands the DevOps concepts in continuous delivery / development of applications
2. Create the DevOps applications using various tools and technologies
3. Examine the virtual machines and containers for managing the files
4. Apply cloud services for deployment the applications in a real-time
5. Analyze the web security and code testing with appropriate tools

MAPPING OF COs & POs:

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

UNIT-I DevOps Concepts:

Understanding DevOps movement, DevOps with changing time, The water fall model, Agile Model, Collaboration, Why DevOps, Benefits of DevOps, DevOps life cycle- all about continuous, Build Automation, Continuous Integration, Continuous Management, Continuous Delivery / Continuous Development, The agile wheel of wheels

UNIT-II DevOps Tools and Technologies:

Code Repositories : Git, Differences between SVN and Git, Build tools – Maven, Continuous integration tools – Jenkins, Container Technology – Docker, Monitoring Tools – Zenoss, Continuous integration with Jenkins 2, Creating built-in delivery pipelines, Creating Scripts, Creating a pipeline for compiling and executing test units, Using the Build Pipeline plugin, Integrating the deployment operation, Getting started with Chef, Overview of hosted Chef, Installing and configuring a Chef workstation. Converging a Chef node using a Chef workstation, installing software packages using cookbooks, creating a Role

UNIT-III Docker Containers:

Overview of Docker containers, Understanding the difference between virtual machines and containers, Installation and configuration of Docker on CentOS, Creating your first Docker container, Managing containers, Creating a Docker image from Docker file, An overview of Docker's elements, Creating a Dockerfile, Writing a Dockerfile, Building and running a container on a local machine, Testing a container locally, Pushing an image to Docker Hub

UNIT-IV Cloud Provisioning and Configuration Management with Chef

Chef and cloud provisioning, Installing knife plugins for Amazon EC2 and Microsoft Azure, Creating and configuring a virtual machine in Amazon Web Services, Creating and configuring

a virtual machine in Microsoft Azure, Managing Docker containers with Chef, Prerequisite – deploying our application on a remote server, Deploying the application on AWS, Deploying the application on Microsoft Azure, Deploying the application in a Docker container.

UNIT-V Managing Containers Effectively with Kubernetes

Kubernetes architecture overview, Installing Kubernetes on a local machine, Installing the Kubernetes dashboard, Kubernetes application deployment, Using AKS, Creating an AKS service, Configuring kubectl for AKS, The build and push of the image in the Docker Hub, Advantages of AKS, Creating a CI/CD pipeline for Kubernetes with Azure Pipelines

UNIT-VI Testing the Code

Manual testing, Unit testing, JUnit in general and JUnit in particular, A JUnit example, Automated integration testing, Docker in automated testing, Performance testing, Automated acceptance testing, Automated GUI testing, Integrating Selenium tests in Jenkins, JavaScript testing, Testing backend integration points, Test-driven development, A complete test automation scenario, Manually testing our web application, Security and Performance Tests: Applying web security and penetration testing with ZAP, Running performance tests with Postman

TEXTBOOKS:

1. Mitesh Soni, DevOps for Web Development, Packt Publishing, 2016
2. Mikael Krief , Learning DevOps- The complete guide to accelerate collaboration with Jenkins, Kubernetes, Terraform and Azure DevOps, Packt Publishing, 2019

REFERENCE BOOKS:

1. Joakim Verona , Practical DevOps, Packt Publishing, 2016
2. Michael Huttermann, DevOps for Developers, Apress publishers, 2012.
3. Sanjeev Sharma, The DevOps Adoption Playbook, Published by John Wiley & Sons, Inc.2017.
4. Sanjeev Sharma & Bernie Coyne, DevOps for Dummies, Published by John Wiley & Sons, Inc

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) L T C
2 1 3

(A3403205) CONVERSATIONAL SYSTEMS

(Open Elective-II)

For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- To enable attendees to acquire knowledge on chatbots and its terminologies
- To work with ML Concepts and different algorithms to build custom ML Model
- To better understand on Conversational experiences and provide better customer
- experiences

COURSE OUTCOMES: After completion of the course, the student should be able to

- Review, critically analyse and understand conversational systems.
- Synthesize conversational systems and natural language processing
- Apply appropriate methodologies for developing and evaluating conversational systems
- Carry out testing of an implemented conversational system
- Explain the purpose of virtual assistant agents effect on the development, deployment, and evaluation of conversational Systems

MAPPING OF COs & POs:

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

UNIT-I

Introduction to Dialogue Systems: What is a Dialogue System?, A Brief History of Dialogue Systems- Text-Based and Spoken Dialogue Systems, Voice User Interfaces, Chatbots, Embodied Conversational Agents, Robots and Situated Agents, Limitations of Early Dialogue Systems; Present-Day Dialogue Systems- Dialogue Systems on Messaging Platforms, Dialogue Systems on Smartphones, Dialogue Systems on Smart Speakers and Other Devices, Dialogue Systems in Cars, How Current Dialogue Systems Are Different; Modeling Conversation in Dialogue Systems, Designing and Developing Dialogue Systems.

UNIT-II

Introduction to VUI: A Brief History of VUIs, Conversational User Interfaces, What Is a VUI Designer?

Voice-Enabled Devices: Devices- home assistants, watches/bands/earbuds, other devices; Cars and Autonomous Vehicles.

Basic Voice User Interface Design Principles: Designing for Mobile Devices Versus IVR Systems, Conversational Design, Setting User Expectations, Design Tools, Confirmations, Command-and-Control Versus Conversational, Conversational Markers, Error Handling, Don't Blame the User, Novice and Expert Users, Keeping Track of Context, Help and Other Universals, Latency, Disambiguation, Design Documentation, Accessibility.

UNIT-III

Speech Recognition Technology: Choosing an Engine, Barge-In, N-Best Lists, The Challenges of Speech Recognition, Data Privacy.

Advanced Voice User Interface Design: Branching Based on Voice Input, Disambiguation, Handling Negation, Capturing Intent and Objects, Dialog Management, Don't Leave Your

User Hanging, Should the VUI Display What It Recognized?, Sentiment Analysis and Emotion Detection, Text-to-Speech Versus Recorded Speech, Speaker Verification, "Wake" Words, Context, Advanced Multimodal, Bootstrapping Datasets, Advanced NLU.

UNIT-IV

Rule-Based Dialogue Systems: A Typical Dialogue Systems Architecture - Automatic Speech Recognition (ASR), Natural Language Understanding (NLU), Dialogue Management, Natural Language Generation (NLG), Text-to-Speech Synthesis (TTS); Designing a Dialogue System, Tools for Developing Dialogue Systems- Visual Design Tools, Scripting Tools for Handcrafting Dialogue Systems, Advanced Toolkits and Frameworks, Research-Based Toolkits, Best Toolkits.

UNIT-V

Statistical Data-Driven Dialogue Systems: Motivating the Statistical Data-Driven Approach, Dialogue Components in the Statistical Data-Driven Approach - Natural Language Understanding, Dialogue Management, Natural Language Generation; Reinforcement Learning (RL) - Representing Dialogue as a Markov Decision Process, From MDPs to POMDPs, Dialogue State Tracking, Dialogue Policy, Problems and Issues with Reinforcement Learning and POMDPs.

UNIT-VI

End-to-End Neural Dialogue Systems: Neural Network Approaches to Dialogue Modeling, A Neural Conversational Model, Introduction to the Technology of Neural Dialogue- Word Embeddings, Recurrent Neural Networks (RNNs), Long Short-Term Memory Units, The Encoder-Decoder Network; Retrieval-Based Response Generation, Task-Oriented Neural Dialogue Systems.

Challenges and Future Directions: Multimodality in Dialogue, Visual Dialogue and Visually Grounded Language, Data Efficiency: Training Dialogue Systems with Sparse Data, Knowledge Graphs for Dialogue Systems, Dialogue with Social Robots, Dialogue and the Internet of Things, Social and Ethical Issues.

TEXT BOOKS

1. Michael McTear, "Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots", Second Edition, Moran and Claypool Publishers, 2020.
2. Cathy Pearl, "Designing Voice User Interfaces: Principles of Conversational Experiences", O'REILLY, 2016.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS))

L	T	C
2	1	3

(A0535206) COMPUTER GRAPHICS
(Professional Elective - II)
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To provide an understanding of how a computer draws the fundamental graphics primitives - lines and filled polygons in both 2-D and 3-D.
- To understand the fundamental mathematics involved in generating a 3-D scene. Includes coordinate systems, transformations, and vector operations.
- To make to understand the 3-D graphics pipeline
- To give a thorough introduction to computer graphics techniques, focusing on 3D modeling, image synthesis, and rendering.
- To apply knowledge gained in a series of exercises using OpenGL that demonstrates the fundamental principles of computer graphics.

COURSE OUTCOMES:
After Completion of the course, students should be able to:
- Familiar with drawing primitive objects (lines, circles, polygons) on a display.
- Demonstrate an understanding of contemporary graphics hardware. Be exposed to graphical input and output devices.
- Master 2D & 3D modelling and transformations.
- Familiar with projection of 3-D objects on a 2-D plane.
- Master clipping, fill, and rendering techniques and be exposed to color and shading models.
- Understand the concepts of Animation techniques and languages.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	1		1	1	1	1		
CO2	1	1	1	1		1	1	1		1	1	1	1		
CO3	1	1	1	1		1	1	1		1	1	1			2
CO4	1	1	1	1		1	1	1		1	1	1			2
CO5	1	1	1	1		1	1	1		1	1	1		2	
CO6	1	1	1	1		1	1	1		1	1	1	2		

UNIT I:
A Survey of Computer Graphics: Overview of graphics systems: Video-Display Devices, Raster-scan Systems, Random-scan Systems, Graphics Monitors and Work stations, Input devices, Hardcopy Devices and Graphics Software.

UNIT II:
Output Primitives: Points and lines, Line drawing algorithms- DDA, Bresenhams line algorithm, Circle generation algorithm and Ellipse Generating algorithms.

UNIT III:
2-D Geometrical transforms: Basic Transformations, Matrix representations and Homogeneous coordinates, Composite transforms, Other Transformations, Transformations between coordinate systems.

UNIT IV:
2-D Viewing: Definition of view port, clipping and window. The Viewing Pipeline, Viewing coordinate reference frame, Window to View-port coordinate transformation, 2D Viewing functions, Clipping Operation, Point Clipping, Line Clipping: Cohen-Sutherland and Liang -

Barsky line clipping algorithms, Polygon Clipping: Sutherland – Hodgeman polygon clipping algorithm.

UNIT V:

3-D Geometric and Modelling Transformations: Translation, Rotation, Scaling, other Transformations, Composite Transformations.

UNIT VI:

3-D viewing: Viewing Pipeline, Viewing coordinates, Projections. Computer Animation: Design of Animation Sequence, General Computer Animation functions, Raster Animation, Computer Animation Languages, Key-Frame systems, Motion Specifications.

TEXT BOOKS:

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson education.

REFERENCES:

1) "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.
2) "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc Graw hill edition.
3) "Procedural elements for Computer Graphics", David F Rogers, Tata Mc Graw hill, 2nd edition.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS))

L	T	C
2	1	3

(A0534206) SOFTWARE TESTING METHODOLOGIES AND TOOLS

(Professional Elective - II)

For branches: CSE & CSE(DS)

BACKGROUND:

Software testing is an integral and important activity in every software development environment. Software seems to have has permeated almost every equipment that we use in our daily lives. This course is designed to enable a clear understanding and knowledge of the foundations, techniques, and tools in the area of software testing and its practice in the industry. The course will prepare students to be leaders in software testing. Whether you are a developer or a tester, you must test software. This course is a unique opportunity to learn strengths and weaknesses of a variety of software testing techniques.

COURSE OBJECTIVES:

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

- Understand the basic concepts of software testing.
- Understand the various techniques and strategies of software testing and inspection and pointing out the importance of testing in achieving high-quality software.
- Perform effective and efficient structural testing of software.
- Integrate and test the various units and components of a software system.
- Perform effective and efficient functional testing of software.
- Select the appropriate tests to regression test your software after changes have been made.
- Plan, track and control the software testing effort.
- Understand the need of automated testing tools and various kinds of automated testing tools.

COURSE OUTCOMES:

- To understand the basics of testing and classification of bugs.
- To learn various path testing techniques apply them on program structure to identify structural bugs.
- To understand the process of dataflow testing and its importance to identify data bugs.
- To design and analyze the logic using decision table structure and KV chart specification to perform logic-based testing.
- To learn the motivation of graph matrices in testing and demonstrate various tools for testing automation.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	1		3	1		1
CO2		3	2	2							1	1		2	
CO3	1									1	1	1		1	
CO4	2	3	2								1	1			2
CO5	2		3		3				2	1		1			2

Detailed Syllabus:

UNIT I :

Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs.

UNIT II:

Flow graphs and Path testing: Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

UNIT III:
Dataflow testing: -Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing.

UNIT IV:
Logic Based testing: Overview, decision tables, path expressions, KV charts, and specifications

UNIT V:
Paths, Path products and Regular expressions: path products & path expression, reduction Procedure, applications, regular expressions & flow anomaly detection.

UNIT VI:
Graph Matrices and Application: Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, Overview of Some Commercial Testing Tools: Win Runner, Load Runner, QTP, Selenium

TEXT BOOKS:
1. Software testing techniques - Boris Beizer, 2nd Edition, Dreamtech.

REFERENCE BOOKS:
1. Software Testing in the Real World – Edward Kit, Pearson.
2. Effective methods of Software Testing, Perry, John Wiley.
3. Art of Software Testing – Meyers, John Wiley.
4. Software testing Tools – Dr.K.V.K.K.Prasad, Dreamtech.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS))

L	T	C
2	1	3

(A3213206) INFORMATION RETRIEVAL SYSTEMS
(Professional Elective - II)

COURSE OBJECTIVES:

- This course covers principles of information retrieval and their application to information systems and services. Emphasis is on models of user information seeking behavior, human information processing, and their relationship to retrieval models in information systems.

COURSE OUTCOMES:

After Completion of the course, students should be able to:

- Understand the objectives of IRS and also how it relates to DBMS and other systems.
- Apply various data structures in the process of retrieving the information from Data.
- Understand the indexing and its impact in Retrieval Systems.
- Understand and apply various searching techniques for retrieving information.
- Understand various text algorithms and also various measures for evaluating the retrieval systems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	1		1	1	1		3	
CO2	1	1	1	1		1	1	1		1	1	1	2		
CO3	1	1	1	1		1	1	1		1	1	1	1		
CO4	1	1	1	1		1	1	1		1	1	1			3
CO5	1	1	1	1		1	1	1		1	1	1	2		

UNIT I:

Introduction & Information Retrieval System Capabilities: Definition, Objectives, Functional Overview, Relationship to DBMS, Digital libraries and Data Warehouses. Search, Browse, Miscellaneous.

UNIT II:

Cataloging and Indexing: Objectives, Indexing Process, Automatic Indexing, Information Extraction.

Data Structures: Introduction, Stemming Algorithms, Inverted file structures, N-gram data structure, PAT data structure, Signature file structure, Hypertext data structure.

UNIT III:

Automatic Indexing: Classes of automatic indexing, Statistical indexing, Natural language, Concept indexing, Hypertext linkages

UNIT IV:

Document and Term Clustering: Introduction, Thesaurus generation, Item clustering, Hierarchy of clusters.

UNIT V:

User Search Techniques: Search statements and binding, Similarity measures and ranking, Relevance feedback, Selective dissemination of information search, Weighted searches of Boolean systems, Searching the Internet and hypertext. Information Visualization: Introduction, Cognition and perception, Information visualization technologies.

UNIT VI:

Text Search Algorithms: Introduction, Software text search algorithms, Hardware text search

systems. Measures used in system evaluation, Measurement example – TREC results.

TEXT BOOKS:

1. Kowalski, Gerald, Mark T Maybury: Information Retrieval Systems: Theory and Implementation, Kluwer Academic Press, 1997.

REFERENCE BOOKS:

1. Frakes, W.B., Ricardo Baeza-Yates: Information Retrieval Data Structures and algorithms, Prentice Hall, 1992.
2. Modern Information Retrieval by Yates Pearson Education.
3. Information Storage &Retrieval by Robert Korfhage – John Wiley & Sons.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) L T C
1 2 2

(A3214206) DATA VISUALIZATION AND PRESENTATION
(Skill Development Course)

COURSE OBJECTIVES:

- To teach various data visualization concepts and also various techniques tools for data presentation. It also emphasis on streaming data and Geo Spatial Visualization.

COURSE OUTCOMES:

After Completion of the course, students should be able to:

- Explore the basic concepts of Data Visualization.
- Apply various visualization techniques to visualize the experimental results.
- Analyze the results using various visualization techniques.
- Understand the visualization of streaming data.
- Understand and apply the Geo Spatial visualization principles for real time applications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	1		1	1	1	2		
CO2	1	1	1	1		1	1	1		1	1	1	1		2
CO3	1	1	1	1		1	1	1		1	1	1	1		
CO4	1	1	1	1		1	1	1		1	1	1		2	
CO5	1	1	1	1		1	1	1		1	1	1	1		3

UNIT I

Introduction to Data Visualization: Overview of data visualization - Data Abstraction - Task Abstraction - Analysis: Four Levels for Validation

UNIT II

Visualization Techniques: Scalar and Point techniques – Color maps – Contouring – Height Plots - Vector visualization techniques – Vector properties – Vector Glyphs – Vector Color Coding – Matrix visualization techniques.

UNIT III

Visual Analytics: Visual Variables- Networks and Trees - Map Color and Other Channels- Manipulate View- Heat Map

UNIT IV

Visualization Tools & Techniques: Introduction to various data visualization tools: R –basics, Data preprocessing, Statistical analysis, Plotly and ggplot library, Tableau, D3.js, Gephi.

UNIT V

Diverse Types of Visual Analysis: Time- Series data visualization – Text data visualization – Multivariate data visualization and case studies

UNIT VI

Visualization of Streaming Data: Best practices of Data Streaming, processing streaming data for visualization, presenting, streaming data, streaming visualization techniques, streaming analysis.

Geo Spatial Visualization: Chloropleth map, Hexagonal Binning, Dot map, Cluster map, cartogram map Visualization Dashboard Creations - Dashboard creation using visualization tools for the use cases: Finance-marketing-insurance-healthcare etc.,

TEXT BOOK(s)

1. Tamara Munzer, Visualization Analysis and Design, CRC Press 2014.
2. Aragues, Anthony. Visualizing Streaming Data: Interactive Analysis Beyond Static Limits. O'Reilly Media, Inc., 2018

REFERENCE BOOKS:

1. Dr.Chun-hauh Chen, W.K.Hardle, A.Unwin, Handbook of Data Visualization, Springer publication, 2016.
2. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication,2020
3. Alexandru C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014.

Mode of Evaluation: CAT / Assignment / Quiz / FAT / Project / Seminar.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) P 3 C 1.5

(A3294206) NATURAL LANGUAGE PROCESSING LAB

COURSE OBJECTIVES:

- To teach the python library that suits for text processing. It emphasis on various preprocessing steps to work on text. It also covers real time applications as part of this course.

COURSE OUTCOMES:

After Completion of the course, students should be able to:

- Understand the preprocessing steps for NLP.
- Apply Python libraries like NLTK for NLP to work on stop words, tokenization, corpus etc.
- Understand the importance of lemmatization and stemming concepts for NLP.
- Understand the process of applying NLP for various applications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	1		1	1	1	2		
CO2	1	1	1	1		1	1	1		1	1	1	1	2	
CO3	1	1	1	1		1	1	1		1	1	1	1		
CO4	1	1	1	1		1	1	1		1	1	1		2	

1. Write a Python NLTK program to remove stop words from a given text.
2. Write a Python NLTK program to split the text sentence/paragraph into a list of words.
3. Write a Python NLTK program to tokenize sentences in languages other than English.
4. Write a Python NLTK program to create a list of words from a given string.
5. Write a Python NLTK program to list down all the corpus names.
6. Write a Python NLTK program to get a list of common stop words in various languages in Python.
7. Write a Python NLTK program to find the definition and examples of a given word using WordNet.
8. Write a Python NLTK program to find the sets of synonyms and antonyms of a given word.
9. Write a Python NLTK program to get the overview of the tagset, details of a specific tag in the tagset and details on several related tagsets, using regular expression.
10. Write a Python NLTK program to find the number of male and female names in the names corpus. Print the first 10 male and female names.
11. Write a Python program to demonstrate Lemmatization with NLTK.
12. Write a Python program to demonstrate Stemming with NLTK.
13. Write a Python Program for NLP analysis of Restaurant review.
14. Write a program for Twitter Sentiment Analysis using Python.
15. Write a program for Sentiment Analysis using VADER.

REFERENCES:

1. https://www.w3resource.com/python-exercises/nltk/corpus-index.php
2. https://pythonspot.com/

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) P 3 C 1.5

(A3295206) DEEP LEARNING LAB

COURSE OBJECTIVES:

- To teach various deep learning packages and platforms along with basic neural network architectures with tuning parameters. It also emphasis on RNN and LSTM for real time applications.

COURSE OUTCOMES:

After Completion of the course, students should be able to:

- Understand the fundamental concepts of Multilayer perceptron.
- Apply and know the process of tuning various hyper-parameters.
- Understand various deep learning packages like Tensorflow, Keras, Theano, etc.
- Demonstrate the CNN for various applications like Sentiment Analysis, Face Recognition, Object detection.
- Understand the process of working recommendation system.
- Understand RNN for time series prediction.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	1		1	1	1	2		
CO2	1	1	1	1		1	1	1		1	1	1	1		
CO3	1	1	1	1		1	1	1		1	1	1		2	
CO4	1	1	1	1		1	1	1		1	1	1			3
CO5	1	1	1	1		1	1	1		1	1	1	1		3
CO6	1	1	1	1		1	1	1		1	1	1	1		2

LIST OF EXPERIMENTS

1. Classification with Multilayer Perceptron using Scikit-learn (MNIST Dataset)
2. Hyper-Parameter Tuning in Multilayer Perceptron
3. Deep learning Packages Basics: Tensorflow, Keras, Theano
4. Classification of MNIST Dataset using CNN
5. Parameter Tuning in CNN
6. Sentiment Analysis using CNN
7. Face recognition using CNN
8. Object detection using Transfer Learning of CNN architectures
9. Recommendation system using Deep Learning
10. Language Modeling using RNN
11. Time Series Prediction using RNN
12. Sentiment Analysis using LSTM

REFERENCES:

1. https://scikit-learn.org/stable/modules/neural_networks_supervised.html
2. https://machinelearningmastery.com/
3. https://thinkingneuron.com/face-recognition-using-deep-learning-cnn-in-python/
4. https://towardsdatascience.com/
5. http://paulorauber.com/slides/deep_learning_lab.pdf

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

III B.Tech. II-Sem (CSE(DS)) P 3 C 1.5

(A0572206) BIG DATA LAB

COURSE OBJECTIVES:

- To teach Big Data concepts in practical way along with Map-Reduce and Hadoop techniques and data models. It also emphasis on applying Classification and Clustering concepts on Big Data.

COURSE OUTCOMES:

After Completion of the course, students should be able to:

- Understand the concept and advantages of Map-Reduce.
- Understand data model using NoSQL.
- Apply Map-Reduce concepts for various Supervised Learning and Unsupervised Learning Concepts.
- Apply the Big Data concepts for real-time applications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1	1	1		1	1	1	1		
CO2	1	1	1	1		1	1	1		1	1	1		3	
CO3	1	1	1	1		1	1	1		1	1	1			3
CO4	1	1	1	1		1	1	1		1	1	1		1	2

LIST OF EXPERIMENTS

1. Word count application in Hadoop.
2. Sorting the data using MapReduce.
3. Implementation of aggregate data model uisng NoSQL
4. Finding max and min value in Hadoop.
5. Implementation of decision tree algorithms using MapReduce.
6. Implementation of K-means Clustering using MapReduce.
7. Generation of Frequent Itemset using MapReduce.
8. Count the number of missing and invalid values through joining two large given datasets.
9. Using hadoop’s map-reduce, Evaluating Number of Products Sold in Each Country in the online shopping portal for the given Dataset.
10. Analyze the sentiment for product reviews, this work proposes a MapReduce technique provided by Apache Hadoop.
11. Trend Analysis based on Access Pattern over Web Logs using Hadoop.

TEXT BOOKS:

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, Professional Hadoop Solutions, Wiley, 2015.
2. Tom White, Hadoop: The Definitive Guide, O’Reilly Media Inc., 2015.
3. Garry Turkington, Hadoop Beginner's Guide, Packt Publishing, 2013.

REFERENCE BOOKS:

1. Pethuru Raj, Anupama Raman, DhivyaNagaraj and Siddhartha Duggirala, HighPerformance Big-Data Analytics: Computing Systems and Approaches, Springer, 2015.
2. Jonathan R. Owens, Jon Lentz and Brian Femiano, Hadoop Real-World Solutions Cookbook, Packt Publishing, 2013.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY

(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

L	T	C
2	1	3

(A3217207) SOFTWARE PRODUCT DEVELOPMENT AND MANAGEMENT

(Professional Elective-III)

COURSE OBJECTIVES:

- Master the principles of software development, including process definition, tailoring, discipline, and various models, to ensure effective software production.
- Equip learners to create precise product specifications, employ effective analysis tools, and master software testing techniques for rigorous product development.
- Empower individuals with essential skills to excel in product management, encompassing strategy, vision, market analysis, and effective product positioning.
- Foster product management expertise by exploring differentiation, setting measurable goals, creating actionable initiatives, building roadmaps, and mastering feature ideation and prioritization.
- Empower product managers with the skills to effectively manage product backlogs, prioritize tasks using the MoSCoW method, and refine backlogs for enhanced efficiency.
- Educate on the Scrum Master's pivotal role, including sprint planning, organization with Infinity, daily Scrum meetings, and the distinctions between sprint review and retrospective.

COURSE OUTCOMES:

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

- Define software development processes, tailor them, and emphasize process discipline.
- Identify software models, life cycles, and understand software specifications.
- Explore product management, strategy, and target market identification.
- Develop product differentiation, goals, initiatives, and effective prioritization techniques.
- Master product backlog management, prioritization, refinement, and Scrum practices.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	2				1		2	1		1	1
CO2	2	2	2	2	1				1		2	1	1	1	1
CO3	2	2	2	2	1				1		2	1			1
CO4	2	2	2	2	2				1		2	1			1
CO5	2	2	2	2	1				1	1	2	2		1	1

UNIT I

Defining of Software Development Process - Process - Tailoring the Process - Improving the process discipline - Need for implementing discipline. Software Production Process - Identify the Software Model - Software Process Models: Waterfall Model, Prototyping Model, RAD Model, Incremental Model, Spiral Model, and Component Assembly Model - Software Life Cycle.

UNIT II

Product Specifications - Defining the Final Product - Data Flow Diagram, Data Dictionary, Structured English, Decision Trees, Decision Tables - Feasibility Study. Software Testing: Test Plan - Development Testing: Verification and Validation - General Testing Methods: White Box and Black Box testing - Unit Testing - System Integration Testing – Validation

Testing - System testing.

UNIT III

Introduction to Product management, product manager's roles and responsibilities, Product strategy, How to define product vision to guide your team, How to define your target market and customer persona, product positioning – how your product fit in the market.

UNIT IV

Product Differentiation - What's Your Competitive Edge, How To Set Smart, Measurable Product Goals, How To Set Actionable Product Initiatives, Product Roadmap, How To Get Ideas for Features, How To Prioritize the Right Features, What Are User Stories and How To Write Them.

UNIT V

Product Backlog, Product Backlog Management, Types of Product Backlog Tasks, How To Manage a Product Backlog in Infinity, Task Prioritization With the MoSCoW Method, How To Use MoSCoW Method in Infinity, Backlog Refinement, aka Backlog Grooming.

UNIT VI

What is Scrum master, roles and responsibilities of Scrum master, Scrum Sprint, What Happens During Sprint Planning?, How To Plan a Scrum Sprint in Infinity, How to Use Tabs to Organize a Sprint in Infinity, Why You Need Daily Scrum Meetings, Sprint Review vs. Sprint Retrospective.

TEXTBOOKS:

1. Hans-Bernd Kittlaus, Samuel A. Fricker, 'Software Product Management' Springer Berlin, Heidelberg.

REFERENCES:

1. "Infinity" The ultimate Product Management Framework – Complete guide to building the right product.
2. Software Product Management- Samuel A. Fricker.
3. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

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2	1	3

(A3218207) DECISION SUPPORT SYSTEMS
(Professional Elective-III)
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
Student should able to learn the following
- Introduce students to the concepts, importance, and applications of decision support systems in different industries and decision-making contexts.
- Familiarize students with various types of decision support systems, such as model-driven DSS, data-driven DSS, knowledge-driven DSS, and communication-driven DSS.
- Teach students how to use mathematical, statistical, and optimization models to represent and analyze decision problems.
- Provide an understanding of data collection, storage, retrieval, and processing techniques required to support decision-making processes in DSS.

COURSE OUTCOMES:
- Understand the importance of data management in decision support systems, including data collection, storage, cleansing, and integration.
- Learn how to create decision models, such as mathematical models, simulation models, and optimization models, to support decision-making processes.
- Apply decision analysis techniques, such as cost-benefit analysis and risk analysis, to evaluate and compare different alternatives.
- Gain practical knowledge in designing, developing, and implementing decision support systems to meet specific organizational needs.
- Demonstrate a comprehensive understanding of the fundamental concepts, principles, and components of decision support systems.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
C01		2	3		1		2		1			2		3	2
C02		3		2		3	1			2			3	1	
CO3	1			1			2			2		1			2
C04		1			2	3	1		2		1		2		1
C05	3			1					1		2		3	1	
C06															

UNIT I MANAGEMENT SUPPORT SYSTEMS:
An Overview Managers and Decision-Making; Managerial Decision-Making and Information Systems; Managers and Computer Support; Computerized Decision Support and the Supporting Technologies; A Framework for Decision Support; The Concept of Decision Support Systems; Group Support Systems; Enterprise Information Systems; Knowledge Management Systems; Expert Systems; Artificial Neural Networks; Advanced Intelligent Decision Support Systems; Hybrid Support Systems

UNIT II DECISION-MAKING SYSTEMS, MODELING, AND SUPPORT DECISION-MAKING:
Introduction and Definitions; Systems; Models; Phases of the Decision- Making Process; Decision-Making: The Intelligence Phase; Decision-Making: The Design Phase; Decision-Making: The Choice Phase; Decision-Making: The Implementation Phase; How Decisions Are Supported; Personality Types, Gender, Human Cognition, and Decision Styles; the Decision-Makers

UNIT III MODELING AND ANALYSIS

MSS Modeling; Static and Dynamic Models; Certainty, Uncertainty, and Risk; Influence Diagrams; The Structure of MSS Mathematical Models; Mathematical Programming Optimization; Multiple Goals, Sensitivity Analysis, What-If, and Goal Seeking; Problem-Solving Search Methods; Heuristic Programming; Simulation; Visual Interactive Modeling and Visual Interactive Simulation; Quantitative Software Packages; Model Base Management

UNIT IV DECISION SUPPORT SYSTEM DEVELOPMENT

Introduction to DSS Development; the Traditional System Development Life Cycle; Alternative Development Methodologies; Prototyping: The DSS Development Methodology; Change Management; DSS Technology Levels and Tools; DSS Development Platforms; DSS Development Tool Selection; Team-Developed DSS; End User Developed DSS.

UNIT V INTELLIGENT DECISION SUPPORT SYSTEMS

Knowledge-Based Systems Concepts and Definitions of Artificial Intelligence; Evolution of Artificial Intelligence; The Artificial Intelligence Field; Basic Concepts of Expert Systems; Applications of Expert Systems; Structure of Expert Systems; How Expert Systems Work; Problem Areas Suitable for Expert Systems; Benefits and Capabilities of Expert Systems; Problems and Limitations of Expert Systems; Expert System Success Factors; Types of Expert Systems; Expert Systems on the Web

UNIT-VI INTELLIGENT SYSTEMS OVER THE INTERNET

Web-Based Intelligent Systems; Intelligent Agents: An Overview; Characteristics of Agents. Why Intelligent Agents? Classification and Types of Agents; Internet-Based Software Agents; DSS Agents and Multi-Agents; Semantic Web: Representing Knowledge for Intelligent Agents; Web-Based Recommendation Systems; Managerial Issues of Intelligent Agents

TEXTBOOKS:

1. Peter G.W. Keen and Michael S. Scott Morton, ‘Decision Support Systems: An Organizational Perspective’ Addison-Wisely Publishing Company.

REFERENCES:

1. Mc Cosh, Andrew M, and Michael S. Scott Morton., “Management Decision Support Systems’, The Mac Millan Press Limited, 1978.
2. Sprague, Ralf H., Carlson, Eric D., “Building Effective Decision Support Systems”. Prentice Hall Inc., 1982.

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IV B.Tech. I-Sem (CSE (DS))

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2	1	3

(A0516205) COMPUTER NETWORKS
(Professional Elective-III)
For branches: ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- An understanding of the overriding principles of computer networking, including protocol design, protocol layering, algorithm design, and performance evaluation.
- An understanding of computer networking theory, including principles embodied in the protocols designed for the application layer, transport layer, network layer, and link layer of a networking stack.
- An understanding of specific implemented protocols covering the application layer, transport layer, network layer, and link layer of the Internet (TCP/IP) stack
- An understanding of security issues.

COURSE OUTCOMES:
- Students are able to classify network services, protocols and architectures.
- Student will learn to explain key Internet applications and their protocols.
- Students will learn to explain security issues in computer networks.
- Students are able to understand the concepts of the OSI and the TCP-IP model.
- Students are able to familiar with network tools and network programming.
- Students are able to learn the concepts of protocols, Wireless networking, network interfaces, and Design/performance issues in LAN's AND WAN's.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1							3					
CO2	1							3			2		2	2	
CO3		1							2		1		1		
CO4				1			2								
CO5	2		1		3										
CO6						1				2			1	2	

UNIT I: INTRODUCTION
Network Hardware, Network Software, References Models. The Physical Layer: Guided Transmission Media, Communication Satellites, The public Switched Telephone Network- The Local Loop: Modern ADSL, and wireless, Trunks and Multiplexing, Switching.

UNIT II: THE DATA LINK LAYER
Data link Layer Design Issues, Elementary Data Link Protocols, and Sliding Window Protocols.

UNIT III: THE MEDIUM ACCESS CONTROL SUBLAYER
Multiple Access protocols, Ethernet- Ethernet Cabling, Manchester Encoding, The Ethernet MAC Sublayer Protocol. The Binary Exponential Backoff Algorithm, Ethernet Performance, Switched Ethernet, Fast Ethernet. Wireless LANs- The 802.11 Protocol Stack, The 802.11 Physical Layer, The 802.11 MAC SubLayer Protocol, The 802.11 Frame Structure.

UNIT IV: THE NETWORK LAYER
Network Layer Design Issues, Routing Algorithms (Shortest path, Flooding, Distance Vector, Link state and Hierarchical routing, Broad cast routing, Multicast routing), Congestion Control Algorithms, Internetworking, IPV4 Addresses.

UNIT V: THE TRANSPORT LAYER

The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols: UDP, The Internet Transport Protocols: TCP,

UNIT VI: THE APPLICATION LAYER

DNS-The Domain Name System, Electronic Mail, The World Wide Web.

TEXTBOOKS:

1. Computer Networks, Andrew S. Tanenbaum, Fouth Edition, Pearson Education.
2. TCP/IP Protocol suite Fourth Edition- Behrouz A.Forouzan

REFERENCES:

1. Computer Communications and Networking Technologies, Michael A. Gallo, William M. Hancock, Cengage Learning.
2. Computer Networks, Bhushan Trivedi, Oxford.
3. Computer Networks: Principles, Technologies and Protocols for Network Design, Natalia Olifer, Victor Olifer, Wiley India.
4. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill.
5. Understanding Communications and Networks, Third Edition, W.A.Shay, Cengage Learning.
6. Computer and Communication Networks, Nader F. Mir, Pearson Education
7. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, Third Edition, Pearson Education.
8. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

L	T	C
2	1	3

(A3220207) TIME SERIES DATA ANALYSIS
(Professional Elective-IV)
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVE:

- The objective of the "Time Series Data Analysis" course is to provide students with a solid understanding of time series analysis techniques and their application in various fields. The course aims to equip students with the knowledge and skills necessary to effectively analyse and interpret time series data, model time-dependent patterns, and make informed forecasts and predictions.

COURSE OUTCOMES:

By the end of the course, students should be able to:

- Understand the fundamental concepts and characteristics of time series data.
- Apply exploratory data analysis techniques to gain insights from time series data.
- Model and analyse time series data using appropriate statistical and mathematical techniques.
- Apply forecasting techniques to make accurate predictions and assess forecast accuracy.
- Explore advanced topics in time series analysis, such as nonlinearity, intervention analysis, and state space models.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2	PS0 3
C01	1		3			3				2			1		
C02		1				2			2		1			2	
CO3			3		1				1				3		1
C04		3			2			2			3		3		
C05	2			2			3		2			1			3

UNIT 1: INTRODUCTION TO TIME SERIES ANALYSIS

Overview of time series data and its characteristics, Stationary and its importance in time series analysis, Time series components: trend, seasonality, and noise, Exploratory data analysis techniques for time series data, Introduction to time series visualization and interpretation.

UNIT 2: TIME SERIES MODELING BASICS

Autocorrelation and partial autocorrelation functions, Moving average (MA) and autoregressive (AR) models, The concepts of white noise and random walk, Estimation and selection of model orders (ARIMA modeling), Model diagnostics and residual analysis.

UNIT 3: ADVANCED TIME SERIES MODELS

Seasonal decomposition of time series (STL decomposition), Seasonal ARIMA (SARIMA) models for seasonal data, Exponential smoothing models (e.g., Holt-Winters method), State space models and the Kalman filter, Handling outliers and missing values in time series data.

UNIT 4: FORECASTING TECHNIQUES

Evaluation metrics for time series forecasting (e.g., MAE, RMSE), Simple forecasting methods (e.g., naïve, moving average), Exponential smoothing forecasting techniques, ARIMA modeling for forecasting, Model selection and model validation techniques.

UNIT 5: ADVANCED TIME SERIES ANALYSIS

Time series regression analysis, Intervention analysis and change point detection, Dynamic

regression models, Vector Autoregression (VAR) models, Granger causality and impulse response analysis.

UNIT 6: NONLINEAR TIME SERIES ANALYSIS

Nonlinear models for time series data (e.g., GARCH, ARCH), Chaos theory and its application in time series analysis, Nonlinear autoregressive exogenous (NARX) models, Introduction to state space models with nonlinearity, Nonlinear forecasting and prediction methods.

TEXTBOOKS:

1. "Time Series Analysis and Its Applications: With R Examples" by Robert H. Shumway and David S. Stoffer
2. "Forecasting: Principles and Practice" by Rob J. Hyndman and George Athanasopoulos

REFERENCES:

1. "Introductory Time Series with R" by Paul S.P. Cowpertwait and Andrew V. Metcalfe
2. "Time Series Analysis: With Applications in R" by Jonathan D. Cryer and Kung-Sik Chan
3. "Applied Time Series Analysis for Fisheries and Environmental Data" by J. Hampton and M. Scheuerell

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

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(A3229207) CONCEPTS OF ARTIFICIAL INTELLIGENCE
(Professional Elective-IV)

COURSE OBJECTIVES:

This course is designed to:
- Learn different AI techniques and their implementation.
- Understand types of agents and the activities of agents.
- Learn problem-solving using searching techniques, Problem characteristics and their implementations.
- Apply knowledge representation using pre-positional logic and First Order logic.
- Understand various learning algorithms

COURSE OUTCOMES:
The Student will be able to:
- Understand and learn the foundations of artificial intelligence
- Analyze the problems using informed and uninformed techniques
- Interpret the knowledge using first-order logic and the process of inference.
- Handle uncertainty using probability notations
- Design the different learning techniques.
- Applying probabilistic language processing interface for machines.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	2	2	1										1
CO2	1	2	2	2	1							1	1		1
CO3	1	2	1	1								1	1		1
CO4	2	2	2	1	1										1
CO5	2	2	2	2								1			2
CO6	2	2	2	2	1							1	1		2

UNIT I:
Introduction to AI: What is AI, Foundations of AI, History of AI, The State of Art.
Intelligent Agents: Agents and Environments, The Concept of Rationality, The Nature of Environments: PEAS, properties of Task Environment, The Structure of Agents.

UNIT – II:
Solving Problems by Searching: Problem Solving Agents, Example problems, Searching for Solutions, Uninformed Search Strategies, Informed search strategies, Heuristic Search Strategies, Heuristic Functions, Local Search Algorithms and Optimization Problems: Hill Climbing search, Simulated Annealing, Genetic Algorithms, Constraint Satisfaction Problems.

UNIT – III:
Knowledge Reasoning and Inference: Knowledge based Agents, The Wumpus World Problem,
Logic: Propositional Logic, First-Order Logic Knowledge and Reasoning: Inference in First-Order Logic: Propositional vs First Order inference. First-Order Logic: Syntax and Symantics of First order Logic, Using First Order Logic, Unification and Lifting, Forward Chaining.
Planning: The planning problem formulation, The Language of Planning Problems, Examples: Air Cargo Transport, Spare Tyres

UNIT IV:
Uncertainty Handling: Acting under Uncertainty, Basic Probability Notation, Axioms of

Probability, Inference using Full Joint Distribution, Bayes Rule and its Use, Probabilistic Reasoning Representing Knowledge in an Uncertain Domain, The semantics of Bayesian Networks.

UNIT V:

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees, Evaluating and Choosing the Best Hypothesis, The Theory of Learning, Regression and Classification with Linear Models, Artificial Neural Networks, Nonparametric Models, Support Vector Machines, Ensemble Learning, Practical Machine Learning.

UNIT VI:

Language Processing and Present and Future of AI:
Probabilistic Language Processing: Phrase structure grammars, Syntactic Analysis, Augmented Grammars and semantic Interpretation, Information Retrieval, Information Extraction, Machine Translation.
Philosophical foundations: Weak AI, Strong AI, Ethics and Risks of AI,
AI Present and Future: Agent Components, Agent Architectures, Are we going in the right direction, what if AI does succeed.

TEXTBOOK:

1. Stuart J.Russell, Peter Norvig, "Artificial Intelligence A Modern Approach", 3rd Ed, Pearson Education/ Prentice Hall 2019. Note: for UNIT-V 4th Edition.

REFERENCES:

1. Nilsson, Nils J., and Nils Johan Nilsson. Artificial intelligence: a new synthesis. Morgan Kaufmann, 1998.
2. Elaine Rich, Kevin Knight and Shivashankar B. Nair, Artificial Intelligence, 3/e, McGraw Hill Education, 2008.
3. Dan W. Patterson, Introduction to Artificial Intelligence and Expert Systems, PHI Learning, 2012.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

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2	1	3

(A3221207) NATURE INSPIRED COMPUTING FOR DATA SCIENCE
(Professional Elective-IV)

COURSE OBJECTIVES:

- Explore nature-inspired computing, focusing on evolutionary and swarm intelligence algorithms and their data science applications.
- Master genetic algorithms, covering principles, encoding, selection, and real-world applications in data science.
- Deepen understanding of particle swarm optimization, including mechanisms, convergence, and data science applications.
- Gain expertise in ant colony optimization, with emphasis on problem representation, pheromone, and data science applications.
- Delve into immuno-computing, understanding the immune system, pattern recognition, and its application through immune algorithms.
- Discover computing with new natural materials, including DNA computing principles, experiments, and its potential applications in problem-solving.

COURSE OUTCOMES:

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

- Master nature-inspired computing algorithms for practical data science solutions.
- Apply genetic algorithms proficiently in real-world data science applications.
- Effectively use PSO techniques to solve complex data science challenges.
- Apply ACO methods for efficient problem-solving in data science.
- Explore immuno-computing and DNA computing applications in data science.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	1	1							1	1		2
CO2	2	2	2	1	2							1	1		2
CO3	2	2	1	2	1							1	2	1	2
CO4	2	2	2	2	2							1	1		2
CO5	2	2	2	2	1							1	2	1	2

UNIT 1: INTRODUCTION TO NATURE INSPIRED COMPUTING

Overview of nature-inspired algorithms and their applications in data science; Evolutionary algorithms: Genetic algorithms, Genetic programming; Swarm intelligence: Particle swarm optimization, Ant colony optimization

UNIT 2: GENETIC ALGORITHMS

Principles and operators of genetic algorithms, Representation and encoding of problem solutions, Fitness evaluation and selection mechanisms, Convergence analysis and parameter tuning, Applications of genetic algorithms in data science

UNIT 3: PARTICLE SWARM OPTIMIZATION

Introduction to swarm intelligence and particle swarm optimization (PSO), Basic concepts and mechanisms of PSO, Particle representation and movement in PSO, Global and local optimization in PSO, Convergence analysis and parameter tuning in PSO, Applications of PSO in data science.

UNIT 4: ANT COLONY OPTIMIZATION

Overview of ant colony optimization (ACO), Problem representation and construction of solution paths in ACO, Pheromone updating and evaporation in ACO, Convergence analysis

and parameter tuning in ACO, Applications of ACO in data science

UNIT 5: IMMUNO-COMPUTING

Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding, Immune Network Theory- Danger Theory, Evaluation Interaction- Immune Algorithms

UNIT 6: COMPUTING WITH NEW NATURAL MATERIALS

DNA Computing: Motivation, DNA Molecule, Adleman's experiment, Test tube programming language, Universal DNA Computers, PAM Model, Splicing Systems, Lipton's Solution to SAT Problem, Scope of DNA Computing, From Classical to DNA Computing

TEXTBOOKS:

1. "Nature-Inspired Optimization Algorithms for Data Science and Analytics" by Jason Brownlee.
2. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007

REFERENCES:

1. "Swarm Intelligence: Principles, Advances, and Applications" by Felix T.S. Chan, Manoj Kumar Tiwari, and T.C. Edwin Cheng
2. "Introduction to Evolutionary Computing" by A.E. Eiben and J.E. Smith Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

L	T	C
2	1	3

(A3222207) KNOWLEDGE REPRESENTATION AND REASONING

(Professional Elective-V)

COURSE OBJECTIVES:

- Master the fundamentals of first-order logic syntax, semantics, and knowledge representation for explicit and implicit beliefs.
- Develop expertise in reasoning with Horn clauses, SLD resolution, and procedural control in dynamic databases.
- Understand production systems, working memory, conflict resolution, and their practical applications in rule-based reasoning.
- Explore object-oriented representation, frames, and structured descriptions for effective knowledge representation and entailment computation.
- Delve into taxonomies, classification, and inheritance networks, including defeasible strategies and formal accounts.
- Navigate default reasoning techniques like closed-world reasoning, circumscription, and vagueness, along with concepts of probability and belief.

COURSE OUTCOMES:

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

- Master first-order logic syntax, semantics, and pragmatic applications.
- Apply Horn clause reasoning and SLD resolution effectively.
- Utilize production systems and rule-based reasoning in practical applications.
- Understand object-oriented knowledge representation and structured descriptions.
- Explore taxonomies, classification, and inheritance networks for advanced reasoning.

MAPPING OF COS & POS:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	1								1		
CO2	1	2	2	2	2							1			
CO3	1	2	2	2	2							1			
CO4	2	2	2	2	1							1			1
CO5	2	2	2	2	1							1			

UNIT 1:

Introduction, The Language of First-Order Logic - The Syntax, The Semantics, The Pragmatics, Explicit and Implicit Belief, Expressing Knowledge - Knowledge Engineering, Vocabulary, Basic Facts, Complex Facts, Terminological Facts, Entailments, Abstract Individuals.

UNIT 2:

Reasoning with Horn Clauses - Horn Clauses, SLD Resolution, Computing SLD Derivations, Procedural Control of Reasoning - Facts and Rules, Rule Formation and Search Strategy, Algorithm Design, Controlling Backtracking, Dynamic Databases.

UNIT 3:

Rules in Production Systems - Production Systems: Basic Operation, Working Memory, Production Rules, A First Example, A Second Example, Conflict Resolution, Applications and Advantages.

UNIT 4:

Object-Oriented Representation- Objects and Frames, A Basic Frame Formalism, An Example - Using Frames to Plan a Trip. Structured Descriptions - Noun Phrases, Concepts, Roles, and

Constants, Meaning and Entailment, Computing Entailments.

UNIT 5:

Taxonomies and Classification, Inheritance- Inheritance Networks, Strategies for Defeasible Inheritance, A Formal Account of Inheritance Networks.

UNIT 6:

Default Reasoning - Closed-World Reasoning, Circumscription, Default Logic, Autoepistemic Logic. Vagueness, Uncertainty, and Degrees of Belief- Objective Probability, Subjective Probability.

TEXT BOOKS:

1. Knowledge representation and reasoning. Ronald Brachman and Hector Levesque. Morgan Kaufmann Publishers. (Online copy is available from the ASU Library.
2. Handbook of knowledge representation. Edited by Frank van Harmelen, Vladimir Lifschitz, and Bruce Porter. Elsevier Science.

REFERENCES:

1. Schank, Roger C., Robert P. Abelson: Scripts, Plans, Goals, and Understanding: An Inquiry into Human Knowledge Structures. Hillsdale, NJ: Lawrence Erlbaum, 1977.
2. John F. Sowa: Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, Thomson Learning, 2000.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS)) L T C
2 1 3

(A3225207) AUGMENTED REALITY AND VIRTUAL REALITY
(Professional Elective-V)
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To make students know the basic concept and framework of virtual reality.
- To teach students the principles and multidisciplinary features of virtual reality.
- To teach students the technology for multimodal user interaction and perception in VR, in particular the visual, audial and haptic interface and behavior.
- To teach students the technology for managing large scale VR environment in real time.
- To provide students with an introduction to the VR system framework and development tools.

COURSE OUTCOMES: On completion of the course, student will be able to
- Design and implement the VR system.
- Implement the Augmented Reality software.
- Analyze and design the framework in VR using various software development tools in VR.
- Recognize the technologies used to manage the large scale VR environment in real time.
- Describe the principles and features of AR.
- Recognize the technologies used to manage the large scale AR environment in real time.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2	PS0 3
C01		2				2		2		2			3		
C02	1		3	2		2		1						2	
CO3		3			2	3		2		3			3		1
C04	3		2	2		2				3				2	
C05	2	2					3				1				1
C06		1	1	3				2		2			3		

UNIT 1: INTRODUCTION TO VIRTUAL REALITY
Fundamental Concept and Components of Virtual Reality- Primary Features and Present Development on Virtual Reality - VR systems - VR as a discipline-Basic features of VR systems-Architecture of VR systems-VR hardware -VR input hardware: tracking systems, motion capture systems, data gloves-VR output hardware: visual displays.

UNIT 2: I/O INTERFACE AND TECHNIQUES IN VR
Multiple Modals of Input and Output Interface in Virtual Reality: Input --Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual / Auditory / Haptic Devices, Interactive Techniques in Virtual Reality: Body Track, Hand Gesture, 3D Manus, Object Grasp.

UNIT 3: VISUAL COMPUTATION IN VIRTUAL REALITY:
Fundamentals of Computer Graphics-Software and Hardware Technology on Stereoscopic Display-Advanced Techniques in CG: Management of Large-Scale Environments & Real Time Rendering -Development Tools and Frameworks in Virtual Reality: Frameworks of Software Development Tools in VR. X3D Standard: Vega, MultiGen, Virtoolsetc

UNIT 4: APPLICATION OF VR IN DIGITAL ENTERTAINMENT:

VR Technology in Film & TV Production, VR Technology in Physical Exercises and Games, Demonstration of Digital Entertainment by VR,3D user interfaces - Why 3D user interfaces, Major user tasks in VE, Interaction techniques for selection, manipulation and navigation,3DUI evaluation.

UNIT 5: INTRODUCTION OF AUGMENTED REALITY:

System Structure of Augmented Reality-Key Technology in AR-- AR software development - AR software, Camera parameters and camera calibration, Marker-based augmented reality, Pattern recognition, AR Toolkit

UNIT 6: TOOLS AND APPLICATIONS OF AUGMENTED REALITY:

Tools available for Augmented Reality and Recognition – Software Tools – Google Poly – Unity – software approaches – recognition types – native software solutions – ARKit – ARCore – software development kit - Cloud services - AR business applications – weather prediction – market prediction – smart cities - AR application for Education - AR application for Healthcare sector – Agriculture – Civil Engineering – Architecture – Archaeology – Crime and Security – Games – IoT - – Use cases – Social Media – Gaming – Education – Healthcare – Shopping and Business.

TEXT BOOKS

1. Sherman, William R. and Alan B. Craig. Understanding Virtual Reality – Interface, Application, and Design, Morgan Kaufmann, 2002.
2. Fei GAO. Design and Development of Virtual Reality Application System, Tsinghua Press, March 2012.

REFERENCE BOOKS

1. Guangran LIU. Virtual Reality Technology, Tsinghua Press, Jan. 2011.
2. Burdea, G. C. and P. Coffet. Virtual Reality Technology, 2nd Edition. Wiley-IEEE Press, 2003/2006.

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(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

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2	1	3

(A3224207) HIGH PERFORMANCE COMPUTING

(Professional Elective-V)

COURSE OBJECTIVES:

- Understand modern processors, memory hierarchies, and optimization techniques for serial code in microprocessor architectures.
- Explore data access optimization, bandwidth-based modeling, and algorithm classification for code optimization.
- Learn about parallel computer taxonomy, shared and distributed memory systems, and the basics of parallelization for improved performance.
- Master shared-memory parallel programming with OpenMP, including efficient programming, profiling, and case studies.
- Optimize locality on ccNUMA architectures, addressing placement issues and pitfalls in C++ with a focus on efficiency.
- Dive into distributed-memory parallel programming using MPI, covering message passing, performance tools, communication parameters, and programming models.

COURSE OUTCOMES:

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

- Explore modern processor architectures, memory hierarchies, and serial code optimization techniques.
- Master data access optimization, algorithm performance, and STREAM benchmarks for efficient computation.
- Understand parallel computer taxonomy, parallelization basics, and scalability concepts in computing.
- Learn shared-memory parallel programming using OpenMP, profiling, and optimizing performance.
- Optimize locality on ccNUMA architectures, address placement pitfalls, and handle ccNUMA issues with C++.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1							1		1	
CO2	1	2	2	2	2							1		1	2
CO3	1	2	2	1								1	1		1
CO4	1	2	2	2	2							1		1	1
CO5	1	1	2	2	2									1	1

UNIT I: INTRODUCTION:

Modern processors: Stored –program computer architecture; General-purpose cache – based microprocessor architecture; Memory hierarchies; Multicore and Multithreaded processors; Vector processors.

Basic optimization techniques for serial code: Simple measures-Elimination of common sub expressions, avoiding branches, using SIMD instruction sets; The role of compilers; C++ Optimizations

UNIT II: OPTIMIZATION

Data access optimization: Balance analysis- Bandwidth-based performance modelling, the STREAM benchmarks; storage order - case studies; Algorithm classification and access optimizations.

UNIT III: PARALLEL COMPUTERS & PARALLELIZATION.

Parallel computers: Taxonomy; shared – memory computers; Distributed- memory computers; Hierarchical systems; Networks.

Basics of parallelization: Why parallelize? Parallelism; Parallel scalability.

UNIT IV: OPEN MP

Shared- memory parallel programming with Open MP:Introduction to Open MP; Open MP Case Study: – parallel Jacobi algorithm.

Efficient open MP Programming: Profiling open MP programs; Performance pitfalls;

Case study: Parallel sparse matrix-vector multiply

UNIT V: ccNUMA ARCHITECTURES

Locality optimizations on cc NUMA architectures: Locality of access on cc NUMA; cc NUMA optimization of sparse MVM (Case study); Placement pitfalls; cc NUMA issues with C++.

UNIT VI: DISTRIBUTED-MEMORY PARALLEL PROGRAMMING WITH MPI

Message passing; Introduction to MPI; MPI Parallelization of a Jacobi solver.

Efficient MPI Programming: MPI Performance tools; Communication Parameters; Synchronization, serialization, contention; Reducing communication overhead; Internodes point-to-point communication. Basic MPI/0pen MP programming models.

TEXTBOOK:

1. Introduction to high performance computing for scientists and engineers, Georg Hager and Gerhard Wellein, CRC Press (Special Indian Edition) 2012.

REFERENCE BOOKS:

1. Multi-Core Programming: Increasing Performance through Software Multithreading, S. Akhter & J. Roberts, Intel Press, 2006. ISBN: 0-9764832-4-6
2. The OpenMP API specification for parallel programming. http://openmp.org./wp/opemmp-specifications.
3. Computer Architecture: A Quantitative Approach, Hennessy J.L., Patterson /D.A., Morgan Kaufmann, 4th edn, 2006, ISBN: 978-0123704900.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

L	T	C
2	1	3

(A3215207) ESSENTIALS OF BLOCKCHAIN TECHNOLOGY

(Open Elective-III)

COURSE OBJECTIVES:

- Explore the history of digital money to distributed ledgers, block chain architecture, crypto primitives, and basic consensus mechanisms.
- Examine consensus protocol requirements, Proof of Work (PoW), scalability aspects, and consensus in permissioned block chains.
- Dive into Hyperledger Fabric components, chain code design, implementation, and tools for blockchain development.
- Discover blockchain applications in financial systems, settlements, KYC, capital markets, insurance, and trade/supply chain management.
- Investigate blockchain in government, digital identity, record-keeping, and blockchain cryptography for security and privacy.
- Analyse security and privacy issues in blockchain technology, types of attacks, enhancements, and applications in healthcare and finance.

COURSE OUTCOMES:

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

- Explore blockchain architecture, cryptographic primitives, and consensus mechanisms.
- Evaluate consensus protocols, focusing on Proof of Work (PoW) and scalability.
- Master Hyperledger Fabric components, chain code design, and implementation.
- Examine blockchain applications in financial systems, trade/supply chains, and government.
- Analyse security and privacy challenges in blockchain technology and potential solutions.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1									1	1	
CO2	1	2	1	1	2							1		1	
CO3	1	1	1	2	2							1		1	
CO4	1	2	1	2	2										1
CO5	1	2	1	1	1							1			1

UNIT - I

History: Digital Money to Distributed Ledgers -Design Primitives: Protocols, Security, Consensus, Permissions, Privacy- : Block chain Architecture and Design-Basic crypto primitives: Hash, Signature- Hash chain to Block chain-Basic consensus mechanisms.

UNIT - II

Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Block chain consensus protocols: Permissioned Block chains-Design goals-Consensus protocols for Permissioned Block chains.

UNIT - III

Decomposing the consensus process-Hyper ledger fabric components-Chain code Design and Implementation: Hyper ledger Fabric II: Beyond Chain code: fabric SDK and Front End-Hyper ledger composer tool.

UNIT - IV

Block chain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-

Insurance- Block chain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

UNIT - V

Block chain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems: Block chain Cryptography: Privacy and Security on Block chain.

UNIT – VI

Security And Privacy Issues of Block Chain Technology: Introduction, Block chain Aspects for Consideration, Security of block chain, Privacy of block chains, Security Issues of Block chain Technology, Privacy Issues of Block chain Technology, Types of Attack, Security Enhancement to Block chain Systems, Applications of Block chain in Health care, Finance.

TEXT BOOKS:

1. Mark Gates, "Block chain: Ultimate guide to understanding block chain, bit coin, crypto currencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, "Hands-On Block chain with Hyper ledger: Building decentralized applications with Hyperledger Fabric and Composer", 2018.
3. Bahga, Vijay Madisetti, "Block chain Applications: A Hands-On Approach", Arshdeep Bahga, Vijay Madisetti publishers 2017

REFERENCE BOOKS:

1. Andreas Antonopoulos, "Mastering Bitcoin: Unlocking Digital Crypto currencies", O'Reilly Media, Inc. 2014.
2. Melanie Swa, "Block chain", O'Reilly Media 2014.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

L	T	C
2	1	3

(A3228207) CYBER SECURITY AND CYBER LAWS

(Open Elective-III)

For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Identify the key components of cyber security in network
- Describe risk management processes and practices
- Define types of service delivery process and storage management process
- Access additional external resources to supplement knowledge of cyber forensics and laws

COURSE OUTCOMES:

- Demonstrate a solid understanding of the core principles and concepts of cybersecurity, including confidentiality, integrity, availability, and non-repudiation.
- Understand the processes and methodologies for managing information security, risk assessment, and security policies.
- Explore network security technologies and protocols to protect data and communications from unauthorized access and attacks.
- Explain the principles of cryptography and encryption techniques used to secure sensitive data and communications.
- Identify common types of malware, cyber threats, and attack vectors and understand the methods to defend against them.
- Develop skills in incident response and handling, including detecting, analyzing, and mitigating cybersecurity incidents.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2	PS0 3
C01	1		3	1		2			1		2	3	1		2
C02	1		1		2	1		1		2	1			1	
CO3		1		1			1			1	3		1		2
C04		1	3	2		1			2			3	2		1
C05		2		1	3			2				2	3		2
C06	2		1		2		1		2		1		3	1	

UNIT-I INTRODUCTION TO CYBER CRIME:

Introduction Cybercrime: Definition and Origins of the word, Cybercrime and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, E-mail Spoofing, Spamming, Cyber defamation, Internet Time Theft, Salami Attack/ Salami Technique, Data Diddling, Forgery, Web Jacking, Newsgroup Spam/ Crimes Emanating from Usenet Newsgroup, Industrial Spying/Industrial Espionage, Hacking, Online Frauds, Pornographic Offenses, Software Piracy, Computer Sabotage, E-Mail Bombing/Mail Bombs, Usernet Newsgroup as the Source of Cybercrimes, Computer Network Intrusions, Password Sniffing, Credit Card Frauds, Identity Theft, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, Hacking and the Indian Law(s), A Global Perspective on Cybercrimes, Cybercrime and the Extended Enterprise.

UNIT-II CYBER OFFENSES: HOW CRIMINALS PLAN THEM:

Introduction, Categories of Cybercrime, How Criminals Plan the Attacks, Reconnaissance, Passive Attacks, Active Attacks, Scamming and Scrutinizing Gathered Information, Attack (Gaining and Maintaining the System Access), Social Engineering, Classification of Social Engineering, Cyber stalking, Types of Stalkers, Cases Reported on Cyber stalking, How

Stalking Works?, Real-Life Incident of Cybertstalking, Cybercafe and Cybercrimes, Botnets:The fuel for Cybercrime, Botnet, Attack Vector, Cloud Computing, Why Cloud Computing?, Types of Services, Cybercrime and 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: Types and Techniques of Credit Card Frauds, Registry Settings for Mobile Devices Authentication Service Security: Cryptographic Security for Mobile Devices, Attacks on Mobile/Cell Phones: Mobile Phone Theft, Mobile Devices: Security Implications for Organizations: Managing Diversity and Proliferation of Hand-Held Devices, Organizational Measures for Handling Mobile Devices-Related Security Issues: Encrypting Organizational Databases, Organizational Security Policies and Measures in Mobile Computing Era: Importance of Security Policies relating to Mobile Computing Devices Laptops: Physical Security Countermeasures.

UNIT-IV TOOLS AND METHODS USED IN CYBER CRIME –

Introduction, Proxy Servers and Anonymizers, Phishing, How Phishing Works, Password Cracking, Online Attacks, Offline Attacks, Strong, Weak and Random Passwords, Random Passwords, Keyloggers and Spywares, Software Keyloggers, Hardware Keyloggers, Antikeylogger, Spywares, Virus and Worms, Types of Viruses, Trojan Horses and Backdoors, Backdoor, How to Protect from Trojan and Backdoors, Steganography, Steganalysis, Dos and DDos Attacks, Dos Attacks, Classification of Dos Attacks, Types of Levels of Dos Attack, Tools Used to Launch Dos Attacks, DDos Attacks, How to protect from Dos/DDos Attacks, SQL Injection, Steps for SQL Injection Attack, How to Prevent SQL Injection Attacks.

UNIT-V UNDERSTANDING COMPUTER FORENSICS:

Introduction, Historical Background of Cyberforensics, Digital Forensics Science, The Need for Computer Forensics, Cyberforensics and Digital Evidence, The Rules of Evidence, Forensics Analysis of E-Mail, RFC2822, Digital Forensics Life Cycle, The Digital Forensics Process, The Phases in Computer Forensics/Digital Forensics, Precautions to be Taken when Collecting Electronic Evidence, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Typical Elements Addressed in a Forensics Investigation Engagement Contract , Solving a Computer Forensics Case, Computer Forensics and Steganography, Rootkits, Information Hiding, Forensics and Socal Networking Sites: The Security/Privacy Threats, Challenges in Computer Forensics, Technical Challenges: Understanding the Raw Data and its Structure, The Legal Challenges in Computer Forensics and Data Privacy Issues, Special Tools and Techniques, Digital Forensics Tools Ready Reckenor, Special Technique: Data Mining used in Cyberforensics, Forensics Auditing.

UNIT-VI CYBERCRIME AND CYBERTERRORISM:

Social, Political, Ethical and Psychological Dimensions: Introduction, Intellectual Property in the Cyberspace, Copyright, Patent, Trademarks, Trade Secret, Trade Name, Domain Name, The Ethical Dimension of Cybercrimes, Ethical Hackers: Good Guys in Bad Land, The Psychology, Mindset and Skills of Hackers and Other Cybercriminals, Inside the Minds and Shoes of Hackers and Cybercriminals, Hackers and Cybercriminals: Evolution of Technical prowess and Skills, Ethical Hackers, Sociology of Cybercriminals, Personality Traits of Cybercriminals and Younger Generation’s views about Hacking, Information Warfare: Perception or An Eminent Reality?, Cyberwar Ground is HOT.

TEXT BOOKS:

1. Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole and Sunit Belpure, Publication Wiley.

REFERENCES:

1. Management of Information Security, M. E. Whitman, H. J. Mattord, Nelson Education, CENGAGE Learning, 2011, 3rd Edition.
2. Guide to Computer Forensics and Investigations, B. Nelson, A. Phillips, F. Enfinger, C. Steuart, Nelson Education / CENGAGE Learning, 2010, 4th Edition

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

L	T	C
2	1	3

(A3216207) FUNDAMENTALS OF QUANTUM COMPUTING
(Open Elective-III)
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
Students should able to learn:
- Fundamentals of quantum computing.
- Basics of quantum information theory and cryptography.
- Quantum algorithms, its implementation platforms and applications

COURSE OUTCOMES:
- To understand the fundamentals of quantum computation and circuits
- To learn basic quantum algorithms.
- To understand basics of quantum information theory and cryptography.
- To learn different platforms implementing basic applications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
C01	1		2	2				3			2		2		2
C02		1				3			2		2	2	1	3	
CO3	2	2		3		2		3		1		2		2	
C04	1	2		3					2		2		2		

UNIT-I
Introduction: Introduction to Quantum Computing, Global Perspectives, Quantum Bits, Qubit measurement, Quantum Algorithms, Quantum Information, Experimental quantum information processing, Quantum computation, Postulates of quantum mechanics.

UNIT-II
Quantum Computation: Quantum Circuits- Quantum algorithms, Single Orbit operations, Controlled Operations, Measurement, Universal Quantum Gates, Simulation of Quantum Systems, Quantum Fourier Transform, Phase Estimation, Applications, Quantum Search Algorithms- Quantum Counting-Speeding up the solution of NP – Complete problems-Quantum search of an unstructured database.

UNIT-III
Quantum Computers: Guiding Principles, Conditions for Quantum Computations, Harmonic Oscillator Quantum Computer, Optical Photon Quantum Computer- Optical Cavity Quantum Electrodynamics, Ion Traps, Magnetic Resonance.

UNIT-IV
Quantum Information: Quantum Noise and Quantum Operations – Classical Noise and Markov Process, Quantum Operations, Examples of Quantum Noise and Quantum Operations-Applications of Quantum Operations, Limitations of the Quantum operations formalism, Distance Measures for Quantum Information.

UNIT-V
Quantum Error Correction: Introduction, Shor Code, Theory of Quantum Error-Correction, Constructing Quantum Codes, Stabilizer Codes, Fault-Tolerant Quantum Computation, Entropy and Data information – Shannon Entropy, Basic Properties of Entropy, Von Neumann, Strong Sub Additivity.

UNIT-VI

Quantum Information Theory: Distinguishing quantum states and the accessible information, Data Compression, Classical Information Over Noisy Quantum Channels, Quantum Information Over Noisy Quantum Channels, Entanglement as a physical resources, Quantum Cryptography.

TEXT BOOKS:

1. Micheal A. Nielsen & Issac L.Chiang ," Quantum Computation and Quantum Information", Cambridge University Press, Fint South Asian edition ,2002.
2. Benenti G., Casati G. and Strini G., Principles of Quantum Computation and Information.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

L	T	C
2	1	3

(A3219207) IT PROJECT MANAGEMENT
(Open Elective-IV)
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To understand IT Project Management concepts, project overview and feasibility studies
- To apply Project Cost Control and Scheduling techniques like PERT and CPM.
- To describe Agile Project management, Principles and Methodologies
- To be familiar with Agile methodologies and techniques like Scrum, DevOps, etc

COURSE OUTCOMES:
After completion of this course, the student should be able to
- Student will understand the concepts of Project, Project Management & Role of a project manager
- Student will understand how a project is monitored, stages of a project, Measuring the viability of project.
- Student can Understand how the project is planned, apply cost control Techniques like PERT, CPM.
- Student will learn how to apply scheduling techniques.
- Student will understand how to control the change management & have Knowledge about Quality criteria aspects
- Student have clear idea about what is Project organization.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2	PS0 3
C01	2	2		2		3	2	2	2	2	1	2	1	2	3
C02	1			2					2		1		2		3
CO3	2	2	1	1	1						3				
C04	2	1	2	1	1						3		3		
C05									2	2	2		2	2	
C06	2	2				3	3	3	2	2	2		2	3	3

UNIT-I: INTRODUCTION TO PROJECT MANAGEMENT
Concept of project, Project Management, Program and Project Portfolio Management, Role of Project Manager, The Project Management Profession. The Management Spectrum, The People, The Product, The Process, The Project, The W5HH Principle.

UNIT-II: PROJECTS & PROJECT WORK
Projects, Successful projects, Project Management, System Development Life Cycle, Project Management & Development Life Cycle, Elements of Project Management, Development Process Model, The Project Plan, The Business case, Implementation & Post-Implementation Strategies.

UNIT-III: PROJECT PLANNING & MONITORING & CONTROL
PROJECT PLANNING: Approaches to planning, Product flow diagram, Activity planning, Resource allocation, Using software tools for planning, CPM, PERT Network.
MONITORING & CONTROL: The Project control life cycle, Monitoring Progress, Applying Control, Purpose and Types of Report Meetings, Taking Corrective action.

UNIT-IV: PROJECT TIME MANAGEMENT

Importance of Project Schedules, Planning Schedule Management, Defining Activities, Sequencing Activities, Estimating Activity Resources, Estimating Activity Duration, Developing the schedule.

UNIT-V: CHANGE CONTROL MANAGEMENT & QUALITY

CHANGE CONTROL MANAGEMENT: Definition of Change, Change management Roles & Responsibilities, The Change Management Process, Configuration Management.
QUALITY: Definition of Quality, Quality Characteristics, Quality Criteria, Quality Control vs Quality assurance, Quality plan.

UNIT-VI: PROJECT ORGANIZATION

Programmes & Projects, Identifying Stake holders & concerns, Organizational Framework, Characteristics of Project Manager, Project team, Matrix Management, Team Building & Team Dynamics, Management Styles, communication Methods.

TEXT BOOKS:

1. Project Management for IT Related Projects. ISEB Foundation, BCS Publications.
2. Information Technology Project Management Eight Edition by Kathy Schwalbe
3. Software Engineering: A Practitioner's Approach by Roger S. Pressman. 7th Edition published by McGraw-Hill.

REFERENCES:

1. Mike Cohn, Succeeding with Agile: Software Development Using Scrum, 2015, 1stEdition Addison-Wesley Professional.
2. Agile Project Management with Scrum, Ken Schwaber, Microsoft Professional
3. Project Planning and Management with CPM and PERT, Kundan Singh and Mitthan Lal Kansal

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

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(A3223207) DISTRIBUTED DATABASES
(Open Elective-IV)

COURSE OBJECTIVES:

- Introduce database concepts, architectural concepts in distributed database environments, transaction management, and data distribution alternatives.
- Explore database control, including authentication, access rights, semantic integrity control, and query optimization in distributed systems.
- Understand concurrency control terminology, multitransaction processing systems, and concurrency control mechanisms in distributed databases.
- Learn about deadlock handling, including definitions, occurrence in centralized and distributed systems, and distributed commit protocols.
- Study data modeling, including conceptual, logical data models, and various data model types for effective database design.
- Examine traditional distributed database architectures, their classifications, and approaches for developing distributed database environments, including cooperative and peer-to-peer architectures.

COURSE OUTCOMES:

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

- Understand distributed database concepts and architectural principles.
- Learn data distribution, query optimization, and concurrency control.
- Explore data modeling and logical data models.
- Gain insights into deadlock handling and commit protocols.
- Examine traditional distributed database architectures and their classifications.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1							1	1	2	1
CO2	1	2	1	2	2							1		1	2
CO3	2	2	2		2							1	2	2	2
CO4	1	1	1	2									1	2	
CO5	2	1	2		1							1		1	1

UNIT I:

Introduction: Database Concepts, DBE Architectural Concepts, Archetypical DBE Architectures, A New Taxonomy, An Example DDBE, A Reference DDBE Architecture, Transaction Management in Distributed Systems

Data Distribution Alternatives: Design Alternatives, Fragmentation, Distribution Transparency, Impact of Distribution on User Queries

UNIT II:

Database Control: Authentication, Access Rights, Semantic Integrity Control, Distributed Semantic Integrity Control, Cost of Semantic Integrity Enforcement

Query Optimization: Query Processing in Centralized Systems, Query Processing in Distributed Systems

UNIT III:

Controlling Concurrency: Terminology, Multitransaction Processing Systems, Centralized DBE Concurrency Control, Concurrency Control in Distributed Database Systems

UNIT IV:

Deadlock Handling: Deadlock Definition, Deadlocks in Centralized Systems, Deadlocks in Distributed Systems,

Commit Protocols: Terminology, Distributed Commit Protocols

UNIT V:

Data Modeling Overview: Categorizing MLs and DMs, The Conceptual Level of the CLP, Conceptual Modeling Language Examples, Working With Data Models, Using Multiple Types of Modeling

Logical Data Models: The RDM, The Network Data Model, The Hierarchical Data Model, The OODM

UNIT VI:

Traditional DDBE Architectures: Applying Our Taxonomy to Traditional DDBE Architectures, The MDBS Architecture Classifications, Approaches for Developing A DDBE New DDBE Architectures**:** Cooperative DBEs, Peer-to-Peer DDBEs, Comparing COOP and P2P

TEXTBOOKS:

1. Distributed Database Management Systems – A Practical Approach, Saeed K. Rahimi, Frank S. Haug, A John Wiley & Sons, Inc., Publication, 2010.
2. M. Tamer OZSU and Patuck Valduriez: Principles of Distributed Database Systems, Pearson Edn. Asia, 2001.
3. Stefano Ceri and Giuseppe Pelagatti: Distributed Databases, McGraw Hill.

REFERENCE BOOKS:

1. Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom: “Database Systems: The Complete Book”, Second Edition, Pearson International Edition

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS)) L T C
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(A3226207) ADVANCED SOCIAL, TEXT AND MEDIA ANALYTICS
(Open Elective-IV)
For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To provide an overview of common text mining and social media data analytic activities
- To understand the complexities of processing text and network data from different data sources
- Understand and apply social media analytics tools.
- To enable students to solve complex real-world problems for sentiment analysis and recommendation systems.

COURSE OUTCOMES:
- Demonstrate a thorough understanding of social media data and the unique challenges and opportunities it presents for analysis.
- Learn various techniques for preprocessing and cleaning text data to prepare it for analysis, including tokenization, stemming, and stop-word removal.
- Understand the principles and methods of natural language processing, including part-of-speech tagging, named entity recognition, and syntactic parsing.
- Develop skills in sentiment analysis to determine the sentiment or emotion expressed in social media posts or text data.
- Learn how to extract and collect data from social media platforms, such as Twitter, Facebook, and Instagram, for analysis.

MAPPING OD COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2	PS0 3
C01	1		2		1		2		2		1		2		1
C02			2	3			1		2			2		1	
CO3		1		1		2		1		3	3		1		1
C04	1		3		2		3	2		1		3	1	3	3
C05		1			1		1			2				2	
C06															

UNIT-1: TEXT MINING
Introduction to Text Mining - Defining Text Mining, General Architecture of Text Mining Systems, Core Text Mining Operations, Using Background Knowledge for Text Mining, Text Mining Query Languages, Text Mining Preprocessing Techniques, Text mining applications

UNIT-2: TEXT MINING ESSENTIALS
Text Categorization, Clustering, Information Extraction, Probabilistic Models for Information Extraction, Visualization Approaches.

UNIT-3: WEB MINING
Introduction to Data Mining and Web Mining, Information Retrieval and Web Search-Information Retrieval Models, Text and Web Page Pre-Processing, Inverted Index and Its Compression, Latent Semantic Indexing, Web Search, Meta-Search: Combining Multiple Rankings, Web Spamming.

UNIT-4: WEB ANALYTICS
Clickstream Analysis: Practical Solutions - A Web Analytics Primer, The Best Web Analytics Report, Foundational Analytical Strategies, Everyday Clickstream Analyses Made Actionable, Measuring Success - Moving Beyond Conversion Rates, Measuring Success for a Non-

ecommerce Website, Testing Options: A/B and MVT, Competitive Intelligence Analysis- Website Traffic Analysis, Search and Keyword Analysis, Audience Identification and Segmentation Analysis.

UNIT-5: SOCIAL MEDIA ANALYTICS

Social Media Mining and Challenges, Network Models- Properties of Real-World Networks, Random Graphs, Small-World Model, Preferential Attachment Model, Community Analysis- Community Detection, Community Evolution, Community Evaluation, Herd Behavior, Information Cascades.

UNIT-6: APPLICATIONS OF SMA

Influence and Homophily- Measuring Assortativity, Influence, Homophily, Distinguishing Influence and Homophily, Recommendation in Social Media- Classical Recommendation Algorithms, Recommendation Using Social Context, Evaluating Recommendations, Behavior Analytics- Individual Behavior, Collective Behavior.

TEXTBOOKS:

1. The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data, Ronen Feldman and James Sanger, Cambridge University Press, 2006
2. Bing Liu, Web Data Mining-Exploring Hyperlinks, Contents, and Usage Data, Springer, Second Edition, 2011.
3. Web Analytics 2.0: The Art of Online Accountability, Avinash Kaushik, 2009
4. Reza Zafarani, Mohammad Ali Abbasi and Huan Liu, Social Media Mining-An Introduction, Cambridge University Press, 2014.

REFERENCE BOOKS:

1. Hansen, Derek., Shneiderman, Ben., Smith, Marc A.. Analyzing Social Media Networks with NodeXL: Insights from a Connected World. Netherlands: Elsevier Science, 2010.
2. Theories of Communication Networks, Monge P. R. & Contractor N. S, New York, 2003

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

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(A3227207) COMPUTER VISION WITH OPENCV

(Skill Development Course)

For branches: CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- Gain a thorough understanding of computer vision principles, including image representation, feature extraction, object detection, and tracking.
- Become proficient in using the OpenCV library and its various functions and modules for image and video manipulation.
- Learn and apply essential image processing techniques, such as filtering, thresholding, and edge detection, to enhance and preprocess images.
- Understand feature detection algorithms (e.g., Harris corner detection, SIFT, ORB) and matching techniques to identify and track key points across images.

COURSE OUTCOMES:

- Develop a solid understanding of computer vision concepts, including image representation, color spaces, and image processing.
- Become proficient in using the OpenCV library for image and video processing tasks.
- Learn how to apply various image filters and enhancement techniques to improve image quality and clarity.
- Understand feature detection algorithms and techniques for identifying key points in images and matching them across multiple images.
- Learn how to detect and localize objects within images using techniques like Haar cascades, HOG (Histogram of Oriented Gradients), and deep learning-based methods.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12	PSO 1	PSO 2	PS0 3
C01	1			2		3		1		2		1		3	2
C02			1		3		2			2			2		2
CO3		2			1		2	3		1			2		
C04				2				2			3	2		1	
C05			1	3		1			1						1
C06		1			1			2			1		3		

UNIT I:

Introduction: Load and show an image, What's a pixel, Save an image, Capture live video, Add an overlay, Add a trackbar, Compose an RGB color, Catch mouse events, Draw with the mouse, Access a slice of the image, Object-Oriented Programming, Patterns.

UNIT II:

Drawing Shapes: Using Numpy, Define colors, Draw a line, Select thickness with a trackbar, Select color with a trackbar, Select end point with the mouse, Draw a complete line, Draw multiple lines, Draw a rectangle, Draw multiple rectangles, Draw an ellipse, Draw a polygon, Draw a filled polygon, Draw a polygon with the mouse, Draw text.

UNIT III:

Color spaces: Sliding through the color cube, The HSV colorspace, Extracting an object based on hue

Image transformation: Translation, Rotation, Scale, Flipping, Image arithmetic, Bitwise operations, Masking, Splitting channels, Merging channels, Color spaces, Affine transformation.

UNIT IV:

Histograms: Grayscale histogram, Color histogram, Blurring

Filters and convolution: Simple thresholding, Binary thresholding, To zero, Adaptive thresholding, 2D convolution, Morphological Transformations, Image gradient – Laplacian, Canny edge detection.

UNIT V:

Creating an application: Shortcut keys, Create the Window class, Handle the mouse, Create the Object class, Drawing an object, Adding new windows and new objects, Passing the mouse click to an object, Select an object, Moving an object, Add window custom options, Displaying information in the status bar, Create the Text class, Send key events to windows and objects, Use the tab key to advance to the next object, Use the escape key to unselect, Toggle between upper case and lower case, Update size of the text object, Creating the Node class.

UNIT VI:

Detect faces: Use trackbars to select parameters, Video face detection.

YOLO - object detection: Load the YOLO network, Identify objects, 3 Scales for handling different sizes, Detecting objects, Sources.

Widgets: Trackbar, Text, Button, Entry, Combobox, Listbox.

REFERENCES:

1. OpenCV tutorial Documentation by Raphael Holzer.
2. OpenCV with Python – Tutorialspoint.
3. https://opencv-tutorial.readthedocs.io/en/latest/intro/intro.html#catch-mouse-events

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech. I-Sem (CSE (DS))

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(A0021204) MANAGEMENT SCIENCE
(Humanities and Social Sciences)
For branches: CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:
- To understand the concept of management and approaches of a management.
- To understand the different types of organization structures.
- To understand the importance of Plant Location & Layout techniques, Quality Control, Work-study and Management of marketing strategies
- To study HRM by integrating Recruitment, Selection, Training & Development.
- To Study evaluation of PERT/CPM, Estimate Time/Costs & resource.
- To understand challenges faced by Women as an Entrepreneur.

COURSE OUT COMES: After completion of the course the student should able to:
- Apply the concepts & principles of management in real life industry.
- Design & develop organization chart & structure for an enterprise.
- Apply Work-study principles in real life industry and able to maintain Materials departments.
- Understand the concepts of HRM in various functions of organization.
- Develop PERT/CPM Charts for projects of an enterprise and estimate time & cost of project.
- Elevate the methods to resolve the issues and challenges of Women.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	1		1			1		2	1	2		
CO2		1	2	1	1	1			1	2	1	1	1	1	1
CO3		1	2	1	1				1	2	2	1	1	1	2
CO4					1			1	1	1	2	1	1	1	1
CO5		1	2	1	1				2	2	2	1	1	2	1
CO6				1		1		2				1			

UNIT I

INTRODUCTION TO MANAGEMENT: Concepts of Management and organization-nature, importance and Functions of Management, Taylor‘s Scientific Management Theory, Fayol‘s Principles of Management, Mayo‘s Hawthorne Experiments, Maslow‘s Theory of Human Needs, Douglas McGregor‘s Theory X and Theory Y, Herzberg‘s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

UNIT II

DESIGNING ORGANIZATIONAL STRUCTURES: Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization (Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat organization structure) and their merits, demerits and suitability.

UNIT III

OPERATIONS MANAGEMENT: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), materials management: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores

Records-supply chain management, Marketing: functions of marketing, marketing mix, marketing strategies based on product life cycle, channels of distribution.

UNIT IV

HUMAN RESOURCES MANAGEMENT (HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs.PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.

UNIT V

PROJECT MANAGEMENT (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (simple problems)

UNIT VI

WOMEN ENTREPRENEURSHIP: Scope of Entrepreneurship among women- promotional efforts in supporting women entrepreneurs in India-opportunities for women entrepreneurs – challenges or problems of women entrepreneurs-successful cases of women entrepreneurs.

TEXTBOOKS:

1. Aryasri: Management Science, TMH.
2. Stoner, Freeman, Gilbert, Management, Pearson Education.

REFERENCES:

1. Kotler Philip & Keller Kevin Lane: Marketing Management, PHI.
2. Koontz & Weihrich: Essentials of Management, MH.
3. Thomas N. Duening & John M. Ivancevich Management—Principles and Guidelines, Biztantra.
4. Kanishka Bedi, Production and Operations Management, Oxford University Press.
5. Memoria & S.V. Gauker, Personnel Management, Himalaya.

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IV B.Tech. I-Sem (CSE (DS))

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(A0015203) UNIVERSAL HUMAN VALUES
(Mandatory Learning Course)
For branches: CE, EEE, ME, ECE, CSE, CSE(DS) & CSE&BS

COURSE OBJECTIVES:

- This course is developed to design a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- The main objective of this course is to help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.

COURSE OUTCOMES:

- To create a holistic perspective based on self-exploration
- The students are able to see that their practice in living is not in harmony with their natural acceptance most of the time, and all they need to do is to refer to their natural acceptance to remove this disharmony.
- The students are able to see that they can enlist their desires and the desires are not vague.
- To strengthen the self-reflection.
- To develop the commitment and courage to act.
- The students become aware of their activities of 'I' and start finding their focus of attention at different moments. Also they are able to see that most of their desires are coming from outside (through preconditioning or sensation) and are not based on their natural acceptance.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	1	1	-	2	-	2	-	-	-	1	3	-	-
CO2	2	3	2	3	-	3	-	1	-	--	-	3	3	-	-
CO3	2	2	3	1	-	1	-	3	-	-	-	2	3	-	-
CO4	3	2	3	2	-	2	-	2	-	-	-	2	3	-	-
CO5	2	2	2	1	-	2	-	1	-	-	-	3	3	-	-
CO6	1	1	1	2	-	1	-	3	-	-	-	2	3	-	-

UNIT 1:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements forfulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil the above human aspirations

UNIT II:

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer),

Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyam and Health; correctappraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health (Practice Exercises and Case Studies will be taken up in Practice Sessions)

UNIT III:

Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-I)

Understanding Harmony in the family–the basic unit of human interaction , Understanding values in human-human relationship; meaning of Justice (*Nyaya)* (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness (*Ubhay-tripti)*; Trust *(Vishwas)* and Respect *(Samman)* as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence.

UNIT IV:

Understanding Harmony in the Family and Society-Harmony in Human-Human Relationship (Part-I)

Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals (Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals), Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha), Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT V:

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

Understanding the harmony in the Nature, Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature, Understanding Existence as Co-existence *(Sah-astitva)* of mutually interacting units in all- pervasive space, Holistic perception of harmony at all levels of existence, Practice Exercises and Case Studies will be taken up in Practice Sessions

UNIT VI:

Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

TEXT BOOK

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-

93- 87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

REFERENCE BOOKS

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. F Schumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

In addition, the following reference books may be found useful for supplementary reading in connection with different parts of the course:

1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.
2. PL Dhar, RR Gaur, 1990, *Science and Humanism*, Commonwealth Publishers.
3. Sussan George, 1976, *How the Other Half Dies,* Penguin Press. Reprinted 1986, 1991
4. Ivan Illich, 1974, *Energy & Equity, T*he Trinity Press, Worcester, and HarperCollins, USA
5. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, limits to Growth, Club of Rome's Report, Universe Books.
6. Subhas Palekar, 2000, *How to practice Natural Farming,* Pracheen (Vaidik) Krishi Tantra Shodh, Amravati.
7. A Nagraj, 1998, *Jeevan Vidya ek Parichay,* Divya Path Sansthan, Amarkantak.
8. E.F. Schumacher, 1973, *Small is Beautiful: a study of economics as if people mattered*, Blond & Briggs, Britain.
9. A.N. Tripathy, 2003, *Human Values*, New Age International Publishers.

Relevant websites, movies and documentaries

1. Story of Stuff, http://www.storyofstuff.com
2. Al Gore, An Inconvenient Truth, Paramount Classics, USA
3. Charlie Chaplin, Modern Times, United Artists, USA
4. IIT Delhi, Modern Technology – the Untold Story
5. Gandhi A., Right Here Right Now, Cyclewala Productions

IV B.Tech, I-Sem (CSE(DS))

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(A0094207) COMPREHENSIVE VIVA-VOCE

There shall be comprehensive Viva-Voce examination at the end of 7th semester. Comprehensive Viva Examination shall be conducted by the committee consisting of senior faculty (based on the recommendation of HOD), an external Examiner from other institutions and HOD and evaluated for 50 marks.

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IV B.Tech, I-Sem (CSE(DS))

L	T	C
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(A0095207) INDUSTRIAL / RESEARCH INTERNSHIP

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2

The student has to undergo research / industry internship in III year, II-Semester break for a period of two months in a reputed organization. The finalization of the summer internship organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the research / industry internship will be evaluated during 7^{th} semester which carries 3 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech, II-Sem (CSE(DS))

L	T	C
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(A0096208) TECHNICAL SEMINAR

COURSE OBJECTIVES:

- To understand the basic concepts of technical and practical issues of course specialization
- To import a well-organized report writing skill of technical writing

COURSE OUTCOMES:

At the end of the Seminar the students are able to:

- Identify and compare technical and practical issues related to the area of course specialization
- Outline annotated bibliography of research demonstrating scholarly skills
- Prepare a well-organized report employing elements of technical writing and critical thinking.
- Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	1	-	2	2	1	2	2	2	1	2	2	2	1
CO2	1	2	-	2	-	2	1	1	2	1	1	2	2	2	-
CO3	1	2	-	-	-	1	1	2	2	2	1	2	1	2	-
CO4	1	2	1	2	-	1	1	1	2	1	1	1	1	1	2

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech, II-Sem (CSE(DS))

L	T	C
0	0	5

(A0097208) INTERNSHIP IN INDUSTRY

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2

The student has to undergo 6 months internship in IV year, II-Semester for a complete period of 06 months in a reputed industry/organization. The finalization of the summer internship industry/organization will be done by HOD, two senior faculty members of the department and same will be recommended to the Principal for approval. The outcome of the industry internship will be evaluated during 8^{th} semester which carries 05 credits. Certificate from the organization has to be submitted to this effect attested by HoD and Internship in charge to the academic section.

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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

IV B.Tech, II-Sem (CSE(DS))

L	T	C
0	0	6

(A0098208) PROJECT WORK

COURSE OBJECTIVE:

- To develop competency of applying engineering knowledge to real life problems

COURSE OUTCOMES:

At the end of the project work the students are able to:

- Formulate prototype/models and/or experimental set-up and/or simulation and other systems capable of meeting the objectives.
- Identify methods and materials to carry out experiments/develop code
- Analyse the results to come out with concrete solutions.
- Write a technical report citing relevant information of the project apart from developing a presentation.

MAPPING OF COs & POs:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO2	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2
CO3	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO4	2	2	-	2	-	-	-	-	-	3	-	1	-	-	2
CO5	3	3	-	-	2	1	-	-	-	2	2	-	1	-	1
CO6	3	2	-	2	2	-	-	-	-	2	-	-	1	-	2

The project topic should be approved by Internal Department Committee (IDC) / Identified by organization where the student is carrying out 6 months internship. Out of total 150 marks for the project work, 50 marks shall be for Internal Evaluation and 100 marks for the End Semester Examination. The evaluation of project work shall be conducted at the end of the IV year II semester. The external project viva voce examination will be conducted by the committee consisting of an external Examiner from other institute, Head of the Department and the supervisor of the project. The Internal evaluation for 50 marks shall be on the basis of one technical seminars (25 marks) and remaining 25 for main project related activities. The Internal evaluation of the project work for 50 marks shall be conducted by the committee consisting of head of the Department or his nominee, senior faculty member and the supervisor of project.

RGM COLLEGE OF ENGINEERING AND TECHNOLOGY
(AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (DATA SCIENCE)

ACTION FOR IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct *If the candidate:*	Punishment
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject onlyof all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection withthe 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 beenimpersonated, shall be cancelled in all the subjects of the examination (including practicals and projectwork) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additionalsheet, during or After the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language inthe answer paper or in letters to the	Cancellation of the performance in that subject.

	Examiners or writes to the Examiner requesting him to award pass marks.	
6.	Refuses to obey the orders of the Chief Superintendent/Assistant–Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair meansor misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The 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 performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not The candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned inclause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examinationhall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and

		project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of Internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the Principal or College Academic committee for furtheraction to award suitable punishment.	