ADICHUNCHANAGIRI UNIVERSITY

FACULTY OF ENGINEERING, MANAGEMENT & TECHNOLOGY

BE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING))

CHOICE BASED CREDIT SYSTEM (CBCS SCHEME (2022-23)

B G Nagara, Nagamangala Taluk, Mandya District,
Karnataka-571448

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

VISION:

To innovate in the fields of artificial intelligence and machine learning for achieving the sustainable development and to meet the value based socio-economic needs.

MISSION:

1 Advance the capabilities of AI systems and harness their potential to improve various aspects of human life.

2 By aligning artificial intelligence and machine learning with sustainable development goals, to create a world where technology serves as a catalyst for positive change.

3 Crafting technologically entrepreneurial operations, innovative skill and development for socio-economic requirements.

Program Educational Objectives (PEOs)

1. Analyse the requirements, realize the technical specification and design the Engineering solutions by applying artificial intelligence theory and principles.
2. Make successful career in higher Studies /industry / research.
3. Be life-long learning and should be able to work on multi-disciplinary projects.
4. Be Competent for effective communication, in management and in professional skills and ethics.

PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Ability to apply the concepts, principles and practices of Artificial Intelligence and Machine Learning and critically evaluate the results with proper arguments, selection of tools and techniques when subjected to loosely defined scenarios.
2. Ability to use Artificial Intelligence and Machine Learning models on data for enabling better decision making.

Program outcomes (POs)-12 Graduate Attributes

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

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

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

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

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

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

10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

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

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

ACU/AUTY/ 729/ /2022-23

Date: 25/11/2022

NOTIFICATION

Sub: Regulations of 2022 Scheme and CBCS Curriculum for BE & M.Tech Programs- reg.

Ref: 1. Proceedings of the 12th meeting of CAC held on 09.09.2022
2. Minutes of the 9th meeting of the Board of Management held on 19.05.2022.
3. Notification No. ACU/AUTY/AC-09/101/1/2022-23, dated 10.05.2022.

With reference to the above, the Regulations of 2022 Scheme and Choice Based Credit System (CBCS) for UG and PG (All Programs) was notified (Ref.3). Further, in accordance with the resolutions of the Boards of Studies - Faculty of Engineering, Management & Technology BGS Institute of Technology Committee of Academic Council and Board of Management as referred above; it was decided to approve the Regulations 2022 scheme and Choice Based Credit System (CBCS) for UG and PG programs by the University.

These Regulations of 2022 scheme and CBCS Curriculum shall be effective for students admitted to BE & M.Tech course from the academic year 2022-23 onwards.

By order,

Dr. C.K. Subbaraya
Registrar
Adichunchanagiri University
B.G.Nagara-571448

Copy to:

1. PS to the Hon'ble Visitor, His Excellency, the Governor of Karnataka
2. PS to the Hon'ble Chancellor
3. OSD to the Vice-Chancellor
4. Secretary, Ministry of Higher Education, Government of Karnataka
5. PS to the Registrar (Evaluation), ACU
6. Dean, Research, ACU
7. Dean, Academics and Accreditations, ACU
8. Principal, BGSIT, B.G.Nagara-571448, Nagamangala (Tq), Mandya (Dist)
9. Office Copy

Adichunchanagiri University, BG Nagara
Regulations Governing the Degree of BE Under Choice Based Credit System (CBCS) Scheme
Effective from academic year 2022-23

CONTENTS

Adichunchanagiri University, BG Nagara
REGULATIONS GOVERNING
THE DEGREE OF BACHELOR OF ENGINEERING (BE) UNDER CHOICE BASED CREDIT SYSTEM (CBCS)

Effective from the academic year 2022-23

Definitions of Keywords

The following are the definitions/descriptions that have been followed for the different terms used in the Regulations of BE Programme:

1) **Programme:** It is an educational programme in a particular stream/ branch of Engineering/branch of specialization leading to award of Degree. It involves events/activities, comprising of lectures/ tutorials/ laboratory work/ field work, outreach activities/ project work/ vocational training/ viva/ seminars/ internship/ assignments/ presentations/ self-study etc., or a combination of some of these.
2) **Branch:** Means specialization or discipline of BE Degree Programme, such as Civil Engineering, Mechanical Engineering, Electronics & Communication Engineering, Computer Science &Engineering and Information Science & Engineering, Artificial Intelligence and Machine Learning.
3) **Register Number:** It is the unique identification number assigned to all the admitted students of the University.
4) **Semester:** Refers to one of the two sessions of an academic year (vide: serial number 5), each session being of sixteen weeks duration (with working days greater than or equal to ninety).The odd semester may be scheduled from August and even semester from February of the academic year.
5) **Academic Year:** Refers to the sessions of two consecutive semesters (odd followed by an even) including periods of vacation.
6) **Course:** Refers to usually referred to as 'papers' and is a component of a programme. All courses need not carry the same weightage (credit). The courses should define course objectives and course outcomes. A course may be designed to comprise lectures/ tutorials/ laboratory work/ field work/ outreach activities/project work/ vocational training/ viva/ seminars/ term papers/assignments/ presentations/ self-study, etc., or a combination of some of these.

7) **Credit:** Refers to a unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of lecture or two hours of laboratory/ practical courses/ tutorials/ fieldwork per week, etc.
8) **Audit Courses:** Means knowledge/ skill enhancing courses without the benefit of a grade (vide: serial number 18) or credit for a course.
9) **Choice Based Credit System (CBCS):** Refers to customizing the course work, through Core, Elective and Soft skill courses, to provide necessary support for the students to achieve their goals.
10) **Course Registration:** Refers to formal registration for the courses of a semester (Credits) by every student under the supervision of a Faculty Advisor (also called Mentor, Counselor etc.,) in each Semester for the Institution to maintain proper record.
11) **Course Evaluation:** Means Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE) to constitute the major evaluations prescribed for each course. CIE and SEE to carry 50% and 50% respectively, to enable each course to be evaluated for 100 marks, irrespective of its Credits.
12) **Continuous Internal Evaluation (CIE):** Refers to evaluation of students' achievement in the learning process. CIE shall be by the Course Instructor and includes tests and any one of the following, homework, problem solving, group discussion, quiz, mini-project and seminar throughout the Semester, with weightage for the different components being fixed as per the BOS.
13) **Semester End Examination (SEE):** Refers to examination conducted at the University level covering the entire course syllabus. For this purpose, syllabi to be modularized and SEE questions to be set from each module, with a choice confined to the concerned module only. SEE is also termed as University examination.
14) **First Attempt:** Refers to a student who has completed all formalities and has become eligible to attend the SEE and has attended at least one head of passing, such attempt shall be considered as first attempt.
15) **Make up Examination:** It is the examination conducted to the failed / rejected courses after Even Semester as specified by the calendar of events of the University.

16) **Credit Based System (CBS)**: Refers to quantification of course work, after a student completes teaching – learning process, followed by passing in both CIE and SEE. Under CBCS, the requirement for awarding degree is prescribed in terms of total number of credits to be earned by the students.

17) **Credit Representation:** Refers to Credit values for different academic activities considered, as per the Table-1. Credits for seminar, project phases, project viva–voce and internship shall be as specified in the Scheme of Teaching and Examination (Annexure -1).

Table-1: Credit Values

Theory/ Lectures (L) (hours/week/ Semester)	Tutorials (T) (hours/week/ Semester)	Laboratory/Practical (P) /practical train-ing(hours/week/Se mester)	Credits (L:T:P)	Total Credits
4	0	0	4:0:0	4
3	0	0	3:0:0	3
2	2	0	2:1:0	3
2	0	2	2:0:1	3
2	2	2	2:1:1	4
0	0	6	0:0:3	3

NOTE: Activities like study tour and participation in guest lectures not to carry Credits.

18) **Letter Grade:** It is an index of the performance of students in a said Course. Grades are denoted by letters S, A, B, C, D, E and F.

19) **Grading:** Grade refers to qualitative measure of achievement of a student in each course, based on the percentage of marks secured in (CIE plus SEE). Grading is done by Absolute Grading [Refer: 22BE6.0]. The rubrics attached to letter grades are as follows: S – Outstanding, A – Excellent, B – Very Good, C – Good, D – Above Average, E – Average and F – Fail.

20) **Grade Point (GP):** Refers to a numerical weightage allotted to each letter grade on a 10- point scale as under:

Letter Grade and corresponding Grade Points on a typical 10 – Point scale							
Letter Grade	S	A	B	C	D	E	F
Grade Point	10	09	08	07	06	04	00

21) **Passing Standards:** Refers to passing a course only when getting GP greater than or equal to 04 (as per serial number 18).

22) **Credit Point:** It is the product of grade point (GP) and number of credits for a Course i.e.,
Credit Point (CrP) = GP ×Credits for the Course

23) **Semester Grade Point Average (SGPA):** Refers to a measure of academic performance of student/s in a semester. It is the ratio of total credit points secured by a student in various Courses of a semester and the total course credits taken during that semester. [Refer:22BE6.0]

24) **Cumulative Grade Point Average (CGPA):** Refers to a measure of overall cumulative performance of a student overall semesters. The CGPA is the ratio of total credit points earned by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places. [Refer: 22BE6.0]

25) **Transcript or Grade Card or Certificate:** Refers to a certificate showing the grades earned by a student. A grade certificate shall be issued to all the registered students after every semester. The grade certificate will display the programme details (Course code, title, number of credits, grades secured) along with SGPA of that semester and CGPA earned till that semester.

26) **University:** Adichunchanagiri University (ACU), BG Nagara.

Adichunchanagiri University, BG Nagara
Regulations Governing the Degree of Bachelor of Engineering (BE)
Under Choice Based Credit System (CBCS)
(With effective from the academic year 2022-23)

22BE 1.0	Title, Duration and Credits of the Programme of Study
22BE 1.1	The programme of study shall be called the Degree of Bachelor of Engineering abbreviated as BE (Subject of Specialization).
22BE 1.2	The programme to which students are admitted to I Semester of the programme shall be of four academic years duration divided into eight semesters and each semester is of 16 weeks duration. The programme to which students are admitted to III Semester of the programme under lateral entry shall be of three academic year duration divided into six semesters and each semester is of 16 weeks duration. The programme (conducted during evening) to which students are admitted to III semester of the programme under lateral entry shall be of three academic year duration divided into six semesters and each semester is of 16 weeks duration. The deficit Contact hours of the programme, conducted during evening on all working days, shall be compensated on all Sundays (except on general holidays).
22BE 1.3	The calendar of events in respect of the programme of study shall be notified by the University in advance.
22BE 1.4	The University examination in all programmes of study shall be conducted at the end of each semester for all the eight semesters.
22BE 1.5	**Maximum Duration for Programme Completion:** a) i. Students admitted to I Year BE shall complete the programme within a period of Eight academic years from the date of first admission, failing which they have to discontinue the course. ii. Students admitted to II Year BE under lateral entry scheme shall complete the programme within a period of Six academic years from the date of first admission, failing which he/she has to discontinue the Course. b) i. A student who has not obtained the eligibility for III Semester even after three academic years from the date of admission to I Semester shall discontinue the programme or get readmitted to I Semester of I Year BE with a new University Seat Number.

22BE 1.5	ii. A student (under lateral entry scheme) who has not obtained the eligibility for V Semester even after three academic years from the date of admission to III Semester shall discontinue the Programme or get readmitted to III Semester of II Year BE with a new University Seat Number.
22BE 1.6	**Prescribed number of Credits for the Programme:** (a) The number of credits to be completed by students admitted to I year Semester of BE programme shall be 166. (b) The number of credits to be completed by students admitted to III Semester of BE Programme under lateral entry scheme shall be 126.
22BE 1.7	**Definition of credits** 1 hour Lecture(L) per week per semester=1 credit 2 hour Tutorial(T) per week per semester=1 credit 2 hour Practical/Practical Training/Laboratory/Drawing (P) per week per semester=1 credit
22BE 2.0	Eligibility for Admission (As per the Government orders issued from time to time)
22BE 2.1	Admission to I Year/ I Semester Bachelor Degree in Engineering shall be open to the students who have passed the II PUC/ XII Standard/ Equivalent Examination with English as one of the Languages and obtained a Minimum of 45% of Marks in aggregate in Physics and Mathematics along with Chemistry / Bio-Technology / Biology / Electronics / Computer. In case of SC/ST, Category-1 and OBC (2A, 2B, 3A and 3B) category students from Karnataka (Karnataka candidates), the minimum marks for eligibility shall be 40%. With regard to the qualification earned from foreign countries, Equivalence Certificate from the Association of Indian Universities is Mandatory for admission to BE programme. In case of any dispute about the equivalence in qualification earned from foreign countries, the decision of the Equivalence Committee shall be the final in establishing the eligibility of the student. Admission to II Year/ III Semester Bachelor Degree in Engineering (Lateral Entry) shall be open to the Diploma holders and B.Sc. graduates.

	(i) Diploma Holders (a) Must have passed diploma or equivalent examination as recognized by University and secured not less than forty five percentage (45%) marks in the final year examination (fifth and sixth semesters) in the appropriate branch of engineering. In case of SC/ST and OBC students from Karnataka, the minimum marks for eligibility shall be forty percent (40%). (b) Those candidates who have completed Diploma from other than Karnataka State shall provide the Equivalence/ Eligibility Certificate from the Director of Technical Education, Karnataka. **(ii) B.Sc. Graduates** Must have passed B.Sc. degree from a recognized University under the UGC or equivalent qualification as recognized by University and secured not less than forty five percentage (45%) marks in aggregate (considering the marks of all six semesters). In case of SC/ ST and OBC students from Karnataka (Karnataka candidates) the minimum marks for eligibility shall be forty percent (40%). Candidates must have studied Mathematics as subject of study at XII Standard.
22BE 2.2	**(i) Diploma Holders for the programme conducted during evening:** A candidate who has passed diploma examination or equivalent examination and obtained an aggregate minimum of 45% marks taken together in all the subjects of the final year (fifth and sixth semesters) diploma exanimation is eligible to BE Courses, and 40% of marks in case of SC/ST and backward classes of Karnataka candidates. In addition to this, a candidate after passing the diploma, must have minimum of two years full-time professional experience as on first September of the year of admission, in a registered firm/company/ industry/ educational / Government / Autonomous organizations in the branch of Engineering/ Technology, in which the candidates hold a diploma, and in which admission is sought by him/her. Further that employment shall be in an establishment situated within the 100 km from the place of the institution to which the candidate is seeking admission. Professional experience refers to the experience earned as an employee on regular basis in, (a) Government, Government Undertaking, Public Sector Undertaking, Corporation or,

22BE 2.2 (continued)	(b) In a private company registered under the Directorate of Industries and Commerce or the Directorate of Small Scale Industries or, (c) Government, Government recognized Institutions as technical staff. Provided that the period of apprenticeship undergone shall also be treated as professional experience, if sponsored by the Board of Apprenticeship Training, Southern Region, Chennai or by Government, Government undertakings and Public Sector undertakings. Further, those candidates who have completed Diploma from other than Karnataka state shall provide the Equivalence/ Eligibility Certificate from the Director of Technical Education, Karnataka.
22BE 2.3	Those students, who have passed a qualifying examination other than the PUC II examination of the Pre-University Education Board of Karnataka, have to obtain Eligibility Certificate for seeking admission to BE Degree Programme from Adichunchanagiri University, BG Nagara.
22BE 3.0	**Courses**
22BE 3.1	There shall be the following types of Courses: a) Humanities and Social Sciences (HSS) including Management. These are mandatory for all disciplines. b) Basic Sciences (BS): Physics, Chemistry and Mathematics. These are mandatory for all disciplines. c) Engineering Sciences (ES): Materials, Drawing, and Basics of Electrical/ Electronics/ Instrumentation/ Civil/ Mechanical/ Computer Engineering. These are mandatory for all disciplines. d) Professional Subjects (PS) - Core: These are the Professional Core (PC) courses, relevant to the chosen specialization/ branch. The core Courses are to be compulsorily studied by a student and are mandatory to complete them to fulfil the requirements of a programme. e) Professional Subjects (PS) - Elective: These are the Professional Electives (PE), relevant to the chosen specialization/ branch and can be chosen from the pool of papers. It shall be supportive to the discipline providing extended scope/enabling an exposure to some other discipline /domain and nurturing student proficiency skills. f) Open Subjects - Electives (OE): These are from other technical areas and/ or from emerging fields. g) Mini Project and Main Project: Carried out at the Institution or at an Industry. h) Seminar: Deliverable at the Institution under the supervision of a Faculty.

22BE 3.1	i) Internship: Preferably at an industry/R & D organization/IT company/ Government organization of significant repute for a specified period mentioned in the Scheme of Teaching and Examination. j) Mandatory Courses (MC): These courses are mandatory, without the benefit of a grade or credit, for students admitted to BE programme. A pass in each mandatory course is required to qualify for Degree award from the University. k) Audit Courses (AC): Knowledge/ skill enhancement courses without the benefit of a grade or credit for a course. i) The Audit Course/s (other than the Course/s considered for completing the prescribed programme credits) can be any Course offered by the programme to which the student is admitted to other programmes offered in the institution, where
22BE 3.1 (continued)	the student is studying. ii) The students who are interested in audit courses can register for one audit course at a time during III to VIII Semesters. Students, who have opted for audit courses and considered on par with students registered for credit courses, have to satisfy the attendance and CIE requirements. However, they need not have to appear for SEE. iii) Registration for any audit course, in writing, shall be completed at the beginning of semesters. The Institution should intimate the Registrar (Evaluation) about the registration at the beginning of the semester and obtain a formal approval for inclusion of the audit Course/s in the Grade cards/ Transcripts issued to the students.
22BE 3.2	The minimum number of students registered to any Elective offered by the Departments shall be not less than fifteen.
22BE3.3	A student shall exercise his option in respect of Elective Courses and register for the same at the beginning of the concerned semester. The student may be permitted to opt for a change of Elective Course within 15 days from the date of commencement of the semester as per the calendar of the University.
22BE3.4	**Course Registration:** Every student shall register for the Courses of a semester (Credits) under the supervision of a Faculty Advisor (also called Mentor, Counsellor etc.) in each Semester for the Institution to maintain proper record.
22BE4.0	**Internship/Professional Practice/Practical Examinations/Project work**

22BE4.1	1) The Department/college shall nominate staff member/s to facilitate, guide and supervise students under Internship/ Professional Practice/Practical Examinations/Project work. 2) The Internship shall be completed during the period specified for four weeks during the vacation of VI and VII semesters and/or VII and VIII Semester 3) The internship can be carried out in any industry/R & D Organization/Research Institute/Educational institute of repute. 4) The students shall report the progress of the Internship/ Professional Practice/Practical Examinations/Project work to the guide at regular intervals and seek his/her advice. 5) After the completion of Internship/Professional Practice/Practical Examinations/Project work, students shall submit a report with completion and attendance certificates to the Head of the Department with the approval of guides. 6) There will be 50 marks for CIE (Seminar: 25 & Internship Report: 25) and 50 marks for Viva–voce conducted during SEE with two Internal Examiners. The minimum requirement of CIE marks shall be 50% of the maximum marks. [To be read along with 22BE8.6] 7) The guide shall award the marks for Seminar /Viva-voce on Internship/Professional Practice/Practical Examinations/Project work Report after evaluation. He/she will also be the internal examiner for Viva–voce conducted during SEE. 8) Viva-voce on Internship/Professional Practice/Practical Examinations/Project work shall be conducted at the college with two internal Examiners. The Examiners shall jointly award the Viva-voce marks. 9) The students are permitted to carry out the internship anywhere in India or abroad. The University will not provide any kind of financial assistance to any student for carrying out the Internship.
22BE4.2	**Failing to undergo Internship:** Internship is one of the head of passing. Completion of internship is mandatory. If any student fails to undergo /complete the internship, he/she shall be considered as failed in that Course and shall not be permitted to appear for SEE in that Course. However, student shall appear for SEE after satisfying the conditions prescribed for Internship. The reappearance shall be considered as an attempt.
22BE5.0	**Seminar and Project Work**

<table>
<tr><td>22BE 5.1</td><td>Seminar: Seminar is one of the head of passing:
i) Each candidate shall deliver Seminar as per the Scheme of Teaching and Examination on the topics chosen from the relevant fields with latest topics for about 20 minutes.
ii) The Head of the Department shall make arrangements for conducting seminars through concerned faculty members of the Department. The committee constituted for the purpose by the Head of the Department shall award the CIE marks for the
seminar. The committee shall consist of three faculties from the Department and the senior most acting as the Chairman/Chairperson. [To be read along with 22BE8.6].</td></tr>
<tr><td>22BE 5.2</td><td>Project Work: Project (Mini and Main)Work is one of the head of passing:
Mini Project work and Main Project work shall preferably be batch wise, the strength of each batch shall not exceed maximum of four students (minimum of 2).</td></tr>
<tr><td>22BE 5.3</td><td>Viva-voce examination in Mini Project work and Main Project work shall be conductedBatch-wise.</td></tr>
<tr><td>22BE 6.0</td><td>Computation of SGPA and CGPA</td></tr>
<tr><td>22BE 6.1</td><td>i) The University adopts absolute grading system wherein the marks are converted to grades, and every semester results will be declared with semester grade point average (SGPA) and Cumulative Grade Point Average (CGPA). The CGPA will be calculated for every semester, except for the first semester.
ii) The grading system with the letter grades and the assigned range of marks under absolute grading system are as given below:
<table>
<tr><td>Level</td><td>Outstanding</td><td>Excellent</td><td>Very Good</td><td>Good</td><td>Above Average</td><td>Average</td><td>Fail</td></tr>
<tr><td>Letter Grade</td><td>S</td><td>A</td><td>B</td><td>C</td><td>D</td><td>E</td><td>F</td></tr>
<tr><td>Grade Points</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>4</td><td>0</td></tr>
<tr><td rowspan="2">Percentage of Marks Scored in a Course</td><td>≥ 90</td><td><90≥80</td><td><80≥70</td><td><70≥60</td><td><60≥45</td><td><45≥40</td><td><40</td></tr>
<tr><td>(90-100)</td><td>(80-89)</td><td>(70-79)</td><td>(60-69)</td><td>(45-59)</td><td>(40-44)</td><td>(0-39)</td></tr>
</table></td></tr>
</table>

22BE 6.1

iii) A student obtaining Grade 'F' in a course shall be considered failed and is required to reappear in subsequent SEE. Whatever the letter grade secured by the student during his / her reappearance shall be retained. The failed student shall take make up examinations as per the calendar of events issued by the university.

22BE 6.2

Computation of SGPA and CGPA (as per UGC Guidelines)

The following procedures shall be used to compute the SGPA and CGPA respectively:

i) The SGPA is the ratio of sum of the product of the number of credits with the grade points secured by a student in all the courses taken by him/her and the sum of the number of credits of all the courses undergone by a student, i.e.,

Where Ci is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

ii) The CGPA is also calculated in the same manner taking into account all the Courses undergone by a student over all the semesters of a programme, i.e.,

$$CGPA = \frac{\sum(C_i \times S_i)}{\sum C_i}$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

The SGPA and CGPA shall be rounded off to 2 decimal places and reported in the transcripts.

Illustration for Computation of SGPA and CGPA Computation of SGPA

Level				
Course	**Credit**	**Grade letter**	**Grade point**	**Credit Point = (Credit × Grade)**
Course 1	4	B	08	4 × 08 = 32
Course 2	4	D	06	4 × 06 = 24
Course 3	4	C	07	4 × 07 = 28
Course 4	3	S	10	3 × 10 = 30
Course 5	3	E	04	3 × 04 = 12
Course 6	3	D	06	3 × 06 = 18
Course 7	2	A	09	2 × 09 = 18
Course 8	2	D	06	2 × 06 = 12
Total	25	--	--	174
Thus, **SGPA= 174/25 = 6.96**				

Illustration No.2				
Course	**Credit**	**Grade letter**	**Grade point**	**Credit Point = (Credit × Grade)**
Course 1	4	B	08	4 × 08 = 32
Course 2	4	D	06	4 × 06 = 24
Course 3	4	C	07	4 × 07 = 28
Course 4	3	S	10	3 × 10 = 30
Course 5	3	F	00	3 × 00 = 00
Course 6	3	D	06	3 × 06 = 18
Course 7	2	A	09	2 × 09 = 18
Course 8	2	D	06	2 × 06 = 12
Total	25	--	--	162
Thus, SGPA= 162/25 = 6.48				

If a Student secures letter grade C during reappearance then the SGPA is Calculated as shown below.

Illustration No. 2(a)

Course	**Credit**	**Grade letter**	**Grade point**	**Credit Point = (Credit × Grade)**
Course 5	3	C	07	3 × 07 = 21
Total Credit Points = Credit Points of first Attempt + Credit Points of subsequent attempt =162 + 21 = 183				
Total credits of the semester = 25				
Thus, **SGPA= 183/25=7.32**				

Illustration No.3

Course	**Credit**	**Grade letter**	**Grade point**	**Credit Point = (Credit × Grade)**
Course 1	4	B	08	4 × 08 = 32
Course 2	4	D	06	4 × 06 = 24
Course 3	4	C	07	4 × 07 = 28
Course 4	3	S	10	3 × 10 = 30
Course 5	3	A	09	3 × 09 = 27
Course 6	3	D	06	3 × 06 = 18
Course 7	2	A	09	2 × 09 = 18
Course 8	2	D	06	2 × 06 = 12
Total	25	--	--	189
Thus, **SGPA= 189/25 = 7.56**				

$$CGPA\,(for\ illustrations\ 2\ \&\ 3) = \frac{25 \times 7.32 + 25 \times 7.56}{50} = 7.44$$

Semester	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**
Credits of the semester	24	24	27	27	24	24	24	26
SGPA	7.00	8.50	9.20	6.86	8.18	7.73	8.68	9.40

Thus CGPA

$$= \frac{24 \times 7.00 + 24 \times 8.50 + 27 \times 9.20 + 27 \times 6.86 + 24 \times 8.18 + 24 \times 7.73 + 24 \times 8.68 + 26 \times 9.40}{200} = 8.2$$

	Grade Card: Based on the secured letter grades, grade points, SGPA and CGPA, a grade card for each semester and a consolidated grade card indicating the performance in all semesters shall be issued.
22BE 7.0	Conversions of Grades into Percentage and Declaration of Class
22BE 7.1	Conversion formula for the conversion of CGPA into Percentage is given below: Percentage of marks secured, P = [CGPA Earned – 0.75] × 10 **Illustration for a CGPA of 8.20:** P = [8.2 – 0.75] × 10 = 74.5%
22BE 7.2	**Class Declaration:** After the conversion of final CGPA into percentage of marks (P), a graduating student is declared to have passed in (i) First Class with Distinction (FCD) if P ≥ 70% (ii) First Class (FC) if P ≥ 60% but <70% and (iii) Second Class (SC) if P < 60%.
22BE 8.0	**Continuous Internal Evaluation**
22BE 8.1	For each theory and practical paper, the CIE marks shall be 50. For Technical Seminar, the CIE marks shall be 50. For Internship/ Professional Practice, the CIE marks shall be 50. For Project Phase –I and Project Seminar and Project phase –II, the CIE shall be 100 respectively.
22BE 8.2	In case of theory, the CIE marks in each theory course shall be the sum of marks prescribed for test and assignment. Marks prescribed for test shall be 40 and that for assignment is 10. The CIE marks for test in a theory course shall be based on three tests generally conducted at the end of **fifth, tenth and fourteenth** week of each semester. Each test shall be conducted for a maximum of 40 marks and the final marks shall be the average of two best tests among the three tests. The remaining 10 marks shall be awarded based on the evaluation of Assignments/ Unit tests/written quizzes that support to cover some of the course/programme outcomes. Final CIE marks awarded shall be the sum of these two out of maximum of 50 marks. For English – I, English – II, Constitution of India, Environmental Studies and other audit courses CIE is conducted for 50 marks. The candidates shall write the Internal Assessment Tests and Assignments/Unit- Tests/ written quizzes in Blue Books which shall be preserved by the Principal / Head of the Department for at least two years after the announcement of University results and shall be made available for verification.

22BE 8.3	In the case of a Practical, the CIE marks shall be based on the laboratory records(40 marks on continuous evaluation based on conduct of experiment, viva and report writing) and one practical test (10 Marks) to be conducted at the end of the semester.
22BE 8.4	(i) The CIE marks for I Year Computer Aided Engineering / Drawing: a) 40 marks for class work (sketching and Computer Aided Engineering Drawing). b) 10 marks for test conducted in the same pattern as that of SEE. (ii) The CIE marks for other Drawings/ Design Drawings offered by various branches shall be based on the evaluation of the sheets and one test in the ratio 40:10. (iii) The CIE marks awarded for field work (like surveying Practice) shall be based on the evaluation of the associated field work and one test in the ratio 40:10.
22BE 8.5	The CIE marks in the case of projects and seminars in the final year shall be based on the evaluation at the end of VIII Semester by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the project / seminar guide.
22BE 8.6	i) Minimum CIE marks for all theory courses shall be 40% of the maximum marks prescribed for continuous internal evaluation. ii) Minimum requirement of CIE marks for Practical / Mini-Project / Internship / Technical Seminar / Project work Phase 2 shall be 50% of the maximum marks. iii) Minimum requirement of CIE marks for Technical Seminar shall be 40% of the maximum marks. iv) Minimum CIE marks for Project work Phase 1 shall be 50% of the maximum marks v) Minimum CIE marks for Additional Mathematics shall be 40% of the maximum marks prescribed for Continuous Internal Evaluation.
22BE 8.7	i) Students failing to secure the minimum percentage of CIE marks of any course/s shall not be eligible for the SEE conducted by the university and they shall be considered as fail in that course/s. However they can appear for University Examinations conducted in other courses of the same semester and backlog course/s if any. ii) Students who satisfied the attendance requirement but not the CIE requirements are permitted to register afresh and appear for SEE after satisfying CIE requirements in same course/s (with or

	without satisfying the attendance requirement) when offered during subsequent semester/s. iii) If any student fails to secure a minimum of 40% of the maximum CIE marks in seminar / fails to deliver the seminar, he/she shall be considered as failed in that course and shall not be eligible for the award of degree. However, the student shall become eligible for the award of degree after satisfying the requirements prescribed for seminar during the subsequent semester/s.
22BE 8.8	CIE marks of those students, who come under 22BE8.7, shall be sent separately to the Registrar (Evaluation).
22BE 8.9	If a student remains absent for all the CIE tests conducted, the CIE Marks shall be marked as AB for the courses against the Register Number of the student in the marks sheet submitted to the University by the Principal of the College.
22BE 8.10	Improvement of CIE marks shall not be allowed in: a. Theory Courses where the student has already secured the minimum required marks. b. Laboratory / Workshop / Seminar / Internship / Project where the student has already secured the minimum required marks.
22BE 8.11	The final list, incorporating corrections (if any) of CIE marks awarded to the students in the Theory/Practical/Internship/Project work/ Seminar, shall be displayed on the notice board of the college before the closure of the semester and a certified copy of the same shall be sent by the Principal to the University Examination Section within the stipulated date. Every page of the CIE marks sheet shall bear the signatures of the concerned Teacher/Teachers, Head of the Department and Principal.
22BE 8.12	Any corrections or overwriting of CIE marks shall bear the signature(s) of concerned Teacher(s) and in such cases the Head of the Department shall indicate the number of corrections on every sheet and attest it with his/her signature.
22BE 8.13	CIE marks shall reach the University before the commencement of examination as per the notification issued from the office of the Registrar (Evaluation) from time to time. After the submission of CIE marks to the University, any request under any circumstances for change of CIE marks may be considered with a valid reason.
22BE 9.0	Eligibility for Passing and Award of Degree (To be read along with 22BE4.2, 5.1,5.2, 8.6 and8.7)

22BE 9.1	a) For a pass in a theory Course/Drawing, the student shall secure minimum of 35% of the maximum marks prescribed in the University examination and in total 40% of the maximum marks (i.e., prescribed for SEE and CIE) including the CIE marks secured by the student. b) The minimum passing letter grade in a course is 'E'. c) For a pass in a Practical/Internship/Project (Mini & Main) /Viva-voce examination, a Student shall secure a minimum of 40% of the maximum marks prescribed for the University Examination. The minimum passing grade in a course is 'E'.
22BE 9.2	1) A student who obtain any grade from 'S' to 'E' shall be considered as passed. 2) If a student secures 'F' grade in any of the head of passing (22BE 4.2, 22BE 5.1, 22BE 5.2 and 22BE 11.2), he/she has to reappear in that head in the Make-up Examination and further if 'F' is secured, then he/she has to reappear for the SEE. 3) A student will be declared successful at the end of programme, when he/she has none of the courses remaining with 'F' grade and shall have CGPA of greater than or equal to 5.00.
	4) In case, the CGPA falls below 5.00 at the end of the programme, the student shall be permitted to appear again for SEE in full or part of the previous semester courses by rejecting the performance for required number of course/s (other than seminar, project and practical) and times, subject to the provision of 22BE 1.5, to make up CGPA equal to or greater than 5.0. The student should reject the SEE results of the previous attempt and obtain written permission from the Registrar (Evaluation) to reappear in the subsequent SEE.
22BE 9.3	The student who do not satisfy the provision 22BE 9.2 (1) and the student who remain absent for the University examinations shall be deemed to have failed in that course/s. He/she has to reappear for the University examination in the subsequent examinations. The CIE marks awarded to the student at first attempt in the concerned theory Course/s will be carried forward. Revised CIE marks are considered only in cases under the provisions of 22BE8.7.
22BE 9.4	Student who passes a course of a semester as per 22BE 9.1 and has earned CGPA equal to or greater than 5.00 shall not be allowed to appear for any individual Course/s again, unless they opt for rejection of results of entire semester as per 22BE 9.5.

22BE 9.5	A student may, at his/her desire, reject the total performance of a semester (including CIE marks) or reject only the result of his/her performance in SEE of a semester. The rejection is permitted only once during the entire programme of study.
22BE 9.6	The student who desires to reject the results of a semester shall reject performance in all the courses of the semester, irrespective of whether the student has passed or failed in any course. However, the rejection of performance of VIII Semester project shall not be permitted.
22BE 9.7	A student, who desires to reject the total performance of a semester including CIE marks, has to take readmission for that semester. Application for approval of readmission shall be sent to the Registrar through the Principal of College within 30 days from the date of the announcement of the results. Readmission to first semester in such cases shall not be considered as fresh admission and therefore the student will continue to have the same Register Number, which was allotted earlier. The Course duration (as per 22BE 1.5) will be counted with reference to old Register Number.
22BE 9.8	The student, who rejects only the results of University examination of a semester, shall be permitted to reappear for University examinations of all the Courses of that semester in the subsequent examinations. However, the CIE marks obtained by the student in the rejected semester shall be retained. Applications for rejection and approval to reappear for University examination shall be sent to the Registrar (Evaluation) through the Principal of the College within 30 days from the date of announcement of the results. If the rejection of results of University examination is of odd semester, the student shall be allowed to take admission to the immediate next even semester. However, if the rejection of results of University examination is of even semester, then the student shall not be allowed to take admission to the next odd semester (as per 22BE 11.2).
22BE 9.9	Students who opt for rejection of results of University examinations are eligible for the award of class and distinction, but are not eligible for the award of ranks.
22BE 9.10	A student shall be declared to have completed the programme of BE degree, provided the student has undergone the stipulated Course work as per the Scheme of Teaching and Examination and has earned the prescribed number of credits as per the provision 22BE1.6, having CGPA ≥ 5 with none of the registered courses remaining with 'F' grade.

22BE 9.11	Student who find it too difficult to pass a course can drop the course/s after CIE-1 the total number of credits registered even after dropping a course/s shall be at least 20. i) A specific period shall be fixed for dropping courses in a given Semester after the announcement of CIE-I result based on the recommendations of the Mentor in consultation with the course teacher. The same shall be recommended by the concerned Head of the Department. Dropping of courses/s shall not appear in the Grade Card. ii) If core course/s are dropped, such course/s are to be reregistered whenever the course/s are offered. However, if the dropped course/s are electives, then students have an option to reregister either for the same or an equivalent course/s later, depending on the availability of course/s with the consent of the Mentor and approval from the concerned Head of the Department.
22BE 9.12	i) A student shall be permitted to withdraw temporarily from the programme on grounds like, prolonged illness, calamity in the family or any other serious happening. The withdrawal shall be for periods which are integral multiples of a Semester provided:
	a) The student shall present the facts to the college within 6 weeks from the date; he/she has last attended the classes stating fully the reasons for such a withdrawal, together with supporting documents and endorsement of his/her parent or guardian. Further, the Principal has to forward to the University and get the approval. b) The student shall not have any dues to the College. ii) A student availing temporary withdrawal from the programme of study under above provision shall be required to pay such fees and/or charges as may be fixed by the University at the time of reporting to the College to continue the programme. The fees/charges once paid shall not be refunded. iii) A student shall be entitled to avail the temporary withdrawal facility only once during his/her studentship of the programme at the University. The withdrawal period shall be such that the candidate can complete the programme requirement (166 credits for students admitted in I Year and 126 credits for Lateral entry students) within the time limits specified by the University. However, any other permissible concession requested by the concerned student shall have to be at the discretion of the Registrar.
22BE 10.0	**Attendance Requirement**

22BE 10.1	Courses of each semester shall be treated as a separate unit for calculation of the attendance. The candidate has to put in a minimum attendance of 75% in each course with a provision to condone 10% of the attendance by the Dean on the specific recommendations of the Head of the Department where the student is studying, based on medical grounds, participation in University/State/ National/ International level sports and cultural activities, seminars, workshops, paper presentation, etc., of significant value. The supporting documents for condoning the shortage of attendanceare to be submitted along with the specific recommendations.
22BE 10.2	a) The basis for calculation of attendance shall be the period prescribed by the university by its calendar events. b) For course/s having lecture and tutorial hours, attendance shall be with respect to 75% of attendance in lecture hour and 75% of attendance in tutorial hours. If the attendance requirement is not satisfied in any one of them, the candidate shall be considered as not satisfied the attendance condition. Condonation of 10% shall be applied separately to lecture and tutorial hour to make up the deficiency in attendance. Faculties shall also maintain the attendance of students of lecture and tutorial hours separately in the same register or in separate registers. c) In case of late admission, approved by competent authority (ACU), to I Semester/III semester / III semester (lateral entry scheme) of Engineering programme, the attendance shall be reckoned from the date of admission to the programme.
22BE 10.3	The Course Instructor/ Mentor/College shall inform the students as well as their parents about the attendance status periodically. Students who are facing the shortage of Attendance be mentored to make up the shortage.
22BE 10.4	A candidate, who does not satisfy the attendance requirement (in one or more courses) as mentioned in 22BE10.1 shall not be eligible to appear for the SEE & Make up examinations of that semester and shall not be permitted to take admission to next higher semester. The candidate shall be required to repeat that semester during the subsequent year.
22BE 10.5	The detained list shall be sent to Registrar (Evaluation) one week prior to the commencement of the examination. The detained students should obtain permission from Principal, for readmission to the semester concerned as a repeater.

22BE 11.0	**Vertical Progression (Promotion / Eligibility to higher Semesters)**
22BE 11.1	There shall be no restriction for promotion from an odd semester to the next even Semester provided the student has fulfilled the attendance requirement.
22BE 11.2	A student shall be declared failed if the candidate i) Fail to satisfy the condition 22BE 9.1. ii) Absent himself / herself to the university examinations. iii) Is held guilty of examination malpractice and for any other reasons and declared the performance of any course/s null and void by a competent authority. iv) Has not satisfied the CIE requirements of any credit course/s v) Has not registered for the SEE even after satisfying the attendance and CIE requirements.
22BE 11.3	A) Vertical Progression in case of students admitted to I Year. a) A student with CGPA ≥ 5 at the end of first academic year and having no 'F' grade or having any number of 'F' grades in the two semesters of I Year of the program shall be eligible to move to II Year. i) A student with CGPA ≥ 5 at the end of second academic year and having any number of 'F' grades in the four semesters of I & II Year of the program shall be eligible to move to III Year. ii) A student with CGPA ≥ 5 at the end of third academic year and has earned all the prescribed credits of I Year and having any number of 'F' grades in the four semesters of II & III Year of the program shall be eligible to move to IV Year. b) A student shall also be eligible for the first time, with a warning to move higher odd semester if he/she has failed to secure a minimum CGPA = 5 at the end of any academic year. c) For the award of degree a CGPA ≥ 5 at the end of program shall be mandatory. B) Vertical progression in case of students admitted to II Year (Lateral entry) a) A student with CGPA ≥ 5 at the end of second academic year and having no 'F' grade or having any number of 'F' in the two semesters of II Year of the program shall be eligible to move to III Year. i) A student with CGPA ≥ 5 at the end of third academic year and having no 'F' grade or having any number of 'F' grades in the four semesters of II & III Year of the program shall be eligible to move to IV Year.

22BE 11.3	b) A student shall also be eligible for the first time, with a warning to move higher odd semester if he/she has failed to secure a minimum CGPA = 5 at the end of any academic year. The mandatory non-credit courses Additional Mathematics prescribed at II Year, to lateral entry diploma holders admitted to third Semester of BE programs, shall compulsorily be registered during the respective Semesters to complete all the formalities of the course and appear for the CIE. For the award of degree a CGPA ≥ 5 at the end of program shall be mandatory. C) Vertical Progression in case B.Sc. students admitted to II Year (Lateral Entry)
22BE 11.3 (continued)	a) A student with CGPA ≥ 5 at the end of second academic year and having no 'F' grade or having any number of 'F' grades in the two semesters of II Year of the program shall be eligible to move to III Year. i) A student with CGPA ≥ 5 at the end of third academic year and having no 'F' grade or having any number of 'F' grades in the four semesters of II & III Year of the program shall be eligible to move to IV Year. b) A student shall also be eligible for the first time, with a warning to move higher odd semester if he/she has failed to secure a minimum CGPA = 5 at the end of any academic year. Lateral entrant students from B.Sc. stream shall clear the non-credit courses Computer Aided Engineering Drawing and Elements of Civil Engineering & Mechanics of the I Year Engineering Program. These courses shall not be considered for vertical progression from II Year to III Year. These courses shall be completed before eighth Semester. c) For the award of degree a CGPA ≥ 5 at the end of program shall be mandatory.
22BE 11.4	1) Noncompliance of CGPA ≥ 5 at the end of an academic year. i) In case the CGPA falls below 5 at the end of an academic year for the second time during the subsequent academic year the student shall not be permitted for the next higher odd Semester. ii) In case of 22BE 11.4 (1) (i), the students are permitted to appear again for SEE in full or part of the corresponding previous course/s by rejecting the performance of them (other than internship, technical seminar, project (mini & main) and laboratories) for any number of times subject to the provision of 22BE 1.5 to make up the CGPA equal to or greater than 5 for enrolment to next higher odd semester or for the award of degree.

	iii) The student should reject the SEE result of the previous attempt and obtain written permission from the Registrar (Evaluation) to reappear in the subsequent SEE. 2) Noncompliance of Mini Project: a) The mini project shall be considered as a head of passing and shall be considered for the award of degree, those who do not take up/complete the mini project shall be declared as failed and shall have to complete the same during subsequent university examination after satisfying the mini project requirement, also mini project shall be considered for eligibility to VII Semester. 3. Noncompliance of Internship: a) All the students admitted to III year of BE shall have to undergo mandatory internship of four weeks during the vacation of VI and VII semesters and/or VII and VIII Semester. A university examination shall be conducted during VIII Semester and the prescribed credits shall be included with the credits of VIII semester. Internship shall be considered as a head of passing and shall be considered for the award of degree. Those who do not take up / complete the internship shall be declared as fail and shall have to complete the same during subsequent University Examination after satisfying the internship requirement.
22BE 12.0	**Award of Prizes, Medals and Ranks**
22BE 12.1	For the award of Prizes and Medals, the conditions stipulated by the donor shall be considered subject to the provisions of the statutes framed by the University for such awards.
22BE 12.2	1) For award of rank in a specialization of Bachelor of Engineering, the CGPA secured by the students from III to VIII Semesters is considered. 2) A student shall be eligible for a rank at the time of award of degree of Bachelor of Engineering, provided the student, a)(i) Has passed I to VIII Semester in all the credit courses in first attempt only in case of candidates admitted I Year. (ii) Has passed III to VIII Semester in all the credit courses in first attempt only in case of candidates admitted under lateral entry scheme. (iii) Has completed all the prescribed Audit/Mandatory Courses. b) Is not a repeater in any semester because of rejection of result of a semester/ shortage of attendance etc. c) Has completed all the semesters without any break/discontinuity. d) Has completed all the semesters (I to VIII/III to VIII) in ACU constituent college only.

22BE 12.2	e) Has not been transferred from any other University. 3) The total number of ranks awarded shall be in the ratio of 10% of the total candidates for each course and up to a maximum of 10 ranks only in a discipline.
22BE 12.3	Ranks are awarded based on the merit of the students as determined CGPA. If two or more students get the same CGPA, the tie shall be resolved by considering the number of times a student has obtained higher SGPA. If it is not resolved even at this stage, the number of times a student has obtained higher grades like S, A, B etc., shall be taken into account to decide the order of the rank.
22BE 13.0	**Transfers of Students**
22BE 13.1	Transfer of students from one college to another college affiliated to other universities, within Karnataka State shall be permitted only at the beginning of third, fifth, and seventh semesters, subject to availability of seats within the permitted intake in the College and subject to the prior approval of the University. Further, the students must have passed in all the Courses of I and II Semesters for admission to III semester and all the Courses of I to IV Semesters for admission to V Semester and all the Courses of I to VI Semesters for admission to VII semester. The students seeking admission shall have to, i) Apply for establishment of equivalence with prescribed fees as notified by the ACU and obtain No Objection Certificate (NOC) for admission from the University before commencement of term as notified by ACU. ii) Produce NOC for admission from both the colleges before commencement of term as notified by ACU. iii) Complete additional Course/s, if any, as per the decision of concerned Board of Studies and approval of Dean, Faculty of Engineering, Technology & Management, on establishing equivalence between two schemes. A Grade card shall be issued to that effect. Additional Course/s shall not be considered for the eligibility criterion prescribed for promotion, class, calculation of SGPA and CGPA. However, a pass in the additional Courses, if any, is mandatory before the completion of Degree.

22BE 13.2	Transfer of students within the college from one branch to another branch at the start of III Semester shall be permitted with the approval of the Registrar, ACU subject to the Provisions made by the Government of Karnataka and AICTE on this behalf. Guidelines for change of branch are: i) Branch change at the college level shall be carried out by the Principal of the college. ii) Facility of branch change at the II Year (III Semester) level shall be available only to meritorious students and shall not to be considered as a matter of right. iii) Branch change is permitted at II Year (III Semester) only. iv) For the purpose of branch change, the "prescribed intake" shall be the intake prescribed by AICTE for the previous academic session when the students were admitted at I Semester level. Subsequent variations in intake shall have no bearings on the students eligible for branch change. v) Branch change is permitted, if strength in any Branch is not falling below 40% of the prescribed intake. vi) Branch change can be made against clear vacancy in a particular branch vacancy (V) being defined as: $V = I - (Reg. + Rep.)$ Where I = The prescribed Intake for the branch. Reg. = No. of regular students who become eligible to be promoted to III Semester. Rep. = No. of students from previous batches who become eligible to join III Semester (along with regular students). vii) Branch change shall be strictly according to the Merit list prepared by the college on the basis of total marks obtained by a student in I Year University Examinations. viii) Change of branch should be completed within 30 days of announcement of I& II Semester (I Year) results. ix) Consolidated list showing the branch change as per above guidelines be sent to the University.
22BE 13.3	The University may prescribe fee for administrative purpose, which shall be notified from time to time, for transfer from one discipline to another discipline (change of branch within the College).
22BE 14.0	**Applicability and Power to Modify**
22BE 14.1	The regulations governing the Degree of Bachelor of Engineering of Adichunchanagiri University shall be a binding on all concerned.

22BE 14.2	i) Notwithstanding anything contained in the foregoing, the University shall have the power to issue directions/ orders to address any difficulty. ii) Nothing in the foregoing may be construed as limiting the power of the University to amend, modify or repeal any or all of the above.
22BE 15	**Convocation Ceremony**
22BE 15.1	There shall be an annual Convocation Ceremony in the University for the award of the Degree subject to if he/she has: i) Fulfilled Degree requirements in terms of earned credits (166 or 126 in case of lateral entry). ii) Satisfactorily completed mandatory courses. iii) Normal practice and disciplinary action pending against the student.

BGS Institute of Technology
Scheme for First Semester B.E (Physics Cycle)

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22MAT11	Engineering Mathematics – I	Mathematics	3	2	0	5	3	50	50	100	4
2	22PHY12	Applied Physics	BS	3	1	0	4	3	50	50	100	3
3	22CIV13	Civil Engineering & Mechanics	CV	2	2	0	4	3	50	50	100	3
4	22ELE14	Basics of Electrical Engineering	ECE	3	0	0	3	3	50	50	100	3
5	22CED15	Computer Aided Engineering Drawing	ME	2	0	2	4	3	50	50	100	3
6	22PHYL16	Applied Physics Lab	BS	0	0	2	2	3	50	50	100	1
7	22ELEL17	Basic Electrical Engineering Lab	ECE	0	0	2	2	3	50	50	100	1
8	22AEC18	Communicative English-I	HRD	3	2	0	5	3	50	50	100	1
9	22 BIO19	Biology for Engineers	Humanities	0	--	2	2	2	50	50	100	1
									450	450	900	
TOTAL CREDITS& CONTACT HOURS							**31**					**20**
TOTAL CREDITS OF I SEMESTER							**31**					**20**

Scheme for First Semester B.E (Chemistry Cycle)

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22MAT11	Engineering Mathematics – I	Mathematics	3	2	0	5	3	50	50	100	4
2	22CHE12	Applied Chemistry	BS	3	1	0	4	3	50	50	100	3
3	22 PCL13	Programming in C Language	CSE	3	1	0	4	3	50	50	100	3
4	22ELN14	Basic Electronics	ECE	3	0	0	3	3	50	50	100	3
5	22 EME15	Elements of Mechanical Engineering	ME	2	2	0	4	3	50	50	100	3
6	22CHEL16	Applied Chemistry Lab	BS	0	0	2	2	3	50	50	100	1
7	22CPL17	Computer Programming Laboratory	CSE	0	1	2	3	3	50	50	100	1
8	22AEC18	Communicative English-I	HRD	3	2	0	5	1	50	50	100	1
9	22 DS19	Data Science	CSE	0	--	2	2	1	50	50	100	1
									450	450	900	
TOTAL CREDITS& CONTACT HOURS							**31**					**20**
TOTAL CREDITS OF I SEMESTER												**20**

SEE for Data Science and Biology for Engineers is conducted with one internal from Parent Department and one from other Department.

Scheme for Second Semester B.E (Physics Cycle)

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22MAT21	Engineering Mathematics – II	Mathematics	3	2	0	5	3	50	50	100	4
2	22PHY22	Applied Physics	BS	3	1	0	4	3	50	50	100	3
3	22CIV23	Civil Engineering & Mechanics	CV	2	2	0	4	3	50	50	100	3
4	22ELE24	Basics of Electrical Engineering	ECE	3	0	0	3	3	50	50	100	3
5	22CED25	Computer Aided Engineering Drawing	ME	2	0	2	4	3	50	50	100	3
6	22PHYL26	Applied Physics Lab	BS	0	0	2	2	3	50	50	100	1
7	22ELEL27	Basic Electrical Engineering Lab	ECE	0	0	2	2	3	50	50	100	1
8	22AEC28	Communicative English-II	HRD	3	2	0	5	3	50	50	100	1
9	22 BIO29	Biology for Engineers	Humanities	0	--	2	2	2	50	50	100	1
									450	450	900	
TOTAL CREDITS& CONTACT HOURS							**31**					**20**
TOTAL CREDITS OF I SEMESTER												**20**

Scheme for Second Semester B.E (Chemistry Cycle)

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22MAT21	Engineering Mathematics – II	Mathematics	3	2	0	5	3	50	50	100	4
2	22CHE22	Applied Chemistry	BS	3	1	0	4	3	50	50	100	3
3	22 PCL23	Programming in C Language	CSE	3	1	0	4	3	50	50	100	3
4	22ELN24	Basic Electronics	ECE	3	0	0	3	3	50	50	100	3
5	22 EME25	Elements of Mechanical Engineering	ME	2	2	0	4	3	50	50	100	3
6	22CHEL26	Applied Chemistry Lab	BS	0	0	2	2	3	50	50	100	1
7	22CPL27	Computer Programming Laboratory	CSE	0	1	2	3	3	50	50	100	1
8	22AEC28	Communicative English-II	HRD	3	2	0	5	1	50	50	100	1
9	22 DS29	Data Science	CSE	0	--	2	2	1	50	50	100	1
									450	450	900	
TOTAL CREDITS& CONTACT HOURS							**31**					**20**
TOTAL CREDITS OF I SEMESTER												**20**

SEE for Data science and Biology for Engineers is conducted with one internal from Parent Department and one from other Department.

Semester	I	Course Title	Engineering Mathematics-I	Course Code	22MAT-11
Teaching Period	50 Hours	L – T – P – TL*	3 – 2 – 0 - 5	SEE	3 Hours
CIE	50 Marks	SEE*	50Marks	Total	100 Marks
Credit 4					

Course Learning Objectives:

This course **(22MAT-11)** will enable students to expert the basic tools of differential & integral calculus, differential equations and elementary linear algebra and become skilled for solving problems in science and engineering.

: MODULE-1: (10 Hours)

Differential Calculus-1: Review of elementary calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature- Cartesian and polar forms (without proof).

: MODULE-2: (10Hours)

Differential Calculus-2: Taylor's and Maclaurin's series expansions for one variable (statements only), indeterminate forms- L-Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions. Jacobians-Simple problems.

: MODULE-3: (10Hours)

Integral Calculus: Review of elementary integral calculus.

Multiple integrals: Evaluation of double and triple integrals. Evaluation of double integrals- change of order of integration. Beta and Gamma functions: definitions, Relation between beta and gamma functions and simple problems.

: MODULE-4: (10Hours)

Ordinary differential equations (ODE's)of first order: Exact and reducible to exact differential equations. Bernoulli's equation. Applications of ODE's-orthogonal trajectories, Newton's law of cooling and L-R circuits. Nonlinear differential equations: Introduction to general and singular solutions; Solvable for p only; Clairaut's and reducible to Clairaut's equation only.

: MODULE-5: (10Hours)

Elementary Linear Algebra: Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss –Jordan method and Gauss-Seidel method. Eigen values and eigen vectors-Rayleigh's power method. Diagonalization of a square matrix of order two.

COURSE OUTCOMES:

On completion of this course, students will be able to understand:

CO1: Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.

CO2: Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian.

CO3: Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.

CO4: Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.

CO5: Make use of matrix theory for solving system of linear equations and compute eigen values and eigen vectors required for matrix diagonalization process.

RECOMMENDED LEARNING RESOURCES

Textbooks:

- B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
- E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed. (Reprint), 2016.

Reference books:

- C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
- N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
- B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.

- Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
- Thomas G.B. and Finney R.L." Calculus and Analytical Geometry"9th Edition, Pearson, 2012.

QUESTION PAPER PATTERN:

- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

WEBLINKS:

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Semester	I / II	Course Title	Applied Physics	Course Code	22PHY-12/22
Teaching Period	50 Hours	L – T – P – TL	3 – 1 – 0 – 4	SEE	3 Hours
CIE	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS – 03					

COURSE OBJECTIVES:

1. To recognize the importance and learn basic concepts of physics for engineering applications.
2. To identify the importance of quantum mechanics, lasers, optical fibers for advances in technology.
3. To understand the theoretical models used for the study of physical properties of various materials.

COURSE CONTENTS:

Quantum Mechanics:

::MODULE – 1:: (10 Hours)

Quantum theory of radiation: Black body radiation, Planck's law of radiation (Qualitative). Wave-Particle duality, De-Broglie Wavelength Hypothesis, De-Broglie wavelength for electron. Heisenberg's uncertainty principle and its illustration. Application: Non-existence of electrons in the nucleus.

Quantum Free electron theory of metals:

Quantum free electron theory – Assumptions, Fermi level, Fermi energy, Fermi velocity and Fermi factor. Variation of Fermi factor with Energy and temperature, Mention of Expression for density of states. Derive the expression for Fermi energy at absolute zero kelvin. Numerical Problems.

::MODULE – 2:: (10 Hours)

Oscillations and Waves:

Oscillations: Definition of SHM, Derivation of differential equation for SHM, Mechanical simple harmonic oscillators (mass suspended to spring oscillator), Equation of motion for free oscillations, Natural frequency of oscillations. Theory of damped oscillations: over damping, critical & under damping, quality factor. Theory of forced oscillations and resonance, Sharpness of resonance. One example for mechanical resonance.

Shock waves: Types of waves, Mach number, Properties of Shock waves, control volume. Construction and working of Reddy shock tube, applications of shock waves. Numerical problems.

::MODULE – 3:: (10 Hours)

Properties of Engineering Materials:

Elasticity: Basics of elasticity, Hooke's law, Types of elastic moduli, Poisson's ratio. Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (η) in terms of α and β. Relation between Y, η and K.

Bending of Beams: Neutral surface and Neutral plane, Derivation of expression for bending moment of a beam with circular and rectangular cross section. Single cantilever derivation of expression for Young's modulus.

Torsion of cylinder: Expression for couple per unit twist of a solid cylinder, Torsional pendulum- Expression for period of oscillation.

::MODULE – 4:: (10 Hours)

Lasers and Optical fibers:

Lasers: Interaction of radiation with matter – Induced Absorption – Spontaneous Emission and Stimulated Emission. Expression for energy density of radiation in terms of Einstein's coefficients at thermal equilibrium. Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of CO_2 . Applications of Lasers in defense & medical field.

Optical fibers: Propagation mechanism, Angle of acceptance and Numerical aperture – their relationship with refractive indices of core and clad. Condition for propagation. Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and mention of expression for attenuation coefficient, Discussion of block diagram of point-to-point communication system. Applications of optical fibers in communication and data storage. Numerical problems.

::MODULE – 5:: (10 Hours)

Physics of Materials:

Semiconductors: Classification of Semiconductors, Fermi level in intrinsic and extrinsic semiconductors. Expression for electron concentration in

conduction band and mention the expression for hole concentration in valance band of an intrinsic semiconductor. Expression for conductivity and resistivity of an intrinsic semiconductor in terms of mobility of charge carriers.

Dielectric Materials: Electric dipole, dipole moment, Dielectric constant, polarization of dielectric materials and types of polarization. Internal field in solids. Expression for Clausius-Mossotti equation. Numerical problems.

After completion of this course, students will be able to

- Distinguish between phase and group velocities and Apply the quantum theory to understand the electrical conductivity of metals
- Discuss the various types of oscillations and their implications, the role of Shock waves in various fields.
- Recognize the elastic properties of materials for engineering applications.
- Analyze suitability of lasers and optical fibers for engineering applications.
- Compute the carrier concentration in metals and semiconductors.

RECOMMENDED LEARNING RESOURCES:

Textbooks:

1. MN Avadhanulu and PG Kshirsagar, "A Textbook of Engineering Physics", 10th revised Ed, S. Chand and Company Ltd, New Delhi.
2. Arthur Beiser, "Concepts of Modern Physics", 6th Ed., Tata McGraw Hill Edu Pvt Ltd, New Delhi, 2006.
3. BB Laud, "Lasers and Non-Linear Optics", 3rd Ed., New Age International Publishers, 2011.
4. Gaur and Gupta, "Engineering Physics", Dhanpat Rai Publications, 2017.

Reference Books:

1. M. K. Verma, "Introduction to Mechanics", 2nd Ed., University Press (India) Pvt. Ltd., Hyderabad, 2009.
2. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
3. B. G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.

4. MK Harbola, “Engineering Mechanics”, 2nd Ed., Cengage publications, New Delhi, 2009.
5. Chintoo S. Kumar, K. Takayama and K. P. J. Reddy, “Shock Waves made simple”, Wiley India Pvt. Ltd., New Delhi, 2014.
6. David Griffiths, “Introduction to Electrodynamics”, 4th Ed., Cambridge University Press, 2017,

QUESTION PAPER PATTERN:

- The question paper will have ten full questions carrying equal marks.
- Each full question consisting of 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Semester	I / II	Course Title	Civil Engineering and Mechanics	Course Code	22CIV13/23
Teaching Period	50 Hours	L – T – P – TL	2 – 2 – 0 – 4	SEE	3 Hours
CIE	50 Marks	SEE	50 Marks	Total	100 Marks
CREDITS – 03					

COURSE OBJECTIVES:

- To make students to learn scope of various fields of Civil Engineering, basics of civil engineering concepts and importance of infrastructural development.
- To develop a student's ability to analyze the problems involving Forces and Moments with their applications,
- To develop a student's ability to find the Centroid and Moment of inertia and their application.

COURSE CONTENTS:

Introduction to Civil Engineering:

::MODULE – 1:: (08Hours)

Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering. Role of Civil Engineers in infrastructural development, Effect of the infrastructural facilities on socio-economic development of a country. Classification of Roads, Dams and Bridges.

::MODULE – 2:: (10 Hours)

Introduction to Engineering Mechanics:

Basic concepts of idealization, particle, continuum and rigid body; force; system of forces; Basic principles – physical independence of forces, Superposition, Transmissibility, Newton's law of motion, Resolution and Composition of forces, Law of parallelogram of forces, Polygonal law, Resultant of Concurrent coplanar force system, moment and couple of forces.

::MODULE – 3:: (08 Hours)

Analysis of non Concurrent force system

coplanar non concurrent force system, moment of forces, couple, Varignon's theorem, Resultant of Coplanar non concurrent force system.

Analysis of Trusses: types of trusses, analysis of truss by method of joints .

::MODULE – 4:: (08 Hours)

Equilibrium of Forces:

Free body diagrams, Lami's theorem, Equations of Equilibrium, Equilibrium of concurrent and non concurrent coplanar force systems.

Support Reactions:

Types of Loads and Supports, statically determinate and indeterminate beams, Support reaction in beams. Numerical problems on support reactions for statically determinate beams (Point load, uniformly distributed and uniformly varying loads and Moments).

::MODULE – 5:: (08 Hours)

Centroid & Moment of Inertia:

Centroid of simple figures from first principle, centroid of composite/built-up sections; moment of inertia: Introduction, second moment of area of plane sections from first principles, Parallel and perpendicular axes theorems, Radius of gyrations, Moment of inertia of composite area and built up sections. Concept of product of inertia (No Problems).

COURSE OUTCOMES:

After a successful completion of the course, the student will be able to:

1. Mention the applications of various fields of civil engineering.
2. Compute the resultant of given force system subjected to various loads;
3. Compute the reactions developed in trusses
4. Comprehend the action of forces, moments and other loads on system of rigid bodies and compute the reactive forces that develop as a result of the external loads.
5. Locate the centroid and compute the moment of inertia of regular and build up sections.

RECOMMENDED LEARNING RESOURCES:

Text Books:

1. R.C. Hibbler, Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.
2. Bansal R.K., A Text Book of Engineering Mechanics, Laxmi Publications.
3. Andy Ruina and Rudra Pratap, Introducing to Statics and Dynamics, Oxford University Press.
4. Reddy Vijaykumar K and K Suresh Kumar, Engineering Mechanics.
5. F.P. Beer and E. R. Johnston, Mechanics for Engineers, Statics and Dynamics, McGraw Hill.
6. Irving H. Shames, Engineering Mechanics, Prentice-Hall

Reference Books:

1. F.P. Beer and E.R. Johnston, Vector Mechanics for Engineers, Vol I - Statics, Vol II,– Dynamics, Tata McGraw Hill
2. Andy Ruina and Rudra Pratap, Introduction to Statics and Dynamics, Oxford University Press.
3. Reddy Vijay Kumar K. and K. Suresh Kumar, Singer's Engineering Mechanics.
4. Irving H. Shames, Engineering Mechanics, Prentice Hall.

QUESTION PAPER PATTERN:

- The question paper will have ten full questions carrying equal marks.
- Each full question consisting of 20 marks.
- There will be two questions (with a maximum of three sub questions) from each module.
- Students will have to answer five full questions, selecting one full question from each module

Semester	I / II	Course Title	Basic Electrical Engineering	Course Code	22ELE14/24
Teaching Period	42 Hours	L – T – P – TL*	3 – 0 – 0 – 3	Credits	3
CIE*	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS - 03					

COURSE OBJECTIVES: This course will enable students

- To explain Ohm's law and Kirchhoff's laws used for the analysis of DC circuits.
- To explain fundamentals of AC circuits and the behaviour of R, L and C and their combinations in AC circuits.
- To discuss three phase balanced circuits.
- To explain principle of operation, construction and performance of electrical machines such as single phase transformer, DC machines, synchronous generator and three phase induction motor.
- To introduce concepts of electrical wiring, circuit protecting devices and earthing.

MODULE – 1

D.C. Circuits: Ohm's Law and Kirchhoff's Laws, analysis of series, parallel and series- parallel circuits excited by independent voltage sources, Power and Energy.

A.C. Fundamentals: Generation of sinusoidal voltage, frequency of generated voltage, definition and numerical values of average value, root mean square value, form factor and peak factor of sinusoidally varying voltage and current, phasor representation of alternating quantities.

MODULE – 2

Single Phase Circuits: Analysis with phasor diagram of circuits with R, L, C, RL, RC, RLC for series configurations, Real power, reactive power, apparent power and power factor.

Three Phase circuits: Advantages of 3-phase power Circuits, Generation of 3-phase power, Three-phase balanced circuits, voltage and current relations in star and delta connections, Measurement of three phase power using two wattmeter method.

MODULE – 3

Single Phase Transformers: Necessity of transformer, Principle of operation, Types and construction of transformers, emf equation, losses, variation of losses with respect to load, efficiency, Condition for maximum efficiency.

Domestic Wiring: Service mains, Meter board and Distribution board, Brief discussion on concealed conduit wiring, Two-way and three-way control, Elementary discussion on circuit protective devices: Fuse and Miniature Circuit Breaker (MCB's), electric shock, precautions against shock, Earthing: Pipe and Plate earthing.

MODULE – 4

DC Generators: Principle of operation, Construction of D.C. Generators. Expression for induced emf, Types of D.C. Generators, Relation between induced emf and terminal voltage.

DC motors: Principle of operation, Back emf, Torque equation, Types of dc motors, Characteristics of dc motors (shunt and series motors only) and Applications.

MODULE – 5

Three Phase Synchronous Generators: Principle of operation, Constructional details, Synchronous speed, Frequency of generated voltage, emf equation, Concept of winding factor (excluding the derivation and calculation of distribution and pitch factors).

Three Phase Induction Motors: Principle of operation, Generation of rotating magnetic field, Construction and Working of three-phase induction motor, Slip and its significance, Necessity of starter, star-delta starter.

COURSE OUTCOMES:

After studying this course, students will be able to:

- Explain DC circuits and AC fundamental concepts.
- Analyze single phase AC circuits with R, L, C and behavior of three phase AC circuits.
- Explain the working of single phase transformer and concepts of electrical wiring circuit protecting devices and earthing.
- Discuss the principle of operation and construction of DC Machines.
- Describe the principle of operation and construction of AC Synchronous generators and three phase induction motors

Text Book:

1. Basic Electrical Engineering, D C Kulshreshtha, Tata McGraw Hill, Revised First Edition.
2. Principles of Electrical Engineering & Electronics, V.K. Mehta, Rohit Mehta, S. Chand, Publications.

Reference Books:

1. Fundamentals of Electrical Engineering and Electronic, B. L. Theraja, S. Chand & Company Ltd, Reprint Edition 2013.
2. Basic Electrical Engineering, D. P. Kothari and I. J. Nagrath, Tata McGraw Hill, 2017.
3. Electrical Technology, E. Hughes International Students 9th Edition, Pearson, 2005.

COMPUTER AIDED ENGINEERING DRAWING	
Course Code: 22CED15/25	**Credits: 03**
Teaching Hours/Week (L:T:P): 1:0:4	CIE Marks: 50
Total Number of Teaching Hours: 56	SEE Marks: 50

Course Objectives: The basis of this course is to afford the knowledge of drafting skills, elevating conceptualization and practicality of the students.

Module-1 (10 Hours)

Introduction to Computer Aided Sketching

Standard tool bar / menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. Definitions of HP, VP, RPP & LPP. Creation of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering. (Demonstration only)

Orthographic Projections:

Definitions - Planes of projection, reference line and conventions employed. Projections of points in all the four quadrants. Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes.

Module-2 (10 Hours)

Projection of Planes:

Projection of planes such as triangle, square, rectangle, pentagon, hexagon and circle resting on HP in different positions by change of position method only.

Module-3 (16 Hours)

Projection of Solids:

Projection of solids such as cube, prism, pyramid, cylinder, cone and tetrahedron (No problems on freely suspended prisms).

Module-4 (10 Hours)

Development of Surfaces:

Development of lateral surfaces of solids- Different prisms and pyramids,cylinder and cone.

Module-5 (10 Hours)

Isometric Projection:

Introduction to isometric scale, isometric projection of cube, prisms, pyramids, cones, spheres, cut spheres, frustums of cones and pyramids in simple positions, combination of solids (Maximum of two solids).

Miscellaneous Applications: (Lab practice only)

Drawing Simple Mechanisms: Bicycles, two wheeler cart, four wheeler, fan and Furniture. Electronics Engineering Drawings- Simple electrical and electronic circuits.

Sports: Drawing of different tool kits used.

Text Books:

1. Engineering Graphics – K.R. Gopalakrishna, 32nd edition, 2005- Subhash Publishers, Bangalore.
2. Engineering Drawing – N.D. Bhatt & V.M. Panchal, 48th edition, 2005- Charotar Publishing House, Gujarat.
3. A Primer on Computer Aided Engineering Drawing - Solution Book prepared by ACU.

Reference Books:

1. Computer Aided Engineering Drawing, S. Trymbaka Murthy, I.K. InternationalPublishing House Pvt. Ltd., New Delhi,3rdrevised edition, 2006.
2. M. H. Annaiah, B. Sudheer Prem Kumar & C. N. Chandrappa, "Computer Aided Engineering Drawing", New Age International (P) Ltd., 2016.

Evaluation Scheme					
Scheme	**Weightage**	**Marks**	**Marks Break Up**		
CIE	50%	50	Test	Sketchbook	Print-outs
Module-1 is for practice & Internal Assessment only and not for SEE.			10	30	10

SEE	50%	50	Manual Drawing	Computer Printouts
Module-2 to Module-5			34	16

QUESTION PAPER PATTERN:

- Maximum of six questions will be set as per the following pattern.(No mixing of questions from different modules):

Question Paper Pattern			Scheme of Evaluation (in Marks)		
Q. No.	**Module**	**Marks**	**Solutions & Sketching**	**Computer Display & Printout**	**Total Marks**
1 or 2	2	20	20		20
3 or 4	3	50	30	20	50
5 or 6	4 or 5	30	18	12	30
TOTAL		100	68	32	100

NOTE: Students have to answer any one question from Module-2 [Only Sketching- Computer Printout not required - carrying 10 Marks] and one question each from Module-3 (25 Marks) and Module-4 or Module-5 (15 marks) respectively. [Includes Sketching (60% marks) and Computer Printout (40% marks)]

- SEE is to be conducted for 100 Marks and will be reduced to 50 Marks.

Course Outcomes:

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

CO1: Apprehend the basics of engineering graphics and use of computer tools to create simple geometrical entities.

CO2: Ascertain the location of the object with respect to the planes of projection and draw its Orthographic views.

CO3: Draw the development and isometric projection of regular solids.

Semester	I/II	Course Title	Applied Physics Lab	Course Code	22PHYL-16/26
Teaching Period	28 Hours	L – T – P – TL	0 –0 – 2 – 2	SEE	3 Hours
CIE	50 Marks	SEE	50 Marks	Total	100 Marks
CREDITS – 01					

COURSE OBJECTIVES:

- To realize experimentally, the mechanical, electrical and thermal properties of materials, concept of waves and oscillations.
- Design simple circuits and hence study the characteristics of semiconductor devices.

COURSE CONTENTS:

1. Spring Constant -Determination of spring constant and verification of series and parallel combination of springs.
2. Single Cantilever- Determination of the Young's modulus of the given material.
3. Torsional Pendulum - Determination of rigidity modulus &momentum of inertia of the given material.
4. Laser Diffraction – Determination of Wavelength of semiconductor laser using Laser diffraction.
5. Optical Fiber – Determination of acceptance angle and numerical aperture of an optical fiber.
6. Zener Diode - Study of Zener diode characteristics.
7. Fermi Energy- Determination of the Fermi energy of a given metal.
8. LCR Series and Parallel Resonance-Study the frequency response of series and parallel resonance circuit &Determination of self-inductance of a given coil.
9. Photodiode- Study of Photodiode characteristics.
10. Dielectric Constant- Determination of the dielectric constant of a material by charging and discharging method of a capacitor.
11. Black Body Radiator- Verify the Stefan's law of radiation.
12. Semiconductor - Determination of energy gap of a given semiconductor.

COURSE OUTCOMES:

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

- Recall the concepts of Interference of light, Diffraction of light, Total Internal reflection & Fermi energy.
- Understand the principles of operations of optical fibers and semiconductor devices such as photodiode, and NPN transistor using simple circuits.
- Determine elastic moduli and moment of inertia of given materials with the help of suggested procedures.
- Recognize the resonance concept and its practical applications.
- Understand the importance of measurement procedure, honest recording and representing the data, reproduction of results.

CONDUCTION OF PRACTICAL EXAMINATION:

- Any10 experiments are mandatory. Student must perform two experiments in the SEE.

Semester	I / II	Course Title	Basic Electrical Engineering Lab	Course Code	22ELEL17/27
Teaching Period	28 Hours	L – T – P – TL*	0 – 0 – 2 –2	Credits	1
CIE*	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS - 01					

COURSE OBJECTIVES: This course will enable students

- To provide exposure to common electrical components such as Resistors, capacitors and inductors, types of wires and measuring instruments.
- To measure power and power factor measurement of different types of lamps and three phase circuits.
- To explain measurement of impedance for R-L and R-C circuits.
- To determine power consumed in a 3 phase load.
- To explain methods of controlling a lamp from different places.

Orientation class for an exposure to:

- Resistors, capacitors, inductors, rheostats, diodes, transistors, types of wires, measuring instruments – voltmeter, ammeter, wattmeter, multi-meter, Regulated power supply, Function generator, oscilloscope, transformer, dc motor, synchronous generator, three phase induction motor etc.
- Basic safety precautions while dealing with electricity.

LIST OF EXPERIMENTS:

1. Verification of KCL and KVL for DC circuits.
2. Measurement of current, power and power factor of incandescent lamp, fluorescent lamp, and LED lamp.
3. Measurement of resistance and inductance of a choke coil using 3 voltmeter method.
4. Determination of phase and line quantities in three phase star and delta connected loads.
5. Measurement of three phase power using two wattmeter method.
6. Two way and three way control of lamp and formation of truth table.

7. Measurement of Earth Resistance.
8. Study of effect of open and short circuit in simple circuits
9. Half Wave and Full Wave Rectifier.
10. Design of inverting, non-inverting and voltage follower using Op-amp.

DEMONSTRATION EXPERIMENTS (FOR CIE ONLY):

1. Demonstration of fuse, MCB by creating a fault.
2. Demonstration of cut-out sections of electrical machines (DC machines, Induction machines and synchronous machines)
3. Understanding ac and dc supply, use of tester and test lamp to ascertain the healthy status of mains.
4. Understanding of UPS.

COURSE OUTCOMES:

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

- Apply the knowledge of KVL and KCL.
- Computing the ripple factor and efficiency of half wave and full wave rectifier and computing the impedance of a choke coil.
- Applying the knowledge of three phase loads to verify the relationship between line and phase quantities in star and delta connected loads and measurement of three phase power.
- Experiment of two way and three way controlling of lamp and identifying the power consumption and determining the power factor of different lamps.
- Examining the effects of open and short circuit in simple circuits and earth resistance.
- Identify the different electrical components and measuring instruments used for conducting experiments.

Semester	I	Corse Title	Communicative English-I	Course Code	22AEC18
Teaching Period	50 Hours	L – T – P – TL	3 – 2 – 0 - 5	SEE	3 Hours
CIE	50 Marks	SEE	50Marks	Total	100 Marks
CREDITS - 01					

COURSE OBJECTIVES:

The course will enable the students,

- To know about Fundamentals of Communicative English and Communication Skills in general.
- To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for bettercommunication skills.
- To impart basic English grammar and essentials of important language skills.
- To enhance English vocabulary and language proficiency for better communication skills.
- To learn about Techniques of Information Transfer through presentation.

COURSE CONTENTS:

: MODULE-1:(10Hours)

Introduction to Communicative English:

Introduction, Language as a Tool, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English (Communication Channels). Interpersonal and Intrapersonal Communication Skills, How to improve and Develop Interpersonal and Intrapersonal Communication Skills.

: MODULE-2:(10Hours)

Introduction to Phonetics:

Introduction, Phonetic Transcription, English Pronunciation, Pronunciation Guidelines Related to consonants and vowels, Sounds Mispronounced, Silent and Non-silentLetters, Syllables and Structure, Word Accent and Stress Shift, – Rules for Word Accent, Intonation – purposes of intonation, Spelling Rules and Words often Misspelt – Exercises on it.Common Errors in Pronunciation.

: MODULE-3:(10Hours)

Basic English Communicative Grammar and Vocabulary PART - I :

Grammar: Basic English Grammar and Parts of Speech - Nouns, Pronouns, Adjectives, Verbs, Adverbs, Conjunctions, Articles and Preposition. Preposition, kinds of Preposition and Prepositions often Confused. Articles: Use of Articles – Indefinite and Definite Articles, Pronunciation of 'The', wordsending 'age', some plural forms. Introduction to Vocabulary, All Types of Vocabulary –Exercises on it.

: MODULE-4:(10Hours)

Basic English Communicative Grammar and Vocabulary PART - II:

Question Tags, Question Tags for Assertive Sentences (Statements) – Some Exceptions in Question Tags and Exercises, One Word Substitutes and Exercises. Strong and Weak forms of words, Words formation - Prefixes and Suffixes (Vocabulary), Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.

: MODULE-5:(10Hours)

Communication Skills for Employment:

Information Transfer: Oral Presentation - Examples and Practice. Extempore / Public Speaking, Difference between Extempore / Public Speaking, Communication Guidelines for Practice.Mother Tongue Influence (MTI) – South Indian Speakers, Various Techniques for Neutralization of Mother Tongue Influence – Exercises. Reading and Listening Comprehensions – Exercises.

Course Outcomes:

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

1. Understand and apply the Fundamentals of Communication Skills in their communication skills.
2. Identify the nuances of phonetics, intonation and enhance pronunciation skills.
3. To impart basic English grammar and essentials of language skills as per present requirement.
4. Understand and useall types of English vocabulary and language proficiency.

5. AdopttheTechniques of Information Transfer through presentation.

QUESTION PAPER PATTERN:

Note: - The SEE question paper will be set for 100 marks and the marks scored by the student will be finally reduced to 50.

- The question paper will have fifty multiple choice questions carrying equalmarks.
- Each full question carries 1marks.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer fifty full questions, selecting one full question from eachmodule.

Textbooks:

1. Communicative English I by ZestechGloblaPvt Ltd

Semester	I / II	Course Title	DATA SCIENCE	Course Code	22DS19/29
Teaching Period	15 Hours	L – T – P – TL*	0 – 0 – 2 – 2	Exam Hours	02 Hrs
CIE*	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS-01					

***NOTE: L** – Lecture; **T** – Tutorial; **P** – Practical; **TL** – Total;

CIE – Continuous Internal Evaluation; **SEE** – Semester End Examination

COURSE OBJECTIVES:

- To acquire programming skills in core Python.
- To learn how to write loops and decision statements in Python.
- To develop the skill of designing Graphical user Interfaces in Python

COURSE CONTENTS:

Implement the programs with WINDOWS / LINUX platform using Python

1. Write a Python program to find sum and average of two numbers?
2. Write a Python program to convert temperature in Celsius to Fahrenheit.
3. Write a Python program to check whether a given number is prime or not.
4. Write a Python program to find length of string and to convert upper to lower case of astring.
5. Write a program to count a number of vowels in a string.
6. Write a Python program to create an array of 5 integers and display an array.
7. Write a Python program to plot bar graph using labels of languages ‘C’, ‘C++’, ‘Java’,’Python’, ‘PHP’ and students’ marks scored in above languages.
8. Write a Python program to plot pie chart using labels of brands of cars ‘AUDI’, ‘BMW’,’FORD’, ‘TESLA’, ‘JAGUAR’, ‘MERCEDES’ and sales of the cars.

EXAMINATION GUIDELINES:

- Students are allowed to pick one experiment from the lot of 8 programs and provide equal opportunity.

- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and 15% Marks allotted for write up will be deducted.

Semester	I	Course Title	Engineering Mathematics-I	Course Code	22MAT-11
Teaching Period	50 Hours	L – T – P – TL*	3 – 2 – 0 - 5	SEE	3 Hours
CIE	50 Marks	SEE*	50Marks	Total	100 Marks
Credit 4					

Course Learning Objectives:

This course **(22MAT-11)** will enable students to expert the basic tools of differential & integral calculus, differential equations and elementary linear algebra and become skilled for solving problems in science and engineering.

: MODULE-1: (10 Hours)

Differential Calculus-1: Review of elementary calculus, Polar curves - angle between the radius vector and tangent, angle between two curves, pedal equation. Curvature and radius of curvature- Cartesian and polar forms (without proof).

: MODULE-2: (10Hours)

Differential Calculus-2: Taylor's and Maclaurin's series expansions for one variable (statements only), indeterminate forms- L-Hospital's rule. Partial differentiation; Total derivatives-differentiation of composite functions. Jacobians-Simple problems.

: MODULE-3: (10Hours)

Integral Calculus: Review of elementary integral calculus.

Multiple integrals: Evaluation of double and triple integrals. Evaluation of double integrals- change of order of integration. Beta and Gamma functions: definitions, Relation between beta and gamma functions and simple problems.

: MODULE-4: (10Hours)

Ordinary differential equations (ODE's) of first order: Exact and reducible to exact differential equations. Bernoulli's equation. Applications of ODE's-orthogonal trajectories, Newton's law of cooling and L-R circuits. Nonlinear differential equations: Introduction to general and singular solutions; Solvable for p only; Clairaut's and reducible to Clairaut's equation only.

: MODULE-5: (10Hours)

Elementary Linear Algebra: Rank of a matrix-echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss –Jordan method and Gauss-Seidel method. Eigen values and eigen vectors-Rayleigh's power method. Diagonalization of a square matrix of order two.

COURSE OUTCOMES:

On completion of this course, students will be able to understand:

CO1: Apply the knowledge of calculus to solve problems related to polar curves and its applications in determining the bentness of a curve.

CO2: Learn the notion of partial differentiation to calculate rate of change of multivariate functions and solve problems related to composite functions and Jacobian.

CO3: Apply the concept of change of order of integration and variables to evaluate multiple integrals and their usage in computing the area and volumes.

CO4: Solve first-order linear/nonlinear ordinary differential equations analytically using standard methods.

CO5: Make use of matrix theory for solving system of linear equations and compute eigen values and eigen vectors required for matrix diagonalization process.

RECOMMENDED LEARNING RESOURCES

Textbooks:

- B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
- E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed. (Reprint), 2016.

Reference books:

- C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
- N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
- B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.

- Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
- Thomas G.B. and Finney R.L." Calculus and Analytical Geometry"9th Edition, Pearson, 2012.

QUESTION PAPER PATTERN:

- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

WEBLINKS:

- http://.ac.in/courses.php?disciplineID=111
- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Semester	I / II	Course Title	Applied Chemistry	Course Code	22CHE-12/22
Teaching Period	50 Hours	L – T – P – TL	3 – 1 – 0 – 4	SEE	3 Hours
CIE	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS – 03					

COURSE OBJECTIVES:

This course (22CHE - 12/22) will enable students to

- Master the basic knowledge of engineering chemistry for building technical competence in industries, research, and development.
- Impart the basic knowledge of chemistry and its principles involved in electrochemistry, Battery technology and its applications.
- Identifying and analyzing engineering problems related to metallic corrosion, achieving practical solutions for corrosion control and surface modifications of materials for engineering applications.
- Apply the knowledge of Green Chemistry, principles for production of chemical compounds.
- Master the knowledge of synthesis, properties, and utilization of engineering materials like polymers & Nano materials.

COURSE CONTENTS:

MODULE – 1 (10 Hours)

Electrochemistry and Battery technology

Electrochemistry: Introduction, Derivation of Nernst equation for single electrode potential, Reference electrodes; Introduction, construction, working and applications of calomel electrode and Ag/Agcl electrodes. Ion-selective electrode-Definition, construction and principle of glass electrode and determination of pH using glass electrode. Electrolyte concentration cells-definition, derivation of equation to find the emf of concentration cells, numerical problems on concentration cell.

Battery technology: Introduction, characteristics, classification-primary, secondary, and reserve batteries. Construction, working and application of Zinc-Air, Ni-MH and Li-ion batteries.

Fuel cells: Introduction, differences between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H2SO4 electrolyte.

MODULE – 2 (10 Hours)

Corrosion science and Metal finishing

Corrosion: Introduction, Electrochemical theory of corrosion, Factors affecting the rate of corrosion: anodic and cathodic areas, nature of corrosion product, nature of medium-pH, conductivity and temperature. Types of corrosion – Differential metal and differential aeriation-pitting and water line) and stress (Caustic embrittlement in boilers).

Corrosion control: Anodizing-Anodizing of aluminum and phosphating, cathodic protection-sacrificial anode and impressed current methods, Metal Coatings-Galvanization and Tinning.

Metal finishing: Introduction, Technological importance of metal finishing. Factors governing electroplating-Polarization, Decomposition potential and Over voltage. Electroplating: Introduction, Electroplating of chromium (hard and decorative). Electroless plating: Introduction, distinction between electroplating and electroless plating processes. Electroless plating of copper.

MODULE – 3 (10 Hours)

Chemical fuels and Solar energy

Chemical Fuels: Introduction, Classification, definitions of CV, LCV and HCV, determination of calorific value of solid/liquid fuel using bomb calorimeter, numerical problems. Knocking of petrol engine- definition, mechanism, ill effects and prevention. Octane and cetane number. Leaded petrol, unleaded petrol, Power alcohol and biodiesel.

Solar energy: Photovoltaic cells-introduction, construction and working of a typical PV cell, Preparation of solar grade silicon by Union Carbide process/ Method. Advantages & disadvantages of PV cell.

MODULE – 4 (10 Hours)

Green Chemistry and Water chemistry

Green Chemistry: Introduction, definition, Major environmental pollutants-Oxides of Nitrogen, Sulphur and Carbon (Source, effect and control), Basic principles of green chemistry-brief discussion on 12 principles of green chemistry. Various green chemical approaches-Microwave synthesis, Bio catalysed reaction (only explanation with examples), Solvent-free reactions-advantages and conditions Synthesis of typical organic compounds by conventional and green route; i) Adipic acid ii) Paracetamol. Industrial applications of green chemistry.

Water chemistry: Introduction, sources and impurities of water; boiler feed water, boiler troubles with disadvantages -scale and sludge formation, boiler corrosion (due to dissolved O2,CO2 and MgCl2). Sources of water pollution, Definitions of Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), determination of COD, numerical problems on COD. Sewage treatment: primary, secondary (activated sludge) and tertiary methods. Softening of water by ion exchange process. Desalination of sea water by reverse osmosis.

MODULE – 5 (10 Hours)

Engineering Materials

Polymer: Introduction, types of polymerization-addition and condensation polymers. Mechanism of polymerization-free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average Numerical problems, Synthesis and applications of Polyurethanes. Synthesis, properties and applications of Epoxy resin and Silicon rubber.

Biodegradable polymers: Introduction and their requirements. Synthesis, properties and applicationsof Poly lactic acid.

Nanomaterials: Introduction, size dependent properties (Surface area, Electrical, Optical, catalytic and Thermal properties) Synthesis of nanomaterials: Top down and bottom-up approaches, Synthesis by Sol- gel, and precipitation method, Nanoscale materials: Fullerenes, Carbon nanotubes and graphenes- brief Explanation, properties, and applications.

Upon completion of this course, students will be able to

- Apply the knowledge of electrochemistry to improve the efficiency of batteries.
- Interpret the reasons of corrosion, monitor and control by using the proper techniques.
- Understanding theoretical knowledge on fuels like petrol and diesel and its drawbacks in engines, Have concept on rearing high octane quality fuels.
- Explain the principles of green chemistry, develop innovative methods to produce soft water for industrial use and potable at cheaper cost.
- Knowledge on synthesis nano materials and its basic properties and applicability. Polymers for various applications.

RECOMMENDED LEARNING RESOURCES:

Textbooks:

- P.C. Jain & Monica Jain. "Engineering chemistry", Dhanpat Rai publications, New Delhi (2015- Edition).
- S.S.Dara, A textbook of Engineering Chemistry, 10th Edition, S Chand &Co., Ltd., New Dehli,2014.
- Physical Chemistry, by P.W. Atkins, Oxford Publications (Eighth edition-2006).

Reference books:

- O.G.Palanna, "Engineering Chemistry", Tata McGraw Hill Education Pvt Ltd. New Delhi, fourth Reprint (2015-Edition).
- R.V.Gadag & A. Nityananda shetty. "Engineering Chemistry", I K International Publishing House Private Ltd. New Delh (2015-Edition).
- "Wiley Engineering chemistry", Wiley India Pvt. Ltd. New Delhi. Second Edition-2013.
- B.Jaiprakash, R.Venugopal, Shivakumaraiah and Pushpa Iyengar, Chemistry for Engineering students, Subhash Publications, Bengaluru,(2015-Edition).
- M.G. Fontana, N.D. Greene, Corrosion Engineering, McGraw Hill Publications, New York, 3rd Edition, 1996.
- G.A.Ozin & A.C.Arsenault, Nanotechnology A Chemical Approach to Nanomaterials. RSC Publishing, 2005.

QUESTION PAPER PATTERN:

- The question paper will have ten full questions carrying equal marks.
- Each full question consisting of 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Semester	I / II	Course Title	Programming in C Language	Course Code	22CHE-12/22
Teaching Period	50 Hours	L – T – P – TL*	3 – 1 – 0 – 4	SEE	3 Hours
CIE*	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS-03					

***NOTE: L** – Lecture; **T** – Tutorial; **P** – Practical; **TL** – Total;
CIE – Continuous Internal Evaluation; **SEE** – Semester End Examination.

COURSE OBJECTIVES:

The objectives of this course are to make students to learn basic principles of Problem solving, implementing through C programming language and to design & develop programming skills.

COURSE CONTENTS:

Introduction to C language:

::MODULE – 1::

Introduction to computing, Constants, variables, Data types, operators and expressions, Input and output operations.

Textbook 1: Chapter 1, 3, 4, 5

Decision making & Branching:

Introduction, Decision making with if statement, simple if statement, the if-else statement, nesting of if-else statement, the else-if ladder, the switch statement, ternary operator? Goto statement, Programming examples and exercises.

Textbook 1: Chapter 6 10 Hours

::MODULE – 2::

Looping:

Introduction, the while statement, the do statement, the for statement, break and continue, Programming examples and Exercises.

Textbook 1: Chapter 7

Arrays: Introduction, One-dimensional array, Declaration of One-Dimensional arrays, Initialization of one- dimensional arrays programming examples (Linear search, binary search, bubble sort, selection sort), Two-dimensional arrays, Initialization of two-dimensional arrays, programming

examples (Addition of two matrices, multiplication of two matrix)
Textbook 1: Chapter 8 10 Hours

::MODULE – 3::

Strings:
Introduction, Declaring and Initializing string variables, Reading and writing strings, String handling functions, String input and output functions, Array of strings.
Textbook 1: Chapter 9
Functions:
Introduction, need for user-defined functions, elements of user defined function, Definition of functions, parameter passing mechanisms: Call by value and call by reference, Category of functions, nesting of functions. Passing arrays to functions.
Textbook 1: Chapter 10
Textbook 2: Chapter 14.3 10 Hours

::MODULE – 4::

Preprocessors:
Introduction to Preprocessors, macro substitution, file inclusion, compiler control Directives, Programming examples and Exercises.
Textbook 1: Chapter 15
Structures: Introduction, defining a structure, declaring a structure, accessing a structure member, structure initialization, copying and comparing structure variables, Array of structures, arrays within structures, structure within structures.
Unions: Union definition, declaration.
Textbook 1: Chapter 11 10 Hours

::MODULE – 5::

Pointers:
Introduction to pointers, pointers and arrays, pointers and strings, pointer and structure, Allocating Memory at Runtime.
Textbook 3: Chapter 1, Chapter 2 (Page No 43 to 49),
Chapter 3(Page No 133 to 137) Chapter 4(Page No 189 to 200)
Textbook 2: Chapter 17.9

File Management:

Introduction, Defining and opening a File, Closing a File, Input/output operations on Files, Error Handling during I/O Operations, Random Access to Files.

Textbook 1: Chapter 13 10 Hours

COURSE OUTCOMES:

The student will be able to:

- Identify basic elements of c programming structures like data types expressions.
- Code Identify basic elements of C programming structures like control statements, various simple functions and in view of using them in problem solving.
- Apply various operations on derived data types like arrays and strings.
- Apply various operations on derived data types like preprocessing, functions problem solving.
- Implement user defined data structures used in specific applications.

RECOMMENDED LEARNING RESOURCES:

Text Books:

1. E. Balagurusamy, "Programming in ANSI C", Eighth Edition McGraw-Hill
2. Vikas Gupta: Computer Concepts and C Programming, Dreamtech Press 2013.
3. Yashavant kanetkar: "Understanding Pointer in C" Third Edition 2005.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie: The C Programming Language, 2nd Edition, PHI, 2012.
2. R S Bichkar, Programming with C, University Press, 2012.
3. V Rajaraman: Computer Programming in C, PHI, 2013.
4. Byron GottFried & Schaum's Outlines Programming with C, 2nd Edition,McGraw-Hill.

QUESTION PAPER PATTERN:

- The question paper will have ten questions.
- Each full question consisting of 20 marks.
- There will be Three sub-questions from each module.
- Students will have to answer five full questions, selecting one full question from each module.

Semester	I / II	Course Title	Basic Electronics	Course Code	22ELN14/24
Teaching Period	42 Hours	L – T – P – TL*	3 –0 – 0 – 3	Credits	3
CIE*	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS - 03					

Course Objectives: This course will enable students

1. To understand the principles and operation of semiconductor devices, circuits and communication system.
2. To demonstrate the ability to solve problems on analog and digital circuits.
3. To analyze the circuits by applying the knowledge of devices and circuits.

MODULE – 1

Digital fundamentals

Number System- Binary, Hexadecimal, Conversion Decimal to binary, Hexadecimal to decimal and vice-versa, Binary addition and subtraction using 1's and 2's complement method, Review of logic gates, NAND as universal gate (as OR, AND & NOT), Boolean Algebra, Demorgan's theorems, Simplification and realization of Boolean expressions using basic gates and NAND gates, Half adder, Full adder and Parallel adder.

MODULE – 2

Semiconductor diode and its applications

Semiconductor Diodes: PN–junction diode, VI characteristics and parameters of a PN junction diode, applications –Half wave rectifier, Full wave rectifier, Capacitor filter.

Zener diode: Working, VI characteristics, Zener diode as voltage regulator.

MODULE – 3

Transistors and its applications

Bipolar junction transistor, CE configurations and characteristics, DC load line and operating point, BJT as an amplifier and switch. Field-Effect Transistors: Depletion-Type MOSFET, Enhancement- Type MOSFET. Construction & Characteristic of JFET, Silicon Controlled Rectifier (SCR), Two Transistor Model, Switching Action.

MODULE – 4

Operational Amplifier and Oscillators

Operational amplifier: Block diagram of an Operational amplifier, Characteristics of an ideal operational amplifier, Concept of virtual ground, Inverting and non-inverting amplifier, Voltage follower, Adder, Subtractor, Integrator and differentiator.

Oscillators: Concept of feedback, Barkhausen's Criteria, Types of Oscillators-Wein Bridge Oscillator and RC phase shift Oscillator.

MODULE – 5

Communication System

Block diagram of communication system, Need for modulation, Definition of modulation, Amplitude modulation: Definition and waveforms, Expression for AM, Modulation index.

Frequency Modulation: Definition and waveforms (Qualitative analysis), Modulation index, Comparison of AM and FM, Principle of operation of Mobile Phone, Microwave Communication, Optical fibre communication.

Course Outcomes: After studying this course the student should be able to:

- Apply the knowledge of engineering fundamentals to analyze and design digital circuits.
- Explain the construction, operation and applications of Diode.
- Describe the construction and working of devices and circuits.
- Explain the concept of feedback and design op-amp for various applications.
- Describe the basic principles of communication system and mobile phones.

Text Book:

1. Robert L. Boylestad, Louis Nashelsky " Electronic devices and circuit theory" PHI Publication, 11th Edition, 2012.
2. D P Kothari, I J Nagrath "Basic Electronics", McGraw Hill Education, 2014.ISBN: 978-93-329- 0158-2.

Reference Books:

1. Thomas L Floyd, "Electronic Devices", Pearson Education, 9th edition, 2012.
2. George Kennedy "Electronic Communication System", TMH Publication, 5th Edition, 2015.
3. Donald D. Givone " Digital principles and design" TMH Publication, 2003.

ELEMENTS OF MECHANICAL ENGINEERING			
Course Code	**22EME15/25**	**CIE Marks**	**50**
Teaching Hour/Week (L:T:P:S)	2:2:0:0	SEE Marks	50
Total Hours of Teaching-Learning	40	Total Marks	100
Credits	03	Exam Hours	03

Course Objectives:

1. Acquire a basic understanding role of Mechanical Engineering in the industry and society.
2. Acquire a basic understanding of energy resources and basic concepts of Hydraulic turbines.
3. Acquire knowledge of various engineering materials and metal joining techniques.
4. Acquire knowledge on automobile technology in transport application and basics of Refrigeration and Air-Conditioning.
5. Acquire essential experience on basic Power transmission systems, robotics and automation.
6. Acquire knowledge of basic concepts on manufacturing principles and machine tools and their Advancement.

Teaching-Learning Process (General Instruction):

1. Adopt different types of teaching methods to develop the outcomes through PowerPoint presentations and Video demonstrations or Simulations.
2. Chalk and Talk method for Problem Solving.
3. Arrange visits to show the live working models other than laboratory topics.
4. Adopt collaborative (Group Learning) Learning in the class.
5. Adopt Problem Based Learning (PBL), which fosters students Analytical skills and develops thinking skills such as evaluating, generalizing, and analyzing information.
6. Conduct Laboratory Demonstrations and Practical Experiments to enhance experiential skills.

Module 1 (8 Hours)

Energy Sources and Power Plants:

Review of energy sources; Construction and working of Hydel power plant, Solar power plant, Tidal power plant, Wind power plant.

Introduction to basics of turbines and pumps:

Principle and Operation of Hydraulic turbines: Pelton Wheel and Kaplan Turbine. Principle and Operation of Steam turbines: Impulse and Reaction Turbine.

Principle and Operation of Gas turbines: Open and Closed gas Turbine. Introduction to working of Centrifugal Pump.

Laboratory Components:

1. Visit any one Conventional or Renewable Energy Power Plant and prepare a comprehensive report.
2. Demonstration of Components of any one Turbo-machine through Cut Sections.

Teaching- Learning Process

1. Power-point Presentation,
2. Video demonstration or Simulations,
3. Laboratory Demonstrations and Practical Experiments

Module 2 (8 Hours)

Engineering Materials

Ferrous Metals: Cast iron and its types, Steel: Mild steel and Medium carbon steel.

Non-ferrous Metals: Aluminum, Copper and its alloys.

Smart materials - Piezoelectric materials, shape memory alloys, semiconductors, and super- insulators.

Metal Joining Processes:

Soldering, Brazing and Welding: Definitions. Classification and methods of soldering, brazing, and welding. Brief description of arc welding, Electrodes used in arc welding Oxy-acetylene welding, types of flames.

Laboratory Components

1. One exercise each involving Welding, Soldering, and Brazing.
2. Study oxy-acetylene gas flame structure and its application to gas welding

Teaching- Learning Process

1. PowerPoint Presentation
2. Video demonstration or Simulations
3. Laboratory Demonstrations and Practical Experiments

Module 3 (8 Hours)

Fundamentals of IC Engines (self study)

Review of Internal Combustion Engines, 2-Strokes and 4-Strokes engines, Components and working principles, Performance parameters.

Insight into future mobility technology: Electric and Hybrid Vehicles, Components of Electric and Hybrid Vehicles, Drives and Transmission. Advantages and disadvantages of EVs and Hybrid vehicles.

Refrigeration and Air-Conditioning:

Principle of refrigeration, Refrigeration effect, Ton of Refrigeration, COP, Refrigerants and their desirable properties. Principles and Operation of Vapour Compression and Vapour absorption Refrigeration. Working Principles of Air Conditioning, Classification, and Applications of Air Conditioners. Concept and operation of room air conditioning system.

Laboratory Components:

1. Study of Engine Components through Cut Sections
2. Demonstrate Components and Working principles of Domestic Refrigerator and prepare a comprehensive report OR Study/visit any commercial centralized Air-Conditioning unit, understand various components and operations, and prepare a comprehensive report.

Teaching- Learning Process

1. PowerPoint Presentation.
2. Video demonstration or Simulations.
3. Laboratory Demonstrations and Practical Experiments.

Module 4 (8 Hours)

Power Transmission:

Gear Drives: Types - spur, helical, bevel, worm and rack and pinion, velocity ratio, Numerical problems on Simple Gear trains

Belt Drives: Components of belt drive and concept of velocity ratio; Types of belt drives- Flat- Belt Drive and V-Belt Drive with Application. Simple numerical on Belt drives involving velocity ratios. Fundamentals of Machine

Tools and Operations:
Working Principle of Lathe and Operations: Turning, Facing, Thread Cutting, Taper Turning and Knurling.
Working Principle of Grinding Operations: Surface, Cylindrical and Centerless Grinding. Working Principle of Drilling Machine and operations: Reaming, Boring, Tapping, Counter Boring, Counter Sinking.

Laboratory Components:
1. Demonstration of the machine consists of Gear Trains.
2. Demonstration of developing one model involving Lathe, Grinding and Drilling.

   Teaching- Learning Process
   1. PowerPoint Presentation,
   2. Chalk and Talk are used for Problem Solving.
   3. Video demonstration or Simulations.

Module 5 (8 Hours)

Introduction to Mechatronics: Concept of open-loop and closed-loop systems, Examples of Mechatronic systems and their working principle.
Introduction to Robotics and Automation:
Robot anatomy, Joints & links, common Robot configurations. Applications of Robotics in Material Handling, Processing, Assembly, and Inspection. Automation types, NC machines, CNC machines.

Laboratory Components:
1. Carry out a Case study on anyone Mechatronics device and prepare a comprehensive report.
2. Demonstration of any one model of Robot

   Teaching- Learning Process
   1. PowerPoint Presentation,
   2. Students are encouraged to practice only line diagrams for exams.
3. Video demonstration or Simulations,
4. Laboratory Demonstrations and Practical Experiments

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

CO1. Comprehend the basic knowledge of mechanical engineering in energy and its utilization, materials technology, manufacturing techniques, and transmission systems through demonstrations.
CO2. Recognize the application of energy sources in Power generation and utilization of Engineering materials in manufacturing.
CO3. Apply the skills in developing simple mechanical elements and processes.

Suggested Learning Resources:

Books:

1. Elements of Mechanical Engineering, K R Gopala Krishna, Subhash Publications, 2015.
2. Elements of Workshop Technology (Vol. 1 and 2), Hazra Choudhry and Nirzar Roy, Media Promoters and Publishers Pvt. Ltd., 2010.
3. An Introduction to Mechanical Engineering, Jonathan Wickert and Kemper Lewis, Third Edition, 2012
4. Turbo Machines, M. S. Govindegowda and A. M. Nagaraj, M. M. Publications 7Th Ed, 2012
5. Robotics, Appu Kuttan KK, K. International Pvt Ltd, volume 1 9.

Additional References:

- Elements of Mechanical Engineering , S.Trambaka Murthy, IK International Publishing Pvt.ltd.,2010.
- Manufacturing Technology- Foundry, Forming and Welding, P.N.Rao Tata McGraw Hill 3rd Ed., 2003.

Semester	I / II	Course Title	Applied Chemistry lab	Course Code	22CHEL-16/26
Teaching Period	28 Hours	L – T – P – TL	0 –0 – 2 – 2	SEE	3 Hours
CIE	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS – 01					

COURSE OBJECTIVES:

- Quantitative analysis of materials by volumetric and chemical method.
- Instrumental methods for developing experimental skills in building technical competence

Part A: Instrumental Experiments

1. Estimation of FAS Potentiometrically using standard K2Cr2O7 solution.
2. Estimation of Acids in acid mixture Conductometrically.
3. Determination of Viscosity co-efficient of a given liquid using Ostwald's viscometer.
4. Estimation of copper by Colorimeter.
5. Determination of pKa value of a given weak acid using pH meter.

Part B: Volumetric Experiments

1. Estimation of Total hardness of water by EDTA complexometric method.
2. Estimation of CaO in cement solution by rapid EDTA method.
3. Determination of percentage of Copper in brass using standard sodium thiosulphate solution.
4. Determination of COD of industrial waste water.
5. Estimation of percentage of Iron in given haematite ore solution using standard $K_2C_r2O_7$ solution (External indicator method).

Course outcomes:

On completion of this course, students will have the knowledge in,

- Handling different types of instruments for analysis of materials using small quantities of materials involved for quick and accurate results.
- Carrying out different types of titrations for estimation of concerned in materials using comparatively more quantities of materials involved for good results.

CONDUCTION OF PRACTICAL EXAMINATION:

- All 10 experiments are mandatory. Student has to perform two experiments in the SEE.

Text Books:

1 Vogel's A.I. A text book of quantitative analysis, 35th edition, 2012.

2 Willard, Merit, Dean and Settle, A text book of Instrumental analysis, 6th edition 2012.

Reference books:

1. G.H Jeffery, J Bassett, J Mendham and R.C. Denney Vogel's A.I. A text book of quantitative analysis, Dorling Kindersley (India) Pvt., Ltd. 35th edition, 2012.
2. Gary D Christian, Analytical Chemistry, Wiley India, 6th edition, 2015.

Semester	I / II	Course Title	Computer Programming Laboratory	Course Code	22CPL17/27
Teaching Period	42 Hours	L – T – P – TL*	0 – 1 – 2 – 3	Exam Hours	03 Hrs
CIE*	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS-01					

***NOTE: L –** Lecture; **T** – Tutorial; **P** – Practical; **TL** – Total;
CIE – Continuous Internal Evaluation; **SEE** – Semester End Examination

COURSE OBJECTIVES:

- To practice writing flowcharts, algorithms and programs.
- To implement basics of C programming language.
- To provide solutions to the laboratory programs.
- To familiarize the processes of debugging and execution.

COURSE CONTENTS:

1. Develop an algorithm and implement simple C program to solve simple computational problems using arithmetic expressions, demonstrate familiarization with programming environment, concept of naming the program files, storing, compilation and debugging, using different data types.

2. Draw the flowchart and implement a simple C program to solve problems involving if-then-else structures to find the largest of given three positive integers.

3. Design and develop a flowchart or an algorithm that takes three coefficients (a, b, and c) of a Quadratic equation (ax2+bx+c=0) as input and compute all possible roots. Implement a C program for the developed flowchart/ algorithm and execute the same to output the possible roots for a given set of coefficients with appropriate messages. (Using switch statement).

4. Design and develop an algorithm to find the reverse of an integer number NUM and check whether it is PALINDROME or NOT. Implement a C program for the developed algorithm that takes an integer number as input

and output the reverse of the same with suitable messages. Ex: Num: 2014, Reverse: 4102, Not a Palindrome.

5. Draw the flowchart and Write C Program to compute Sin(x) using Taylor series approximation given by Sin(x) = x - (x3/3!) + (x5/5!) - (x7/7!) + ……. Compare the result with the built- in Library function and print both the results with appropriate messages.

6. Develop an algorithm, implement and execute a C program that reads N integer numbers and arrange them in ascending order using Bubble Sort.

7. Develop, implement and execute a C program that reads two matrices A (m x n) and B (p x q) and Compute the product A and B. Read matrix A and matrix B in row major order and in column major order respectively. Print both the input matrices and resultant matrix with suitable headings and output should be in matrix format only. Program must check the compatibility of orders of the matrices for multiplication. Report appropriate message in case of incompatibility.

8. Draw the flowchart and write a recursive C function to find the factorial of a number, n!, defined by fact(n)=1, if n=0. Otherwise fact(n)=n*fact(n-1). Using this function, write a C program to compute the binomial coefficient nCr. Tabulate the results for different values of n and r with suitable messages.

9. Implement structures to read, write, and compute average- marks and the students scoring above and below the average marks for a class of 60 students.

10. Write and execute a C program that:
    i. Implement string copy operation STRCPY (str1, str2) that copies a string str1 to another string str2 without using library function.
    ii. Reads a sentence and prints frequency of each of the vowels and total count of consonants using user defined functions

11. Develop, implement and execute a C program to search a Name in a list of names using Binary searching Technique.

12. Write a C program to find the sum and average of N floating point numbers using pointer.

13. Write a C Program to first read from the file and then append the data of the file.

COURSE OUTCOMES:

The student should be able to:

- Execute C Program on control structures.
- Execute C programs using arrays and functions.
- Execute C programs on string handling functions.
- Execute C programs on pointers, structures and files.

EXAMINATION GUIDELINES:

- NOTE: Program-1 is only for the practice & internal assessment not for SEE.
- Students are allowed to pick one experiment from the lot of 12 programs and provide equal opportunity.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and 15% Marks allotted for write up will be deducted.

Semester	I	Corse Title	Communica-tive English-I	Course Code	22AEC18
Teaching Period	50 Hours	L – T – P – TL	3 – 2 – 0 - 5	SEE	3 Hours
CIE	50 Marks	SEE	50Marks	Total	100 Marks
CREDITS-01					

COURSE OBJECTIVES:

The course will enable the students,

- To know about Fundamentals of Communicative English and Communication Skills in general.
- To train to identify the nuances of phonetics, intonation and enhance pronunciation skills for bettercommunication skills.
- To impart basic English grammar and essentials of important language skills.
- To enhance English vocabulary and language proficiency for better communication skills.
- To learn about Techniques of Information Transfer through presentation.

COURSE CONTENTS:

: MODULE-1:(10Hours)

Introduction to Communicative English:

Introduction, Language as a Tool, Fundamentals of Communicative English, Process of Communication, Barriers to Effective Communicative English, Different styles and levels in Communicative English (Communication Channels). Interpersonal and Intrapersonal Communication Skills, How to improve and Develop Interpersonal and Intrapersonal Communication Skills.

: MODULE-2:(10Hours)

Introduction to Phonetics:

Introduction, Phonetic Transcription, English Pronunciation, Pronunciation Guidelines Related to consonants and vowels, Sounds Mispronounced, Silent and Non-silentLetters, Syllables and Structure, Word Accent and Stress Shift, – Rules for Word Accent, Intonation – purposes of intonation, Spelling Rules and Words often Misspelt – Exercises on it.Common Errors in Pronunciation.

: MODULE-3:(10Hours)

Basic English Communicative Grammar and Vocabulary PART - I :

Grammar: Basic English Grammar and Parts of Speech - Nouns, Pronouns, Adjectives, Verbs, Adverbs, Conjunctions, Articles and Preposition. Preposition, kinds of Preposition and Prepositions often Confused.

Articles: Use of Articles– Indefinite and Definite Articles, Pronunciation of 'The', wordsending 'age', some plural forms. Introduction to Vocabulary, All Types of Vocabulary –Exercises on it.

: MODULE-4: (10Hours)

Basic English Communicative Grammar and Vocabulary PART - II:

Question Tags, Question Tags for Assertive Sentences (Statements) – Some Exceptions in Question Tags and Exercises, One Word Substitutes and Exercises. Strong and Weak forms of words, Words formation - Prefixes and Suffixes (Vocabulary), Contractions and Abbreviations. Word Pairs (Minimal Pairs) – Exercises, Tense and Types of tenses, The Sequence of Tenses (Rules in use of Tenses) and Exercises on it.

: MODULE-5:(10Hours)

Communication Skills for Employment:

Information Transfer: Oral Presentation - Examples and Practice. Extempore / Public Speaking, Difference between Extempore / Public Speaking, Communication Guidelines for Practice.Mother Tongue Influence (MTI) – South Indian Speakers, Various Techniques for Neutralization of Mother Tongue Influence – Exercises.Reading and Listening Comprehensions – Exercises.

Course Outcomes:

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

1. Understand and apply the Fundamentals of Communication Skills in their communication skills.
2. Identify the nuances of phonetics, intonation and enhance pronunciation skills.
3. To impart basic English grammar and essentials of language skills as per present requirement.
4. Understand and useall types of English vocabulary and language proficiency.

5. Adopt theTechniques of Information Transfer through presentation.

QUESTION PAPER PATTERN:

Note: - The SEE question paper will be set for 100 marks and the marks scored by the student will be finally reduced to 50.

- The question paper will have fifty multiple choice questions carrying equalmarks.
- Each full question carries 1marks.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer fifty full questions, selecting one full question from eachmodule.

Textbooks:

1. Communicative English I by Zestech Globla Pvt Ltd

Semester	I/II	Course Title	Biology for Engineers	Course Code	22 BIO19/29
Teaching Period	16 Hours	L – T – P – TL*	1 – 0 – 0 - 0	Credits	1
CIE*	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS- 01					

Module 1

Why Should Engineers Know Biology? Introduction, Need For Biology, Shinkansen Sonic Boom, For Our Wellness—We are All Biological Entities, Learning Biology is, Fundamentally Not Different, From Learning Mathematics.

Life—Its Origin and Evolution on Earth: Introduction, Why are the Surgical Instruments Sterilized Before Use? What is Life? Cell—The Fundamental Functional Unit of Life, Cells in the HumanBody, The Scientific View on the, Origin of Life on Earth, What is Evolution?

Module 2

The Fundamental Molecules of Life—1: Introduction, Bioreactors, Shear in Bioreactors and its Effect on Productivity, What Gets Affected by Shear in Cells? A Typical Eukaryotic Cell Contains Many Parts Tightly Packed Inside it, What Constitutes the Cell (Plasma) Membrane,, Microscopically Speaking? Molecules that Comprise the Cell (Plasma) Membrane, Cell Membrane Functions, Lipids—One of the Four Fundamental Biomolecules, Lipids—The Human Angle.

The Fundamental Molecules of Life—2: Introduction, How is Curd/Yogurt Made at Home? Why Does Milk Turn into Curd? What is the Source of the Acid? Carbohydrates—The Secondof the four Fundamental, Biomolecules, Action at a Molecular Level, Water and its Biological, Casein and Curd Formation , Significance of Carbohydrates in the Human Body, Bioenergy

Module 3

The Fundamental Molecules of Life—3: Introduction, Casein is a Protein, Amino Acids and Their Polymers, Structure of Proteins—The Third, Structure—Function RelationshiP and Significance, Role of Proteins in the Cell and its Membrane, Role of Proteins in the Human Body, Enzymes are

Mostly Proteins, Enzymes Used in the Industry, Quantification of Enzyme, Activity and Kinetics of the Four Fundamental Biomolecules

The Fundamental Molecules of Life—4: Introduction , How Does the Cell Get the Energy Needed for its Various Processes?, Nucleic Acids—The Fourth of the Four Fundamental Biomolecules, Phosphorylation of ADP to ATP, Substrate Level Phosphorylation, Electron Transport Phosphorylation, Where do Phosphorylations Take Place in a Cell?, Polymers of Nucleotides—DNA, RNA Structural Aspects of DNA and RNA, Where and in What Form is DNA Present in the Cell?

Module 4

DNA Replication: Introduction, Separation of Strands, Replication Bubble, and Forks Priming, Addition of New Monomers (DNA Elongation) and Directionality Leading and Lagging Strands and Okazaki Fragments, Problem at the Ends of, Non-Circular DNA Proofreading and Repair of DNA Cell Replication and Its Quantification: Introduction, DNA Replication in a Cell- Part of the Cell Cycle, Steps in a Cell Cycle, Why Should Cells Replicate?, Quantification of Cell Division, Chromosomes in the Cell, All Cells Undergo Mitosis, Germ Cells Undergo Both Mitosis and Meiosis.

Module 5

How are Proteins Made in the Cell? Transcription and Translation: Introduction, The Central Dogma, Overview—Transcription and Translation Processes, The Genetic Code, Transcription—Initiation, Elongation, and Termination, Initiation, Elongation, Termination, Modifications to the Eukaryotic, Pre-MRNA, Cut-Paste, Translation— Initiation, Elongation, and Termination, Initiation, Elongation of the Polypeptide Chain, Termination, Post-Translational Modifications, Protein Targeting, Mutations and Their Outcomes, Mutation—The Molecular Mechanism of Evolution and, the Core of Genetic Engineering.

Mendelian Genetics as a Useful Tool: Introduction, Common Genetic Disorders in India, Common Genetic Disorders, Across the World, Mendelian Genetics—The First Approximation Tool to Predict Genetic Disorders in the Offspring, Essentials of Mendelian Genetics, Probabilities of Occurrence in Mendelian Genetics, Pedigree Analysis, Sex-Linked Inheritance, Non-Mendelian Inheritance

Text Books

1. “Biology for Engineers”, G K Suraishkumar, Oxford University Press.

Semester	II	Corse Title	Engineering Mathematics - II	Course Code	22MAT-21
Teaching Period	50 Hours	L – T – P – TL	3 – 2 – 0 - 5	SEE	3 Hours
CIE	50 Marks	SEE*	50 Marks	Total	100 Marks
CREDITS - 04					

COURSE OBJECTIVES:

The purpose of the course is to enable the students with concrete foundation of vector calculus, ordinary and partial differential equations, infinite series, and numerical methods enabling them to acquire the knowledge of these mathematical tools.

COURSE CONTENTS:

: MODULE-1: (10Hours)

Vector Differentiation: Scalar and vector fields. Gradient, directional derivative; curl and divergence-physical interpretation; solenoidal and irrotational vector fields- Illustrative problems.

Vector Integration: Line Integrals, Theorems of Green, Gauss, and Stokes (without proof) problems only.

: MODULE-2:(10Hours)

Differential Equations of higher order: Second order linear ODE's with constant coefficients-Inverse differential operators, method of variation of parameters and; Cauchy's and Legendre homogeneous equations. Applications of a spring and L-C-R circuits.

: MODULE-3:(10Hours)

Partial Differential Equations (PDE's): Formation of PDE's by elimination of arbitrary constants / functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only. Derivation of one-dimensional heat and wave equations and solutions by the method of separation of variables.

: MODULE-4:(10Hours)

Infinite Series: Series of Positive Terms- Convergence and divergence of

infinite series. Cauchy's root test and D'Alembert's ratio test (without proof) - Illustrative examples.

Power series solutions: Series solution of Bessel's differential equation leading to 55(5)-Besel's function of first kind orthogonality.

: MODULE-5:(10Hours)

Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof). Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)- Illustrative examples.

Numerical integration: Simpson's (1/3)rd and (3/8)th rules, Weddle's rule (without proof) – Problems.

Course Outcomes:

On completion of this course, students will be able to:

- Solve the solenoidal and irrotational vector and surface volume integral applications.
- Explain various physical models through higher order differential equations and solve such linear ordinary differential equations.
- Understand a variety of partial differential equations and solution by exact methods/method of Separation of variables.
- Describe the applications of infinite series and obtain series solution of ordinary differential equations.
- Apply the knowledge of numerical methods in the models of various physical and engineering phenomena.

Textbooks:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.

Reference books:

1. C.Ray Wylie, Louis C.Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.

2. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Veerarajan T.," Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
5. Thomas G.B. and Finney R.L." Calculus and Analytical Geometry"9th Edition, Pearson, 2012.

QUESTION PAPER PATTERN:

- The question paper will have ten full questions carrying equal marks.
- Each full question carries 20 marks.
- There will be two full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer five full questions, selecting one full question from each module.

Web links and Video Lectures (e-Resources):

- http://www.class-central.com/subject/math(MOOCs)
- http://academicearth.org/

Semester	II	Corse Title	Communica-tive English-II	Course Code	22AEC28
Teaching Period	50 Hours	L – T – P – TL	3 – 2 – 0 - 5	SEE	3 Hours
CIE	50 Marks	SEE	50Marks	Total	100 Marks
CREDITS - 01					

COURSE OBJECTIVES:

The course will enable the students,

- To Identify the Common Errors in Writing and Speaking of English.
- To Achieve better Technical writing and Presentation skills for employment.
- To read Technical proposals properly and make them to Write good technical reports.
- Acquire Employment and Workplace communication skills. To learn about Techniques of Information Transfer through presentation in different level.

COURSE CONTENTS:

: MODULE-1:(10Hours)

Identifying Common Errors in Writing and Speaking of English :

- Advanced English Grammar for Professionals with exercises, Common errors identification in parts of speech, Use of verbs and phrasal verbs, Auxiliary verbs and their forms, Subject Verb Agreement (Concord Rules with Exercises).
- Common errors in Subject-verb agreement, Noun-pronoun agreement, Sequence of Tenses and errors identification in Tenses. Advanced English Vocabulary and its types with exercises – Verbal Analogies, Words Confused/Misused.

: MODULE-2:(10Hours)

Nature and Style of sensible writing:

- Organizing Principles of Paragraphs in Documents, Writing Introduction and Conclusion, Importance of Proper Punctuation, TheArt of Condensation (Precise writing) and Techniques in Essay writing, Common Errors due to Indianism in English Communication, Creating Coherence and Cohesion, Sentence arrangements exercises,

Practice of Sentence Corrections activities. Importance of Summarizing and Paraphrasing.

- Misplaced modifiers, Contractions, Collocations, Word Order, Errors due to the Confusion of words, Common errors in the use of Idioms and phrases, Gender, Singular & Plural. Redundancies & Clichés.

: MODULE-3:(10Hours)

Technical Reading and Writing Practices:

- Reading Process and Reading Strategies, Introduction to Technical writing process, Understanding of writing process, Effective Technical Reading and Writing Practices , Introduction to Technical Reports writing, Significance of Reports, Types of Reports.
- Introduction to Technical Proposals Writing, Types of Technical Proposals, Characteristics of Technical Proposals. Scientific Writing Process.
- Grammar – Voice and Speech (Active and Passive Voices) and Reported Speech, Spotting Error Exercises, Sentence Improvement Exercises, Cloze Test and Theme Detection Exercises.

: MODULE-4:(10Hours)

Professional Communication for Employment:

- The Listening Comprehension, Importance of Listening Comprehension, Types of Listening, Understanding and Interpreting, Listening Barriers, Improving Listening Skills. Attributes of a good and poor listener.
- Reading Skills and Reading Comprehension, Active and Passive Reading, Tips for effective reading.
- Preparing for Job Application, Components of a Formal Letter, Formats and Types of official, employment, Business Letters, Resume vs Bio Data, Profile, CV and others, Types of resume, Writing effective resume for employment, Model Letter of Application (Cover Letter) with Resume, Emails, Blog Writing, Memos (Types of Memos) and other recent communication types.

: MODULE-5:(10Hours)

Professional Communication at Workplace:

- Group Discussions – Importance, Characteristics, Strategies of a Group Discussions. Group Discussions is a Tool for Selection. Employment/ Job Interviews - Importance, Characteristics,
- Strategies of a Employment/ Job Interviews. Intra and Interpersonal Communication Skills - Importance, Characteristics, Strategies of a Intra and Interpersonal Communication Skills. Non - Verbal Communication Skills (Body Language) and its importance in GD and PI/JI/EI.

  Presentation skills and Formal Presentations by Students - Importance, Characteristics, Strategies ofPresentation Skills. Dialogues in Various Situations (Activity based Practical Sessions in class by Students).

Course Outcomes:

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

1. To understand and identify the Common Errors in Writing and Speaking.
2. To Achieve better Technical writing and Presentation skills.
3. To read Technical proposals properly and make them to Write good technical reports.
4. Acquire Employment and Workplace communication skills.
5. To learn about Techniques of Information Transfer through presentation in different level.

QUESTION PAPER PATTERN:

Note: - The SEE question paper will be set for 100 marks and the marks scored by the student will be finally reduced to 50.

- The question paper will have fifty multiple choice questions carrying equalmarks.
- Each full question carries 1marks.
- Each full question will have sub question covering all the topics under amodule.
- The students will have to answer fifty full questions, selecting one full question from eachmodule.

Textbooks:

1. Communicative English II by Zestech Globla Pvt Ltd

Bachelor of Engineering- Artificial Intelligence and Machine Learning
2022 Scheme and Syllabus for the 3rd and 4th Semester
III SEMESTER

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/ week			Examination				Credits
				L	T	P	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22MAT31	Engineering Mathematics-III	Maths	03	02	00	4	50	50	100	4
2	22AM32	Data Structures and Applications	AM	02	02	00	4	50	50	100	4
3	22AM33	Unix and Shell Programming	AM	02	02	00	3	50	50	100	3
4	22AM34	Principles of AI	AM	02	02	00	3	50	50	100	3
5	22AM35	Computational Thinking with Python	AM	02	00	02	3	50	50	100	3
6	22AML36	Data Structures with C Laboratory	AM	01	00	02	1	50	50	100	1
7	22AML37	Python Programing Lab	AM	01	00	02	1	50	50	100	1
8	22AE-C38A/38B	Design Thinking / SSD-I	HRD	0	2	0	1	50	50	100	1
9	22 UH-V39A/39B	Yoga / Sports	Humanities	0	0	2	1	50	50	100	1
10	22DIPMAT40	Additional Mathematics-I	Mathematics	3	0	0	1	50	---	50	
TOTAL				15	08	04	25	500	450	950	21

III sem Design Thinking & Yoga --- CSE/ISE/AI&ML SSD-I & Sports --- ECE/CV/ME

IV sem Design Thinking & Yoga --- ECE/CV/ME SSD-I & Sports --- CSE/ISE/AI&ML

IV SEMESTER

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/ week			Examination				Credits
				L	T	P	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22MAT41	Engineering Mathematics- IV	Maths	03	01	-	03	50	50	100	4
2	22AM42	Design and Analysis of Algorithms	AM	03	02	-	03	50	50	100	3
3	22AM43	Data Base Management System	AM	03	02	-	03	50	50	100	4
4	22AM44	Operating Systems	AM	03	02	-	03	50	50	100	3
5	22AM45	Object Oriented Concepts with Java+ Lab (Integrated)	AM	03	02	-	03	50	50	100	3
6	22AML46	Design and Analysis of Algorithms Laboratory	AM	-	02	02	03	50	50	100	1
7	22AML47	DBMS Lab with Mini Project	AM	-	02	02	03	50	50	100	1
8	22AEC 48A/48B	Design Thinking / SSD-I	HRD	0	0	2	1	50	50	100	1
9	22 UHV49A/ 9B	Yoga / Sports	Human-ities	0	0	2	1	50	50	100	1
10	22DIPMA 50	Additional Mathematics-II	Mathematics	3	0	0	----	50	----	50	
TOTAL				18	15	06	25	500	450	950	21

III sem Design Thinking & Yoga --- CSE/ISE/AI&ML SSD-I & Sports --- ECE/CV/ME

IV sem Design Thinking & Yoga --- ECE/CV/ME SSD-I & Sports --- CSE/ISE/AI&ML

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
Engineering Mathematics-III (Effective from the Academic Year 2023 -24)			
Course Code	**22MAT31**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Credits	03	Exam Hours	03
CREDITS - 01	CREDITS - 01	CREDITS - 01	CREDITS - 01

Course objectives:

- To have an insight into Fourier series, Fourier transforms, Laplace transforms.
- To study the Difference equations and Z-transforms.
- To develop the proficiency in variation calculus and solving ODE's arising in engineering applications, using numerical methods.
- To solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
- To Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Module-1

Laplace Transforms: Definition and Laplace transform of elementary functions. Laplace transforms of Periodic functions and unit-step function – problems.

Inverse Laplace Transforms: Inverse Laplace transform - problems, Convolution theorem to find the inverse Laplace transform (without proof) and problems, solution of linear differential equations using Laplace transform.

Module-2

Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions period 2□ and arbitrary period. Half range Fourier series. Practical harmonic analysis, examples from engineering field.

Module-3

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Simple problems.

Difference Equations and Z-Transforms: Difference equations, basic definition, z-transform- definition, Standard z-transforms, Damping and shifting rules, initial value and final value theorems (without proof) and problems, Inverse z-transform. Simple problems.

Module-4

Numerical Solutions of Ordinary Differential Equations (ODE's): Numerical solution of ODE's of first order and first degree- Taylor's series method, Modified Euler's method. Range - Kutta method of fourth order, Milne's and Adam-Bashforth predictor and corrector method (No derivations of formulae), Problems.

Module-5

Numerical Solution of Second Order ODE's: Runge -Kutta method and Milne's predictor and corrector method. (No derivations of formulae).

Calculus of Variations: Variation of function and functional, variation problems, Euler's equation, Geodesics, hanging chain, problems.

Course outcomes: The students will be able to:

- Use Laplace transform and inverse Laplace transform in solving differential/ integral equation arising in network analysis, control systems and other fields of engineering.
- Demonstrate Fourier series to study the behaviour of periodic functions and their applications in system communications, digital signal processing and field theory.
- Make use of Fourier transform and Z-transform to illustrate discrete/ continuous function arising in wave and heat propagation, signals and systems.
- Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numerical methods.
- Determine the extremals of functional using calculus of variations and solve problems arising in dynamics of rigid bodies and vibrational analysis.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Advanced Engineering	SEE Marks	SEE Marks	50
2	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	44th Edition, 2017
3	Engineering Mathematics	Srimanta Pal et al	Oxford University Press	3rd Edition, 2016
Reference Books				
1	Advanced Engineering Mathematics	C.Ray Wylie, Louis C.Barrett	McGraw-Hill Book Co	6th Edition, 1995
2	Introductory Methods of Numerical Analysis	S.S. Sastry	Prentice Hall of India	4th Edition 2010
3	Higher Engineering Mathematics	B.V. Ramana	McGraw-Hill	11th Edition,2010
4	A Text Book of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications	2014

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III				
DATA STRUCTURES AND APPLICATIONS (Effective from the Academic Year 2023 -24) SEMESTER – III				
Subject Code	**22AM32**		**CIE Marks**	**50**
Number of Contact Hours/ Week	T: L:P	3:0:0	SEE Marks	50
Total Number of Contact Hours	50		Exam Hours	3 Hrs
CREDITS – 4				

Course Learning Objectives:

This course will enable students to:

- Explain fundamentals of data structures and their applications essential for programming/problem solving.
- Illustrate linear representation of data structures: Stack, Queues, Lists, Trees and Graphs.
- Demonstrate sorting and searching algorithms.
- Find suitable data structure during application development/Problem Solving.

Module 1

Introduction: Data Structures, Classifications (Primitive & Non-Primitive), Data structure Operations, Review of Pointers and Dynamic Memory Allocation Functions. Representation of Linear Arrays in Memory, dynamically allocated arrays.

Array Operations: Traversing, inserting, deleting, searching, and sorting. Multidimensional Arrays, Polynomials and Sparse Matrices.

Module 2

Stacks and Queues

Stacks: Definition, Stack Operations, Array Representation of Stacks, Stacks using Dynamic Arrays, Stack Applications: Infix to postfix conversion, evaluation of postfix expression, Recursion - Factorial, GCD, Fibonacci Sequence, Tower of Hanoi, Ackerman's function. Queues: Definition, Array Representation, Queue Operations, Circular Queues, De-queues, Priority Queues. Programming Examples.

Module 3

Linked Lists: Definition, Representation of linked lists in Memory, Memory allocation. Linked list operations: Traversing, Searching, Insertion, and Deletion. Doubly Linked lists, Circular linked lists, and header linked lists. Applications of Linked lists - Polynomials, Sparse matrix representation. Programming Examples

Module 4

Trees: Terminology, Binary Trees, Properties of Binary trees, Binary Tree Traversals – In-order, post-order, preorder; Additional Binary tree operations. Threaded binary trees, Binary Search Trees – Definition, Insertion, Deletion, Traversal, Searching, Application of Trees-Evaluation of Expression, Programming Examples.

Module 5

Graphs: Definitions, Terminologies, Elementary Graph operations, Traversal methods: Breadth First Search and Depth First Search.

Hashing: Hash Table organizations, Hashing Functions, Static and Dynamic Hashing.

Self-study component: Matrix and Adjacency List Representation of Graphs, Dynamic arrays in c.

Course outcomes: The students will be able to:

1. Explore various data structures, operations and algorithms
2. Apply searching and sorting operations on files
3. Make use of stack, Queue, Lists, Trees and Graphs in problem solving.
4. Develop all data structures in a high-level language for problem solving.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Ellis Horowitz and Sartaj Sahni, Fundamentals of Data Structures in C, 2nd Ed, Universities Press, (reprinted 2016).
2. Seymour Lipschutz, Data Structures Schaum's Outlines, Revised 1st Ed, McGraw Hill, 2014.

References Books:

1. Gilberg & Forouzan, Data Structures: A Pseudo-code approach with C, 2nd Ed, Cengage Learning, 2014.
2. Reema Thareja, Data Structures using C, 3rd Ed, Oxford press, 2012.
3. Jean-Paul Tremblay & Paul G. Sorenson, An Introduction to Data Structures with Applications, 2nd Ed, McGraw Hill, 2013
4. A M Tenenbaum, Data Structures using C, PHI, 1989
5. Robert Kruse, Data Structures and Program Design in C, 2nd Ed, PHI, 1996.

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
Unix And Shell Programming (Effective from the Academic Year 2023 -24)			
Subject Code	**22AM 33**	**CIE Marks**	**50**
Number of Contact Hours/ Week	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	03
CREDITS - 04			

Course objectives: This course will enable students to

- Understand the UNIX Architecture, File systems and use of basic Commands.
- Use of editors and Networking commands.
- Understand Shell Programming and to write shell scripts.
- Understand and analyze UNIX System calls, Process Creation, Control & Relationship

Module -1

Introduction, Brief history. Unix Components/Architecture. Features of Unix. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. The login prompt General features of Unix commands/ command structure. Command arguments and options. Understanding of some basic commands such as echo, printf, ls, who, date, passwd, cal, Combining commands. Meaning of Internal and external commands. The type command: knowing the type of a command and locating it. The man command knowing more about Unix commands and using Unix online manual pages. The man with keyword option and whatis. The more command and using it with other commands. Knowing the user terminal, displaying its characteristics and setting characteristics. Managing the non uniform behaviour of terminals and keyboards. The root login. Becoming the super user: su command. The /etc/ passwd and /etc/shadow files. Commands to add, modify and delete users. Topics from Chapter 2 , 3 and 15 of Text Book 1, Chapter 1 of Text Book 2.

Laboratory Component:

1. Execute the following basic commands of unix.
   a) date b) echo c) who e) print f) cal g) man h) man -k i) whatisj) ls -l .

Module -2

Unix files. Naming files. Basic file types/categories. Organization of files. Hidden files. Standard directories. Parent child relationship. The home directory and the HOME variable. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames.

Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names. File related commands – cat, mv, rm, cp, wc and od commands. File attributes and permissions and knowing them. The ls command with options. Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions.

Directory

permissions. Topics from Chapters 4, 5 and 6 of Text Book 1

Laboratory Component:

1. Execute the following directory commands of unix.
   a) pwd b) cat c) cd d) mkdir e) rmdir
2. Assuming that a file current permission are rw_r_xr , specify the chmod expression required to change them to
   a) rwxrwxrwx b) r_ _ r_ _ _ _ _ c) _ _ _ r _ _ r_ _ d)_____using both relative and absolute permissions method 10 Hours
3. Execute the following file related commands
   a) cal b) mv c) rm d) cp e) wc f) od.

Module -3

The vi editor. Basics. The .exrc file. Different ways of invoking and quitting vi. Different modes of vi. Input mode commands. Command mode commands. The ex mode commands. Illustrative examples Navigation commands. Repeat command. Pattern searching. The search and replace command. The set, map and abbr commands. Simple examples using these commands. The shell's interpretive cycle. Wild cards and file name generation. Removing the special meanings of wild cards. Three standard files and redirection. Connecting

commands: Pipe. Splitting the output: tee. Command substitution. Basic and Extended regular expressions. The grep, egrep. Typical examples involving different regular expressions.

Topics from Chapters 7, 8 and 13 of Text Book 1. Topics from Chapters 2 and 9, 10 of Text Book 2 10 Hours

Laboratory Component:

1) Execute the following vi edit input mode commands
   a) insert and append [i,a,I,A]
   b) replace[r,R,s,S]
   c) open a line[o and O]
2) Execute the following commands mode command of vi editor
   a) k,j,h and l b) b,l,and w c) 0(zero),1,$
   d) [ctrl-f],[ctrl-b],[ctrl-d]and[ctrl-u] e)G

Module -4

Shell programming. Ordinary and environment variables. The .profile. Read and readonly commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. Simple shell program examples. File inodes and the inode structure. File links – hard and soft links. Filters. Head and tail commands. Cut and paste commands. The sort command and its usage with different options. The umask and default file permissions. Two special files / dev/null and /dev/tty.

Topics from Chapters 11, 12, 14 of Text Book 1, Chapter 17 from Text Book2

Laboratory Component:

1. Write and execute A shell program to read a pattern in a given file.
2. write and execute a shell program to create the following menu and to display the output according to the choice:
   1) list of files 2) process of user 3) today's date 4) users of the system 5)quit to unix.

Module -5

Meaning of a process. Mechanism of process creation. Parent and child process. The ps command with its options. Executing a command at a specified point of time: at command. Executing a command periodically: cron command and the crontab file.. Signals. The nice and nohup commands. Background processes. The bg and fg command. The kill command. The find command with illustrative example.

Structure of a perl script. Running a perl script. Variables and operators. String handling functions. Default variables - $_ and $. – representing the current line and current line number. The range operator. Chop() and chomp() functions. Lists and arrays. The @- variable. The splice operator, push(), pop(), split() and join(). File handles and handling file – using open(), close() and die () functions.. Associative arrays – keys and value functions. Overview of decision making loop control structures – the foreach. Regular expressions – simple and multiple search patterns. The match and substitute operators. Defining and using subroutines.

Topics from Chapters 9 and 19 of Text Book 1. Topics from Chapter 11 of Reference Book 1

Laboratory Component:

1. Write and execute a perl program to convert temperature to centigrade to Fahrenheit.
2. Write and execute a program that takes code and description as input till we enter the no option and then the entered data should be stored into the file “newlist”.
3. Write and execute the perl program to determine whether a given year is a leap year or not.

Write and execute a perl program to convert decimal number to binary

Course outcomes:

After studying this course, students will be able to:

1. Explain multi user OS UNIX and its basic features
2. Interpret UNIX Commands, Shell basics, and shell environments
3. Design and develop shell programming, communication, System calls and terminology.

4. Design and develop UNIX File I/O and UNIX Processes. Perl script writing.

Graduate Attributes (as per NBA)

1. Engineering Knowledge
2. Environment and Sustainability Design/Development of Solutions

Question paper pattern:

The question paper will have ten questions. There will be 2 questions from each module.
Each question will have questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Sumitabha Das., Unix Concepts and Applications., 4th Edition., Tata McGraw Hill
2. Behrouz A. Forouzan, Richard F. Gilberg : UNIX and Shell Programming-Cengage Learning – India Edition. 2009.

Reference Books:

1. M.G. Venkatesh Murthy: UNIX & Shell Programming, Pearson Education.
2. Richard Blum , Christine Bresnahan : Linux Command Line and Shell Scripting Bible, 2nd Edition ,Wiley,2014

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
Principles of AI (Effective from the Academic Year 2023 -24)			
Course Code	**22AM34**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	50
Credits	04	Exam Hours	03

Course objectives:

CLO1 Gain a historical perspective of AI and its foundations
CLO2 Become familiar with basic principles of AI toward problem solving
CLO3 Get to know approaches of inference, perception, Uncertain Knowledge and Reasoning

Module – 1

Introduction: What is AI? Foundations and History of AI
Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structureof agents.

Module – 2

Problem-solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search.
Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search;

Module – 3

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions.
Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoningpatterns in Propositional Logic.

Module –4

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic.
Inference in First Order Logic : Propositional Versus First Order Inference, Unification, Forward Chaining,Backward Chaining, Resolution.

Module – 5

Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited.

Course outcomes: The students will be able to:

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

CO1 Apply knowledge of agent architecture, searching and reasoning techniques for different applications.

CO2 Analyse Searching and Inferencing Techniques.

CO3 Develop knowledge base sentences using propositional logic and first order logic CO 4. Demonstrating agents, searching and inferencing

CO5 Illustrate the application of probability in uncertain reasoning..

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
  Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Artificial Intelligence	Stuart J. Russell and Peter Norvig	Pearson	3rd Edition 2015
Reference Books				
1	Artificial Intelligence	Elaine Rich, Kevin Knight	Tata McGraw Hill	3rd Edition, 2013
2	George F Lugar	Artificial Intelligence Structure and strategies for complex	Pearson Education	5th Edition, 2011

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
COMPUTATIONAL THINKING WITH PYTHON (Effective from the Academic Year 2023 -24)			
Course Code	**22AM35**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	3:2:0	SEE Marks	50
Credits	04	Exam Hours	03

Course objectives:

1. Describe the core syntax and semantics of Python programming language.
2. Discover the need for working with the strings and functions.
3. Illustrate the process of structuring the data using lists, dictionaries, tuples and sets.
4. Indicate the use of regular expressions and built-in functions to navigate the file system.
5. Infer the Object-oriented Programming concepts in Python.

Module – 1

Why should you learn to write programs, Variables, expressions and statements, Conditional execution, Functions

Textbook 1: Chapters 1 – 4

Module – 2

Iteration, Strings, Files

Textbook 1: Chapters 5– 7

Module – 3

Lists, Dictionaries, Tuples, Regular Expressions

Textbook 1: Chapters 8 - 11

Module – 4

Classes and objects, Classes and functions, Classes and methods

Textbook 2: Chapters 15 – 17

Module – 5

Networked programs, Using Web Services, Using databases and SQL

Textbook 1: Chapters 12– 13, 15

Course Outcomes: The students will be able to:

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.
2. Demonstrate proficiency in handling Strings and File Systems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.
4. Interpret the concepts of Object-Oriented Programming as used in Python.
5. Implement exemplary applications related to Network Programming, Web Services and Databases in Python.

Question paper pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Python for Everybody: Exploring Data Using Python 3	Charles R. Severance	Create Space Independent Publishing	1st Edition
2	Think Python: How to Think Like a Computer Scientist	Allen B. Downey	Green Tea Press	2nd Edition
Reference Books				
1	Introduction to Computer Science Using Python	Charles Dierbach	Wiley India Pvt Ltd	1st Edition
2	Introduction to Python Programming	Gowrishankar S, Veena A	CRC Press/Taylor	1st Edition
3	Programming Python	Mark Lutz	O"Reilly Media	4th Edition

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
DATA STRUCTURES WITH C LABORATORY (Effective from the Academic Year 2023 -24)			
Course Code	**22AML36**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	0:2:2	SEE Marks	50
Credits	01	Exam Hours	03

Course Objectives:

1. To write, test, and debug simple C programs.
2. To implement C programs with conditionals and loops.
3. To use functions for structuring C programs.
4. To represent compound data using C lists, tuples, and dictionaries.

LABORATORY EXPERIMENTS

Implement all the experiments in C Language under Linux / Windows environment.

1. Design, Develop and Implement a menu driven Program in C for the following Array Operations.
   a. Creating an Array of N Integer Elements
   b. Display of Array Elements with Suitable Headings
   c. Inserting an Element (ELEM) at a given valid Position (POS)
   d. Deleting an Element at a given valid Position (POS)
   e. Exit.

   Support the program with functions for each of the above operations.

2. Design, Develop and Implement a Program in C for the following operations on Strings
   a. Read a main String (STR), a Pattern String (PAT) and a Replace String (REP)
   b. Perform Pattern Matching Operation: Find and Replace all occurrences of PAT in STR with REP if PAT exists in STR. Report suitable messages in case PAT does not exist in STR.

      Supportthe program with functions for each of the above operations. Don’t use Built-in functions.

3. Design, Develop and Implement a menu driven Program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX)
   a. Push an Element on to Stack
   b. Pop an Element from Stack
   c. Demonstrate how Stack can be used to check Palindrome
   d. Demonstrate Overflow and Underflow situations on Stack
   e. Display the status of Stack
   f. Exit

   Support the program with appropriate functions for each of the above operations.

4. Design, develop and Implement a Program in C for converting an Infix Expression to Postfix Expression.Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^(Power) and alphanumeric operands.

5. Design, develop and Implement a Program in C for the following Stack Applications. Evaluation of Suffixexpression with single digit operands and operators: +, -, *, /, %, ^
   b. Solving Tower of Hanoi problem with n disks

6. Design, Develop and Implement a menu driven Program in C for the following operations on Circular QUEUE of Characters (Array Implementation of Queue with maximum sizeMAX)
   a. Insert an Element on to Circular QUEUE
   b. Delete an Element from Circular QUEUE
   c. Demonstrate Overflow and Underflow situations on Circular QUEUE
   d. Display the status of Circular QUEUE
   e. Exit

   Support the program with appropriate functions for each of the above operations.

7. Design, Develop and Implement a menu driven Program in C for the following operations on Singly Linked List (SLL) of Student Data with the fie7l8ds: USN, Name, Branch, Sem, PhNo.

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
PYTHON PROGRAMMING LABORATORY (Effective from the Academic Year 2023 -24) **SEMESTER – III**			
Subject Code	**22AML37**	**CIE Marks**	**50**
Number of Contact Hours/ Week	0:2:2	SEE Marks	50
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
CREDITS – 1			

Course Learning Objectives:

This course will enable students to:

Course Objectives:

1. Demonstrate the use of IDLE or PyCharm IDE to create Python Applications
2. Using Python programming language to develop programs for solving real-world problems CLO
3. Implement the Object-Oriented Programming concepts in Python.

Prerequisite

- Students should be familiarized about Python installation and setting Python environment
- Usage of IDLE or IDE like PyCharm should be introduced

Laboratory Programs:

Aim: Introduce the Python fundamentals, data types, operators, flow control and exception handling in Python

a) Write a python program to find the best of two test average marks out of three test's marks accepted from the user.
Develop a Python program to check whether a given number is palindrome or not palindrome.

2 Aim: Demonstrating creation of functions, passing parameters and return values

a) Defined as a function F as Fn = Fn-1 + Fn-2. Write a Python program which accepts a value for N (where N >0) as input and pass this value to the function. Display suitable error message if the condition for input value is not followed.
Develop a python program to convert binary to decimal, octal to hexadecimal using functions.

3 Aim: Demonstration of manipulation of strings using string methods.

a) Write a Python program that accepts a sentence and find the number of words, digits, uppercase letters and lowercase letters.
a) Write a Python program to find the string similarity between two given strings.

4. Aim: Discuss different collections like list, sort.
Write a python program to implement insertion sort and merge sort using lists

5. Aim: Demonstration of pattern recognition with and without using regular expressions, dictionaries.

a) Write a program to convert roman numbers in to integer values using dictionaries.
b) Write a function called isphonenumber() to recognize a pattern 415-555-4242 without using regular expression and also write the code to recognize the same pattern using regular expressions.

6. Aim: Demonstration of reading, writing and organizing files.

a) Write a python program to accept a file name from the user and perform the following operations
    1. Display the first N line of the file
    2. Find the frequency of occurrence of the word accepted from the user in the file
b) Write a python program to create a ZIP file of a particular folder which contains several files inside it.

7. Aim: Demonstration of the concepts of classes, methods, objects and inheritance

a) By using the concept of inheritance write a python program to find the area of triangle, circle and rectangle.

a) Write a python program by creating a class called Employee to store the details of Name, Employee_ID, Department and Salary, and implement a method to update salary of employees belonging to a given department.

8 Aim: Demonstration of the concepts of classes with objects, classes with methods.

a).Write a python program by creating a class called Person and create objects Create objects of the Person class.

b). Write a python program by creating a class name called calculator and create methods name (add, subtract, multiply, divide).

9 Aim: Demonstration of the concepts of classes with functions & Database.

a). Write a python program by creating a class and functions for collage as example.

b). Write a python program by creating a student database.

10 Aim: Demonstration of the concepts of manipulate tuples, using web series (JSON).

a). write a Python program that demonstrates how to create and manipulate tuples (gather: An operation that collects multiple arguments into a tuple).

b) write Python program that demonstrates how to work with JSON using the json module in Python

Laboratory Outcomes: The student should be able to:

To be able to introduce core programming basics and program design with functions using Python programming language.

To understand the high-performance programs designed to strengthen the practical expertise.

Conduct of Practical Examination:

Experiment distribution

For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Coursed to change in accordance with university regulations)
  For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks.

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
DESIGN THINKING (Common to all Branches) **(Effective from the Academic Year 2023 -2024)**			
Course Code	**22AEC38A**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	0: 0: 2	SEE Marks	100
Credits	01	Exam Hours	02

Course objectives:

The course will enable the students,

- To Explain the fundamental concept of Innovation and Design Thinking.
- To Demonstrate how to observe and convert observation data to insights.
- To Apply design thinking concept in functional work.

Module-1

Introduction to Design Thinking: Importance of Design Thinking – Phases in design thinking process – Five stage model – non-linearity of the five-stage model.

Module-2

Applications of design thinking in various domains. DT For strategic innovations Growth – Story telling representation.

Module-3

Strategic Foresight - Change – Sense Making - Maintenance Relevance – Value redefinition - Extreme Competition – experience design - Standardization – Humanization.

Module-4

Creative Culture – Rapid prototyping, Strategy and Organization – Business Model design

Module-5

Design thinking workshop: Empathize, Design, Ideate, Prototype and Test

QUESTION PAPER PATTERN:

Note: - SEE for AEC and UHV courses for 2022 scheme and DT courses will be conducted in Batch wise.

- The question paper will have fifty multiple choice questions carrying equal marks.
- Each full question carries 1marks.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer fifty full questions, selecting one full question from each module.

Textbooks:

- Stanford Design Thinking Virtual Crash Course
- Design thinking 101: Principles, Tools & Examples to transform your creative process
- https://onlinecourses.nptel.ac.in/noc19_mg60/preview
- www.tutor2u.net/business/presentations/./productlifecycle/default.html
- https://docs.oracle.com/cd/E11108_02/otn/pdf/. /E11087_01.pdf
- www.bizfilings.com › Home › Marketing › Product Development
- https://www.mindtools.com/brainstm.html
- https://www.quicksprout.com/./how-to-reverse-engineer-your-competitor
- www.vertabelo.com/blog/documentation/reverse-engineeringhttps://support.microsoft.com/en- us/kb/273814
- https://support.google.com/docs/answer/179740?hl=en
- https://www.youtube.com/watch?v=2mjSDIBaUlMthevirtualinstructor.com/foreshortening.html

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment

- Interactive methods
- Flipped Classes
- Activity Based Learning

Content Beyond the Syllabus:

- Course Projects
- Model Based Learning
- Activity Based Learning

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
Yoga (Common to all Branches) **(Effective from the Academic Year 2023 -2024)**			
Course Code	**22UHV39A**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	2–0–0	SEE Marks	50
Credits	01	Exam Hours	02

Course objectives:

The course will enable the students,

- To introduce basic wellness principles and Yogic practices for common people.
- To introduce fundamental principles and practices of Yoga for healthy living.
- To promote Yoga for disease prevention and health promotion as an approach to holistic health.

Module-1

Introduction to Yoga

Introduction, Gguiding principles to be followed by Yoga practitioners. Introduction to Yogic Sukshma Vyayama & Sthula Vyayama and their relevance in Yoga Sadhana. Yogic concept of Wellness and Ashtaanga Yoga of Patanjali. Concept of Wellness and Wellbeing.

Module-2

Concept of Wellness and Wellbeing

Yogic concept of Wellness and Ashtaanga Yoga of Patanjali. Introduction to Shatkarma and their importance in Yoga Sadhana. Health benefits of Shatkarma. Role of Yama and Niyama for Psychosocial Wellbeing. Concept of Panchakosha and Panchamahabhuta

Module-3

Health benefits of Yogasana

Introduction, Surya Namaskar: Its technique and health benefits, the role of Yogasana in diseases prevention and health promotion. Health benefits of Shatkarma. Concept of Panchakosha and Panchamahabhuta.

Module-4

Pranayama

Pranayama: Its principle and types, Mechanism of breathing, Health benefits of Pranayama, Bandha and Mudra: Techniques and their role in Yoga Sadhana. Practices of leading to Dhyana (Meditation).

Module-5

Diet and Nutrition

Yogic concepts of Aahara, Yogiclifesty (Aahara, Vihar, Aachar, Vichar). Yogic attitudes (Myhri, Karuna, Muditha and Upeksha) and practices for mental Wellbeing.

QUESTIONPAPERPATTERN:

Note: SEE for AEC and UHV courses for 2022 scheme and SSD courses conducted in Batch wise.

- The question paper will have fifty multiple choice questions carrying equal marks.
- Eachfullquestioncarries1marks.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer fifty full questions, selecting one full question from each module.

Textbooks:

1. Yoga Sutras of Patanjali by Patanjali
2. Autobiography of a Yogi by Paramahansa Yogananda.
3. Bhagwat Gita.
4. Bhakti Yoga.

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - III			
Additional Mathematics – I (Effective from the Academic Year 2023-2024) (Mandatory Learning Course: Common to All Branches) (A Bridge course for Lateral Entry students under Diploma quota to BE/B.Tech programmes)			
Course Code	**22MATDIP31**	**CIE Marks**	**50**
Teaching Hours/week(L:T:P)	2:1:0	SEE Marks	50
Credits	00	Exam Hours	03

Course objectives:

- To provide basic concepts of complex trigonometry, vector algebra, differential and integral calculus.
- To provide an insight into vector differentiation and first order ODE's.

Module-1

Complex Trigonometry: Complex Numbers: Definitions and properties. Modulus and amplitudeof a complex number, Argand's diagram, De-Moivre's theorem (without proof).

Vector Algebra: Scalar and vectors. Addition and subtraction and multiplication of vectors- Dot and Cross products, problems.

Module-2

Differential Calculus: Review of successive differentiation-illustrative examples. Maclaurin's series expansions-Illustrative examples. Partial Differentiation: Euler's theorem-problems on first order derivatives only. Total derivatives-differentiation of composite functions. Jacobians of order two-Problems.

Module-3

Vector Differentiation: Differentiation of vector functions. Velocity and acceleration of a particle moving on a space curve. Scalar and vector point functions. Gradient, Divergence, Curl-simple problems. Solenoidal and irrotational vector fields-Problems.

Module-4

Integral Calculus: Review of elementary integral calculus. Reduction formulae for sinnx, cosnx (with proof) and sinmx cosnx (without proof)

and evaluation of these with standard limits- Examples. Double and triple integrals-Simple examples.

Module-5

Ordinary differential equations (ODE's. Introduction-solutions of first order and first degree differential equations: exact, linear differential equations. Equations reducible to exact and Bernoulli's equation.

Course outcomes:

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

CO1: Apply concepts of complex numbers and vector algebra to analyze the problems arising in related area.

CO2: Use derivatives and partial derivatives to calculate rate of change of multivariate functions.

CO3: Analyze position, velocity and acceleration in two and three dimensions of vector valued functions.

CO4: Learn techniques of integration including the evaluation of double and triple integrals have a mix of topics under that module.

CO5: Identify and solve first order ordinary differential equations.

- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	43rd Edition, 2015
Reference Books				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics	N.P.Bali and Manish Goyal	Laxmi Publishers	7th Edition, 2007
3	Engineering Mathematics Vol. I	Rohit Khurana	Cengage Learning	1st Edition, 2015

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should.

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
ENGINEERING MATHEMATICS IV (Effective from the Academic Year 2023 -24)			
Course Code	**22MAT41**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	50
Credits	03	Exam Hours	03

Course objectives:

1. To provide students with a framework that will help them choose the appropriate descriptive methods in various data analysis situations.
2. To analyze distributions and relationships of real-time data.
3. To apply estimation and testing methods to make inference and modeling techniques.

Module – 1

Introduction- A Simple Example of a Research Problem, Discrepancies Between Real and Ideal Research Situations, Samples and Populations, Descriptive Versus Inferential Uses of Statistics, Levels of Measurement and Types of Variables.

Basic Statistics, Sampling Error, and Confidence Intervals-Introduction, Research Example: Description of a Sample of HR Scores , Sample Mean (M) , Sum of Squared Deviations (SS) and Sample Variance (s2), Degrees of Freedom (df) for a Sample Variance , Why Is There Variance? , Sample Standard Deviation (s), Assessment of Location of a Single X Score Relative to a Distribution of Scores.

Module – 2

Preliminary Data Screening- Introduction: Problems in Real Data, Quality Control During Data Collection, Example of an SPSS Data Worksheet, Identification of Errors and Inconsistencies, Missing Values, Empirical Example of Data Screening for Individual Variables, Frequency Distribution Tables, Removal of Impossible or Extreme Scores, Bar Chart for a Categorical Variable, Histogram for a Quantitative Variable, Identification and Handling of Outliers, Screening Data for Bivariate Analyses, Bivariate Data Screening for Two Categorical Variables, Bivariate Data Screening for One Categorical and One Quantitative Variable, Bivariate Data Screening for Two Quantitative Variables,Nonlinear Relations.

Module – 3

Bivariate Pearson Correlation- Research Situations Where Pearson's r Is Used, Hypothetical Research Example, Assumptions for Pearson's r, Preliminary Data Screening , Design Issues in Planning Correlation Research, Computation of Pearson's , Statistical Significance Tests for Pearson'sr, Testing the Hypothesis That rXY = 0, Testing Other Hypotheses About rXY, Assessing Differences Between Correlations, Reporting Many Correlations: Need to Control, Inflated Risk of Type I Error, Limiting the Number of Correlations, Cross-Validation of Correlations, Bonferroni Procedure: A More Conservative, Alpha Level for Tests of Individual Correlations, Setting Up CIs for Correlations.

Module –4

Bivariate Regression- Research Situations Where Bivariate Regression Is Used , A Research Example: Prediction of Salary From Years of Job Experience, Assumptions and Data Screening, Issues in Planning a Bivariate Regression Study, Formulas for Bivariate Regression, Statistical Significance Tests for Bivariate Regression, Setting Up Confidence Intervals Around Regression Coefficients, Factors That Influence the Magnitude and Sign of b, Factors That Affect the Size of the b Coefficient, Comparison of Coefficients for Different Predictors or for Different Groups, Effect Size/ Partition of Variance in Bivariate Regression, Statistical Power, Raw Score Versus Standard Score Versions of the Regression Equation, Removing the Influence of X From the Y Variable by Looking at Residuals, From Bivariate Regression, Empirical Example Using SPSS- Information to Report From a Bivariate Regression.

Module – 5

Multiple Regression With Two Predictor Variables, Research Situations Involving Regression With Two Predictor Variables, Hypothetical Research Example, Graphic Representation ofRegression Plane, Semi-partial (or "Part") Correlation, Graphic Representation of Partition of Variance in Regression, With Two Predictors, Assumptions for Regression With Two Predictors, Formulas for Regression Coefficients, Significance Tests and Confidence Intervals.

Course outcomes:

The students will be able to:

1. Describe the method used for analysis, including a discussion of advantages, disadvantages, and necessary assumptions.
2. Demonstrate the correlation is used to identify relationships between variables and how regression analysis is used to predict outcomes
3. Develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, information theory and design engineering.
4. Test the hypothesis of sampling distributions and illustrate examples of Markov chains related to discrete parameter stochastic process.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbook				
1	Applied Statistics From Bivariate Through Multi-variate Techniques	Rebecca M Warner	SAGE Publications, Inc	2nd Edition, April 2012
2	Probability and Statistics for engineers and scientists	R.E.Walpole, R.H.Mayers, S.L. Mayers and K.Ye	Pearson Education	9th Edition, 2012
Reference Books				
1	Probability and Statistics	J.L.Devore	Cengage Learning	8th Edition, 2012
2	Applied Statistics and Probability for Engineers	Douglas C. Montgomery, George C. Runger	John Wiley	6th edition

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
DESIGN AND ANALYSIS OF ALGORITHMS (Effective from the academic year 2023 -2024)			
Subject Code	**22AM42**	**CIE Marks**	**50**
Number of Contact Hours/ Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3 Hrs

Course Learning Objectives:

This course **(22IS42)** will enable students to:

- Understand and use asymptotic notations to analyze the performance of algorithm.
- Understand and analyze the design of algorithms using Divide and Conquer & Dynamic Programming.
- Understand and analyze the design of algorithms using Greedy technique, Backtracking, Branch & Bound techniques.

Module 1 Contact Hours

Introduction: What is an Algorithm? (T2:1.1), Algorithm Specification (T2:1.2), Analysis Framework (T1:2.1), Performance Analysis: Space complexity, Time complexity (T2:1.3). Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation ( ), and Little-oh notation (o), Mathematical analysis of Non- Recursive with Examples (T1:2.2, 2.3, 2.4). Self Study Component: Mathematical analysis of Recursive with Examples

Module 2

Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, (T2:3.1, 3.3, 3.4), Merge sort, Quick sort (T1:4.1, 4.2), Strassen's matrix multiplication (T2:3.8). Decrease and Conquer Approach: Topological Sort. (T1:5.3). Self Study Component: Finding the maximum and minimum

Module 3

Greedy Method: General method, Knapsack Problem, Job sequencing with deadlines (T2:4.1, 4.3, 4.5). Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm (T1:9.1, 9.2). Single source shortest paths: Dijkstra's Algorithm (T1:9.3). Optimal Tree problem: Huffman Trees and Codes (T1:9.4). Self Study Component: Heaps and Heap Sort (T1:6.4).

Module 4

Dynamic Programming: General method with Examples,(T2:5.1, 5.2). Warshall's Algorithm, All Pairs Shortest Paths: Knapsack problem ((T1:8.2, 8.3, 8.4), Bellman- Ford Algorithm (T2:5.4), Travelling Sales Person problem (T2:5.9). Self Study Component: Floyd's Algorithm

Module 5

Backtracking: Graph coloring (T2:7.4), Hamiltonian cycles (T2:7.5). Branch and Bound: Assignment Problem, (T1:12.2), 0/1 Knapsack problem (T2:8.2, T1:12.2): LC Branch and Bound solution (T2:8.2), NP-Complete and NP-Hard problems: Basic concepts, non- deterministic algorithms, P, NP, NP-Complete, and NP-Hard classes (T2:11.1).

Self Study Component: N-Queens problem

Course Outcomes: The student will be able to :

- Describe computational solution to well known problems like searching, sorting etc.
- Apply the appropriate design strategies for problem solving.
- Analyze the computational complexity of various algorithms.
- Explore various algorithms and design strategies for a given problem.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

- Introduction to the Design and Analysis of Algorithms, Anany Levitin:, 2rd Edition, 2009. Pearson.
- Computer Algorithms/C++, Ellis Horowitz, Satraj Sahni and Rajasekaran, 2nd Edition, 2014, Universities Press

Reference Books:

- Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein, 3rd Edition, PHI.
- Design and Analysis of Algorithms, S. Sridhar, Oxford (Higher Education).

Web and Videos links:

- Algorithms: Design and analysis part 1 (coursera)
- Design and Analysis of algorithms: https://onlinecourses.nptel.ac.in/noc23_cs96/preview

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
Data Base Management System (Effective from the Academic Year 2023 -24)			
Subject Code	**22AM43**	**CIE Marks**	**50**
Number of Contact Hours/ Week	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS – 4			

Course Learning Objectives: This course will enable students to:

- Provide a strong foundation in database concepts, technology, and practice.
- Practice SQL programming through a variety of database problems.
- Demonstrate the use of concurrency and transactions in database
- Design and build database applications for real world problems.

Module 1

Introduction to Databases: Introduction, Characteristics of database approach Advantages of using the DBMS approach, History of database applications. Overview of Database Languages and Architectures: Data Models, Schemas, and Instances Three schema architecture and data independence, database languages, andinterfaces The Database System environment. Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles, and structural constraints Weak entity types, ER diagrams, examples, Specialization and Generalization.

Text Book 1:Ch 1.1 to 1.8, 2.1 to 2.6, 3.1 to 3.10

Module 2

Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. Relational Algebra: Unary and Binary relational operation additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra. Mapping Conceptual Design into a Logical Design: Relation Database Design using ER-to-Relational mapping. SQL: SQL data definition and dat types, specifying constraints in

SQL, retrieval queries in SQL, INSERT, DELETE,and UPDATE statements in SQL, Additional features of SQL.

Text Book 1: Ch4.1 to 4.5, 5.1 to 5.3, 6.1 to 6.5, 8.1;

Text Book 2: 3.5

Module 3

SQL: Advances Queries: More complex SQL retrieval queries, Specifying constraint as assertions and action triggers, Views in SQL, Schema change statements in SQL Database Application Development: Accessing databases from applications, An introduction to JDBC, JDBC classes and interfaces, SQLJ, Stored procedures, Case study: The internet Bookshop.

Text Book 1: Ch7.1 to 7.4;

Text Book 2: 6.1 to 6.6, 7.5 to 7.7.

Module 4

Normalization: Database Design Theory – Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form. Normalization Algorithms Inference Rules, Equivalence, and Minimal Cover, Properties of Relationa Decompositions, Algorithms for Relational Database Schema Design, Nulls, Dangling tuples, and alternate Relational Designs, Further discussion of Multivalued dependencies and 4NF, Other dependencies and Normal Forms

Text Book 1: Ch14.1 to 14.7, 15.1 to 15.6

Module 5

Transaction Processing: Introduction to Transaction Processing, Transaction and System concepts, Desirable properties of Transactions, Characterizing schedules based on recoverability, Characterizing schedules based on Serializability, Transaction support in SQL. Why NoSQL? The Value of Relational Databases, Getting at Persistent Data, Concurrency, Integration, A (Mostly) Standard Model, Impedance Mismatch, Application and Integration Databases, Attack of the Clusters, The Emergence of NoSQL,

Textbook 1: 20.1 to 20.6

Textbook3: Chapter 1

Course Outcomes: The student will be able to :

- Identify, analyze and define database objects, enforce integrity constraints on a database using RDBMS.
- Use Structured Query Language (SQL) for database manipulation.
- Design and build simple database systems
- Develop application to interact with databases.

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Text Books:

1. Fundamentals of Database Systems, Ramez Elmasri and Shamkant B. Navathe, 7th Edition, 2017, Pearson.
2. Database management systems, Ramakrishnan, and Gehrke, 3rd Edition, 2014, McGraw Hill
3. Sadalage, P. & Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Pearson Addision Wesley, 2012

Reference Books:

1. Silberschatz Korth and Sudharshan, Database System Concepts, 6th Edition, Mc-GrawHill, 2013.
2. Coronel, Morris, and Rob, Database Principles Fundamentals of Design, Implementation and Management, Cengage Learning 2012.
3. Dan Sullivan, "NoSQL For Mere Mortals", 1st Edition, Pearson Education India, 2015. (ISBN13: 978- 9332557338)
4. Dan McCreary and Ann Kelly, "Making Sense of NoSQL: A guide for Managers and the Rest of us", 1st Edition, Manning Publication/ Dreamtech Press, 2013. (ISBN-13: 978-9351192022)
5. Kristina Chodorow, "Mongodb: The Definitive Guide- Powerful and Scalable Data Storage", 2nd Edition, O'Reilly Publications, 2013. (ISBN-13: 978-9351102694).

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
OPERATING SYSTEM (Effective from the Academic Year 2023 -24)			
Subject Code	**22AM44**	**CIE Marks**	**50**
Number of Contact Hours/ Week	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS – 4			

Course Learning Objectives: This course will enable students to:

- Explain the fundamentals of operating system
- Comprehend multithreaded programming, process management, memory management and storage management.
- Familiar with various types of operating systems

Module 1 Contact Hours

Introduction: What OS do, Computer system organization, architecture, structure, Operations Process, memory and storage management, Protection and security, Distributed systems Special purpose systems, computing environments.

System Structure: OS Services, User OSI, System calls, Types of system calls, System programs, OS design and implementation, OS structure, Virtual machines, OS generatio system boot.

Textbook1: Chapter 1, 2 RBT: L1, L2

Module 2

Process Concept: Overview, Process scheduling, Operations on process, IPC, Examples in IPC, Communication in client-server systems.

Multithreaded Programming: Overview, Models, Libraries, Issues, OS Examples.

Textbook1: Chapter 3,4 RBT: L1, L2

Module 3

Process Scheduling: Basic concept, Scheduling criteria, Algorithm, multiple processo scheduling, thread scheduling, OS Examples, Algorithm Evaluation.

Synchronization: Background, the critical section problem, Petersons solution Synchronization hardware, Semaphores, Classic problems of synchronization, Monitors Synchronization examples, Atomic transactions.
Textbook1: Chapter 5, 6
RBT: L1, L2

Module 4

Deadlocks: System model, Deadlock characterization, Method of handling deadlock, Deadlock prevention, Avoidance, Detection, Recovery from deadlock.
Memory management strategies: Background, swapping, contiguous memory allocation, paging, structure of page table, segmentation.
Textbook1: Chapter 7, 8
RBT: L1, L2

Module 5

Virtual Memory Management: Background, Demand paging, Copy-on-write, Pag replacement, allocation of frames, Trashing, Memory mapped files, Allocating Kernel memor Operating system examples
File System: File concept, Access methods, Directory structure, File system mounting, File sharing, protection
Textbook1: Chapter 9, 10
RBT: L1, L2

Course Outcomes: The student will be able to :

- Explain the fundamentals of operating system
- Comprehend process management, memory management and storage management.
- Familiar with various types of operating systems

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. A. Silberschatz, P B Galvin, G Gagne, Operating systems, 7th edition, John Wiley and sons,.

Reference Books:

1. William Stalling,"Operating Systems: Internals and Design Principles", Pearson Education, 1st Edition, 2018.
2. Andrew S Tanenbaum, Herbert BOS, "Modern Operating Systems", Pearson Education, 4th Edition, 2016

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
OBJECT ORIENTED CONCEPTS USING JAVA (Effective from the Academic Year 2023-24)			
Course Code	**22AM45**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	3:2:0	SEE Marks	50
Credits	04	Exam Hours	03

Course objectives:

1. Learn fundamental features of object-oriented language and JAVA
2. Set up Java JDK environment to create, debug and run simple Java programs.
3. Create multi-threaded programs and event handling mechanisms.
4. Introduce event driven Graphical User Interface (GUI) programming using applets and swings.

Module – 1

Introduction to Object Oriented Concepts:

A Review of structures, Procedure–Oriented Programming system, Object Oriented Programming System,Console I/O, variables and reference variables, Function Prototyping, Function Overloading., Inline Function, Recursive function.

Module – 2

Class and Objects: Introduction, member functions and data,. Objects and arrays, Namespaces, Nested classes, Constructors,Destructors.

Introduction to Java: Java's magic: the Byte code; Java Development Kit (JDK); the Java Buzzwords, Object-oriented programming; Simple Java programs. Data types, variables and arrays, Operators, Control Statements.

Module – 3

Classes, Inheritance, Exception Handling: Classes: Classes fundamentals; Declaring objects; Constructors, this keyword, garbage collection. **Inheritance:** inheritance basics, using super, creating multi level hierarchy, method overriding. Exception handling: Exception handling in Java.

Module –4

Packages and Interfaces: Packages, Access Protection, Importing Packages. Interfaces.

Multi Threaded Programming: Multi-Threaded Programming: What are threads? How to make theclasses threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Bounded buffer problems, producer consumer problems.

Module – 5

Event Handling: Two event handling mechanisms; The delegation event model; Event classes; Sources of events; Event listener interfaces; Using the delegation event model; Adapter classes; Inner classes. Swings: Swings: The origins of Swing; Two key Swing features; Components and Containers; The Swing Packages; A simple Swing Application; Create a Swing Applet; Jlabel and ImageIcon; JTextField;The Swing Buttons; JTabbedpane; JScrollPane; JList;JComboBox; JTable.

Course outcomes: The students will be able to:

1. Explain the object-oriented concepts and JAVA.
2. Develop computer programs to solve real world problems in Java.
3. Develop simple GUI interfaces for a computer program to interact with users, and to understandthe event-based GUI handling principles using swings.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Object Oriented Programming with C++	Sourav Sahay	Oxford University Press	2nd edition
2	Java The Complete Reference	Herbert Schildt	Tata McGraw	7th Edition, 2007
Reference Books				
1	The Complete Reference C++	Herbert Schildt	Tata McGraw Hill	4th Edition, 2003
2	C++ Primer	Stanley B.Lippmann, Josee Lajore	Pearson Education	4th Edition, 2005
3	Object oriented Programming with java	Rajkumar Buyya, S Thamarasiselvi, xingchenchu	Tata McGraw Hill	--

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
Design and Analysis Laboratory (Effective from the Academic Year 2023-24)			
Subject Code	**22AML46**	**CIE Marks**	**50**
Number of Contact Hours/ Week	0:2:2	SEE Marks	50
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 1			

Course Learning Objectives:

This course **(22AML46)** will enable students to:

- Employ various design strategies for problem solving.
- Measure and compare the performance of different algorithms.

Descriptions (if any):

- Design, develop, and implement the specified algorithms for the following problems using C

Programs List:

1. Sort a given set of n integer elements using Quick Sort method and compute its time complexity. Run the program for varied values of n> 5000 and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrate using C how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

2. Sort a given set of n integer elements using Merge Sort method and compute its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus non graph sheet. The elements can be read from a file or can be generated using the random number generator. Demonstrateusing C how the divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.

3. Obtain the Topological ordering of vertices in a given digraph.

4. Heap Sort is a comparison based sorting technique based on Binary Heap data structure. A Binary Heap is a Complete Binary Tree where items are stored in a special order such that value in a parent node is greater than the values in its two children nodes. The former (root) is called as max heap and the latter is called mean heap. Create little Heap Sort Game using C for printing each step of Heap Sort Algorithm.

5. Implement in C, the 0/1 Knapsack problem using
   (a) Dynamic Programming method
   (b) Greedy method.

6. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm. Write the program in C.

7. Find Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal'salgorithm.

8. Find Minimum Cost Spanning Tree of a given connected undirected graph using Prim's algorithm.
9. Implement Travelling Sales Person problem using Dynamic programming.

10. Design and implement to find all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Laboratory Outcomes:

The student should be able to:

- Design algorithms using appropriate design techniques (brute- force, greedy, dynamic programming, etc.)
- Implement a variety of algorithms such assorting, graph related, combinatorial, etc., in a high level language.
- Analyze and compare the performance of algorithms using language features.
- Apply and implement learned algorithm design techniques and data structures to solve real-world problems.

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination.
- Experiment distribution

For questions having only one part: Students are allowed to pick one experimentfrom the lot and are given equal opportunity.

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
DBMS Laboratory and Mini Project (Effective from the Academic Year 2023-24)			
Subject Code	**22AML47**	**CIE Marks**	**50**
Number of Contact Hours/ Week	0:2:2	SEE Marks	50
Total Number of Lab Contact Hours	36	Exam Hours	3 Hrs
Credits – 1			

PART-A: SQL Programming (Max. Exam Marks. 40)

- Design, develop, and implement the specified queries for the following problems using Oracle, MySQL, MS SQL Server, or any other DBMS under LINUX/Windows environment.

- Create Schema and insert at least 5 records for each table. Add appropriate database constraints.

PART-B: Mini Project (Max. Exam Marks. 20)

- Use Java, C#, PHP, Python, or any other similar front-end tool. All applications must be demonstrated on desktop/laptop as a stand-alone or web based application (Mobile apps on Android/IOS are not permitted.) Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal Laboratory Programs:

PART A

1. Consider the following schema for a Library Database: BOOK(Book_id, Title, Publisher_Name, Pub_Year) BOOK_AUTHORS(Book_id, Author_ Name) PUBLISHER(Name, Address, Phone) BOOK_COPIES(Book_id, Programme_id, No- of_Copies) BOOK_LENDING (Book_ id, Programme_id, Card_No, Date_Out, Due_Date) LIBRARY_ PROGRAMME(Programme_id, Programme_Name, Address) Write SQL queries to

1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each Programme, etc.

2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun 2017.
3. Delete a book in BOOK table. Update the contents of other tables to reflect this data manipulation operation.
4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.
5. Create a view of all books and its number of copies that are currently available in the Library

2. ConsiderthefollowingschemaforOrderDatabase:SALESMAN(Salesman_ id, Name, City, Commission) CUSTOMER(Customer_id, Cust_Name, City, Grade, Salesman_id) ORDERS(Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id) Write SQL queries to
   1. Count the customers with grades above Bangalore's average.
   2. Find the name and numbers of all salesman who had more than one customer.
   3. List all the salesman and indicate those who have and don't have customers in their cities (Use UNION operation.)
   4. Create a view that finds the salesman who has the customer with the highest order of a day.
   5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

3. Consider the schema for Movie Database: ACTOR(Act_id, Act_Name, Act_Gender) DIRECTOR (Dir_id, Dir_Name, Dir_Phone) MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_ CAST(Act_id, Mov_id, Role) RATING(Mov_id, Rev_Stars) Write SQL queries to
   1. List the titles of all movies directed by 'Hitchcock'.
   2. Find the movie names where one or more actors acted in two or more movies.
   3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).
   4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.
   5. Update rating of all movies directed by 'Steven Spielberg' to 5.

4. Consider the schema for College Database: STUDENT(USN, SName, Address, Phone, Gender) SEMSEC(SSID, Sem, Sec) CLASS(USN, SSID) COURSE(Subcode, Title, Sem, Credits) IAMARKS(USN, Subcode, SSID, Test1, Test2, Test3, FinalIA) Write SQL queries to
   1. List all the student details studying in fourth semester 'C' section.
   2. Compute the total number of male and female students in each semester and in each

CREDITS – 2

Course Learning Objectives: This course will enable students to:

- Foundation knowledge in database concepts, technology and practice to groom students into well-informed database application developers.
- Strong practice in SQL programming through a variety of database problems.
- Develop database applications using front-end tools and back-end DBMS.

Descriptions (if any):

section.

3. Create a view of Test1 marks of student USN '1BI15CS101' in all Courses.
4. Calculate the FinalIA (average of best two test marks) and update the corresponding tablefor all students.
5. Categorize students based on the following criterion: If FinalIA = 17 to 20 then CAT = 'Outstanding' If FinalIA = 12 to 16 then CAT = 'Average' If FinalIA< 12 then CAT = 'Weak' Give these details only for 8th semester A, B, and C section students.

5. Consider the schema for Company Database: EMPLOYEE(SSN, Name, Address, Sex, Salary, SuperSSN, DNo) DEPARTMENT(DNo, DName, MgrSSN, MgrStartDate) DLOCATION(DNo,DLoc) PROJECT(PNo, PName, PLocation, DNo) WORKS_ON(SSN, PNo, Hours) Write SQL queries to
   1. Make a list of all project numbers for projects that involve an employee whose last nameis 'Scott', either as a worker or as a manager of the department that controls the project.
   2. Show the resulting salaries if every employee working on the 'IoT' project is given a 10 percent raise.

3. Find the sum of the salaries of all employees of the 'Accounts' department, as well as the maximum salary, the minimum salary, and the average salary in this department
4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).
5. For each department that has more than five employees, retrieve the department numberand the number of its employees who are making more than Rs. 6,00,000.

PART B: Mini Project

- For any problem selected
- Make sure that the application should have five or more tables
- Indicative areas include; health care

Laboratory Outcomes: The student should be able to:

- Create, Update and query on the database.
- Demonstrate the working of different concepts of DBMS
- Implement, analyze and evaluate the project developed for an application.

Conduct of Practical Examination:

Experiment distribution

For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity.

For laboratories having PART A and PART B: Students are allowed to pick one experiment from PART A and one experiment from PART B, with equal opportunity.

- Change of experiment is allowed only once and marks allotted for procedure to be made zero of the changed part only.
- Marks Distribution (Courseed to change in accoradance with university regulations)

i) For laboratories having only one part – Procedure + Execution + Viva-Voce: 15+70+15 = 100 Marks

ii) For laboratories having PART A and PART B
   i. Part A – Procedure + Execution + Viva = 6 + 28 + 6 = 40 Marks
   ii. Part B – Procedure + Execution + Viva = 9 + 42 + 9 = 60 Marks.

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV				
SOFT SKILL DEVELOPMENT I (Effective from the Academic Year 2023 -24)				
Subject Code	**22AEC48B**		**CIE Marks**	**50**
Number of Contact Hours/ Week	T:L:P	2:0:0	SEE Marks	50
Total Number of Contact Hours	50		Exam Hours	2 Hrs
CREDITS – 3				

Course Learning Objectives: This course will enable students to:

- To Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
- To provide students with a strong conceptual and practical framework to build, develop and manage teams.
- To help formulate problem solving skills.

Module 1

Quantitative Aptitude (Level-1)

Blood Relation, Direction Sense, Decision making & logical Sequencing, Group of Identical Figures, Verification of Truth of Statement.

Module 2

Verbal (Level-1)

Adjective and prepositions, Adverbs, Abstract nouns & collective nouns, Error spotting & sentence framing. Personal effectiveness, Idioms, phrases & Vocabulary.

Module 3

Quantitative Aptitude (Level-2)

Odd man out, HCF & LCM, Vedic Mathematics, Coding and Decoding, Image Analysis, Mathematical operators, Dot situation, Letter and symbol series, Data sufficiency, Machine input and output.

Module 4

Verbal (Level-2)

Verbal analogies, One word substitute, Subject verb agreement, Idioms & phrases, Essay.

Module 5

Quantitative Aptitude (Level-3)

Percentage, Profit & Loss, Averages, Heights & Distances, Syllogisms, Time Speed and Distance.

Question Paper Pattern:

Note: - SEE for AEC and UHV courses for 2022 scheme and SSD courses will be conducted in Batch wise.

- The question paper will have fifty multiple choice questions carrying equal marks.
- Each full question carries 1marks.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer fifty full questions, selecting one full question from each module.

Textbooks:

1. Communicative English by Zestech GloblaPvt Ltd
2. Arun Sharma - Quantitative Aptitude
3. Arihant Publications - Fast Track Objective Arithmetic

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER - IV			
SPORTS (Effective from the Academic Year 2023 -24)			
Subject Code	**22UHV49B**	**CIE Marks**	**50**
Number of Contact Hours/ Week	2 – 0 – 0	SEE Marks	50
Total Number of Contact Hours	25 Hours	Exam Hours	2 Hrs.
CREDITS – 1			

Course Learning Objectives: This course will enable students to:

- Develop physical talents to their maximum potential.
- Engage in competitive activities, while promoting sound health, safety, and physical fitness.
- Exemplify good conduct as a means for learning good citizenship.
- Learn to appropriately experience both success and failure in an educational environment.

Module 1

Volley ball

Player stance, Receiving and passing, The Volley (Overhead pass), The Dig (Underhand pass), Service Reception, Service- Under Arm Service, Tennis Service, Side Arm Spin Service, Round Arm Service. High spin service, Asian serve American serve (floating), Setting the ball- Set for attack, Back set, Jump set Smash Spike- Straight smash, Body turns smash. Wrist outward smash. Wrist inward smash.

Module 2

Basketball

Grip: Player stance- Triple threat stance and Ball handling exercises Passing (Two hand/one hand)- Chest pass, Bounce Pass, Overhead pass, Underhand pass, Hook Pass, Behind the back pass, Baseball pass, Side arm pass and passing in running.

Receiving-Two Hand receiving, One hand receiving, Receiving in stationary position, Receiving While jumping, Receiving while running, Dribbling- How to start dribble, How to stop dribble, High / Low dribble with variations

Shooting-Layup shot and its variations, one hand set shot, one hand jump shot, Free throw, Hook shot, Tip-in shot.

Module 3

Cricket

Batting-Forward (front foot) and backward (back foot) defensive stroke, Drives Bowling- Simple bowling techniques, Fast bowling, Spin bowling Fielding-Orthodox fielding and Long Barrier (defensive). Pick up and throw and Chase and Return/ Throwing techniques (offensive) Catching- High catch and Low catch Wicket keeping techniques- Stance. Position, Collection of Ball, Ground measurements, Rule and their interpretations and Duties of officials.

Module 4

Kabaddi

Raiding Skills: - Can't, Entry, Footwork, Attack, Retreat; Hand touches; Leg touches: -Toe touch, Foot touch, Squat leg thrust: Various kicks: - Back kick, Side kick, Running kick, Curve kick. Crossing of baulk line, Crossing of Bonus line, Learning the opponent to catch, Pursuing. Additional skills in raiding: - Bringing the antis in to particular position, escaping from various holds, Techniques of escaping from chain formation.

- Defensive Skills: - Holding Skills: Wrist hold. Ankle hold, Dive and Ankle Hold, Knee hold, thigh hold, Waist hold, Blocking- Chest block; Chain Hold.

Module 5

Kho-Kho:

Sitting in the square- Parallel toe / Shuffling or bullet toe method Giving "Kho':- Proximal and Distal foot, Advance Kho, Giving Kho' with a fake. General skills of the game - Running, Chasing, Dodging, Faking etc. Skills in chasing- Moving on the cross lane, Pursuing the runner, Direct, Indirect and Surprise attack, Tapping- Heel, Shoulder and on the pole, Diving, Judgment Kho, Rectification of Foel, Skills in Running- Single and double chain, Variations in ring games, dodging while facing on the back, Pole turning, Pole diving, Pole Avoiding, Attack after pole turning, Fakes- Body, Arm, Legs etc., Counter action for ring game, Combination of different skills Court marking, Rules and their interpretations and Duties of officials.

QUESTION PAPER PATTERN:

Note: - SEE for AEC and UHV courses for 2022 scheme and SSD courses conducted in Batch wise

- The question paper will have fifty multiple choice questions carrying equal marks.
- Each full question carries 1marks.
- Each full question will have sub question covering all the topics under a module.
- The students will have to answer fifty full questions, selecting one full question from each module.

Textbooks:

1. The Volleyball Handbook" by Bob Miller.
2. The Book of Basketball by Bill Simmon
3. Bat, Ball and Field: The Elements of Cricket: A Guide to the History, Miscellany and Magic of the Sport of Cricket by jon hotten.
4. A Text Book on Kabaddi by Muniraju
5. A Text Book of Kho-Kho Dr Kavita Verma

B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER -IV			
Additional Mathematics – II **(Effective from the Academic Year 2022-2023)** (Mandatory Learning Course: Common to All Branches) (A Bridge course for Lateral Entry students under Diploma quota to BE/B.Tech programmes)			
Course Code	**22MATDIP41**	**CIE Marks**	**50**
Teaching Hours/week(L:T:P)	2:1:0	SEE Marks	50
Credits	00	Exam Hours	03

Course objectives:

- To provide essential concepts of linear algebra, second & higher order differential equations along with methods to solve them.
- To provide an insight into elementary probability theory and numerical methods.

Module-1

Linear Algebra: Introduction - rank of matrix by elementary row operations - Echelon form. Consistency of system of linear equations - Gauss elimination method. Eigen values and eigen vectors of a square matrix. Problems.

Module-2

Numerical Methods: Finite differences. Interpolation/extrapolation using Newton's forward and backward difference formulae (Statements only)- problems. Solution of polynomial and transcendental equations – Newton-Raphson and Regula-Falsi methods (only formulae)- Illustrative examples. Numerical integration: Simpson's one third rule and Weddle's rule (without proof) Problems.

Module-3

Higher order ODE's: Linear differential equations of second and higher order equations with constant coefficients. Homogeneous /non-homogeneous equations. Inverse differential operators.[Particular Integral restricted to $R(x)=e^{ax}, \sin ax / \cos ax for_{f D y R x}.$]]

Module-4

Partial Differential Equations (PDE's):- Formation of PDE's by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by

direct integration. Homogeneous PDEs involving derivative with respect to one independent variable only.

Module-5

Probability: Introduction. Sample space and events. Axioms of probability. Addition & multiplication theorems. Conditional probability, Bayes's theorem, problems.

Course Outcomes:

At the end of the course the student will be able to: 1:Solve systems of linear equations using matrix algebra.

1. Apply the knowledge of numerical methods in modelling and solving engineering problems. 3: Make use of analytical methods to solve higher order differential equations.
2. Classify partial differential equations and solve them by exact methods.
3. Apply elementary probability theory and solve related problems.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Sl. No	Title of the Book	Name of the Author/s	Name of the Publisher	Edition and Year
Textbooks				
1	Higher Engineering Mathematics	B.S. Grewal	Khanna Publishers	43rd Edition, 2015
Reference Books				
1	Advanced Engineering Mathematics	E. Kreyszig	John Wiley & Sons	10th Edition, 2015
2	Engineering Mathematics	N.P.Bali and Manish Goyal	Laxmi Publishers	7th Edition, 2007
3	Engineering Mathematics Vol.I	Rohit Khurana	Cengage Learning	1st Edition, 2015

BGS Institute of Technology

Scheme for V Semester B.E Artificial Intelligence and Machine Learning Department

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22AM51	Machine Learning	AM	2	2	0	4	3	50	50	100	3
2	22AM52	Natural Language Processing	AM	3	2	0	5	3	50	50	100	4
3	22AM53	Theory of Computation and complier design	AM	3	2	0	5	3	50	50	100	4
4	22AM54	Computer Vision + Lab	AM	2	0	2	4	3	50	50	100	3
5	22IS55X	Professional Elective -1	AM	2	2	0	4	3	50	50	100	3
6	22AML56	Machine Learning Lab	AM	1	0	2	3	3	50	50	100	1
7	22AML57	Natural Language Processing Lab	AM	1	0	2	3	3	50	50	100	1
8	22AEC58	MOOCS-NPTEL	HSMC	0	0	2	2	2	50	50	100	1
9	22 UHV59	CIP	HSMC	1	0	0	1	2	50	50	100	1
							31		450	450	900	
TOTAL CREDITS& CONTACT HOURS							**31**	20				**21**
TOTAL CREDITS (I+II+III+IV+V Sem)								**20+20+21+21+21**				**103**

BGS Institute of Technology

Scheme for VI Semester B.E Artificial Intelligence and Machine Learning Department

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22AM61	Ethics and Public Policy for AI	AM	4	0	0	4	3	50	50	100	3
2	22AM62	Devops	AM	3	2	0	5	3	50	50	100	4
3	22AM63	Data Analytics	AM	3	2	0	5	3	50	50	100	4
4	22AM64X	Professional Elective -2	AM	2	2	0	4	3	50	50	100	3
5	22AMOE65X	Open Elective -1	AM	2	2	0	4	3	50	50	100	3
6	22AML66	DevOps Lab	AM	1	0	2	3	3	50	50	100	1
7	22AML67	Data analytics with R Lab	AM	1	0	2	3	3	50	50	100	1
8	22AEC 68	Research Methodology	AM	1	0	0	1	2	50	50	100	1
9	22 UHV69	EVS	HSMC	1	0	0	1	2	50	50	100	1
							30		**450**	**450**	**900**	
TOTAL CREDITS& CONTACT HOURS							**31**	20				**21**
TOTAL CREDITS (I+II+III+IV+V+VI Sem)								**20+20+21+21+21+21**				**124**

V Semester	Professional Elective -1	22AM551	Cloud Computing
		22AM552	Parallel Computing
		22AM553	Artificial Neural Network
VI Semester	Professional Elective -2	22 AM 641	Robotic Process Automation
		22 AM 642	Pattern recognition
		22 AM 643	Optimization techniques with ML
	Open Elective- I	22 AMOE651	Principles of AI
		22 AMOE652	Big Data
		22 AMOE653	Parallel Computing
		22 AMOE654	3 Credit Online course MOOCS/NPTEL

BGS Institute of Technology

Scheme for VII Semester B.E Artificial Intelligence and Machine Learning Department

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22AM71	Deep learning	AM	3	2	0	5	3	50	50	100	4
2	22AM72	Advance Java	AM	3	2	0	5	3	50	50	100	4
3	22AM73X	Professional Elective -3	AM	2	2	0	4	3	50	50	100	3
4	22AMOE74X	Open Elective -2	AM	2	2	0	4	3	50	50	100	3
5	22AMTS75	Technical Seminar	AM	0	0	2	2	3	50	50	100	3
6	22AML76	Java lab	AM	1	0	2	3	3	50	50	100	1
7	22AML77	Deep learning lab	AM	1	0	2	3	3	50	50	100	1
8	22AMPW78	Engineering Project Phase -1	AM	0	0	2	2	2	50	50	100	2
							28		**400**	**400**	**800**	
							TOTAL CREDITS	**31**	20			**21**
							TOTAL CREDITS (I+II+III+IV+V+VI+VII Sem)		**20+20+21+21+21+21+21**			**145**

BGS Institute of Technology

Scheme for VIII Semester B.E Artificial Intelligence and Machine Learning Department

Sl. No	Course Code	Title of the Course	Teaching Department	Teaching Hours/week				Examination				Credits
				L	T	P	TL	Duration in Hours	CIE Marks	SEE Marks	Total Marks	
1	22AM81	AI In Agriculture	AM	3	0	0	3	3	50	50	100	3
2	22AM82X	Professional Elective -4	AM	3	0	0	3	3	50	50	100	3
3	22AMINT83	Internship	AM	0	0	10	10	3	50	50	100	5
4	22AMPW84	Engineering Project Phase -1I	AM	0	0	20	20	3	100	100	200	10
							36		**250**	**250**	**500**	
TOTAL CREDITS												**21**
TOTAL CREDITS (I+II+III+IV+V+VI+VII+VIII Sem)								**20+20+21+21+21+21+21+21**				**166**

VII Semester	Professional Elective -3	22AM731	Human Computer Interaction
		22AM732	Game theory
		22AM733	Business Intelligence
VIII Semester	Open Elective-II	22AMOE741	Applications of AI in Healthcare
		22AMOE742	Digital Image Processing
		22AMOE743	Introduction to Machine Learning
	Professional Elective -4	22AM821	IOT with ML
		22AM822	Grid Computing
		22AM823	Fundamentals of robotics system and Robotic programming

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: MACHINE LEARNING			
Subject Code	**22AM51**	**CIE Marks:50**	**50**
Number of Contact Hours/ Week	2:2:0	SEE Marks:50	50
Total Number of Contact Hours	42	Exam Hours:3hrs	2 Hrs.
Credits: 3			

Course objectives:

- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning
- Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in Machine learning.
- Perform statistical analysis of machine learning techniques.

Module – 1

Introduction: Well, posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

Module – 2

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Module – 3

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptron, Backpropagation algorithm.

Module – 4

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm.

Module – 5

Evaluating Hypothesis: Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression , radial basisfunction, cased -based reasoning.

Course outcomes:

The students will be able to:

- Identify the problems for machine learning. And select the either supervised, unsupervised or reinforcement learning.
- Explain theory of probability and statistics related to machine learning
- Investigate concept learning, ANN, Bayes classifier, k nearest neighbor.

Question paper pattern:

- The question paper will have 5 Modules, each module is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks ;

1. Machine Learning Tom M. Mitchell McGraw Hill Education India Edition 2013
2. Python for Everybody: Exploring Data Using Python Charles R. Severance Create Space Independent Publishing Platform 1st Edition, 2016.

Reference Books ;

1. The Elements of Statistical Learning Trevor Hastie, Robert Tibshirani, Jerome Friedman. Springer series in statistics2nd edition
2. Introduction to machine learning Ethem Alpaydın MIT press 2nd edition

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: NATURAL LANGUAGE PROCESSING			
Course Code	**22AM52**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	(3:2:0)	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	03
Credits-4			

Course objectives:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

Module-1 **10 Hours**

Overview and language modeling: Overview: Origins and challenges of NLP-Language and Grammar-Processing Indian Languages- NLP Applications-Information Retrieval. Language Modeling: Various Grammar-based Language Models-Statistical Language
Model. Textbook 1: Ch. 1,2 RBT: L1, L2, L3

Module-2 **10 Hours**

Word level and syntactic analysis: Word Level Analysis: Regular Expressions-Finite-State Automata-Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. Syntactic Analysis: Context-free Grammar- ConstituencyParsing-Probabilistic Parsing. Textbook 1: Ch. 3,4 RBT: L1, L2, L3

Module-3 **10 Hours**

Extracting Relations from Text: From Word Sequences to Dependency Paths: Introduction, Subsequence Kernels for Relation Extraction, A Dependency-Path Kernel for Relation Extraction and Experimental Evaluation. Mining Diagnostic Text Reports by Learning to Annotate Knowledge Roles: Introduction, Domain Knowledge and Knowledge Roles,

Frame Semantics and Semantic Role Labeling, Learning to Annotate Cases with Knowledge Roles and Evaluations.

Module-4 **10 Hours**

Evaluating Self-Explanations in iSTART: Word Matching, Latent Semantic Analysis, and Topic Models: Introduction, iSTART: Feedback Systems, iSTART: Evaluation of Feedback Systems, Textual Signatures: Identifying Text-Types Using Latent Semantic Analysis to Measure the Cohesion of Text Structures: Introduction, Cohesion, Coh-Metrix, Approaches to Analyzing Texts, Latent Semantic Analysis, Predictions, Results of Experiments

Module-5 **10 Hours**

Information Retrieval And Lexical Resources: Information Retrieval: Design features of Information Retrieval Systems-Classical, Non classical, Alternative Models of Information Retrieval – valuation Lexical Resources: World Net-Frame Net- Stemmers-POS TaggerResearch Corpora.

Textbook 1: Ch. 9,12 RBT: L1, L2, L3

Course outcomes:

The students will be able to:

- Analyze the natural language text.
- Define the importance of natural language.
- Understand the concepts Text mining.
- Illustrate information retrieval techniques.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Natural Language Processing and Information Retrieval Tanveer Siddiqui, U.S. Tiwary Oxford University Press 2008.
2. "Natural LanguageProcessing and Text Mining Anne Kao and Stephen R. Poteet (Eds) Springer-Verlag London Limited 2007.

Reference Books:

1. Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition Daniel Jurafsky and James H Martin 2nd Edition, Prentice Hall2008
2. Natural Language Understanding Richard M Reese 2nd edition, Benjamin/ Cummingspublishing company1995
3. Information Storage and Retrieval systems Gerald J. Kowalski and Mark.T. Maybury Kluwer academic Publishers2000

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: THEORY OF COMPUTATION AND COMPLIER DESIGN			
Subject Code	**22AM53**	**CIE Marks**	**50**
Number of Contact Hours/Week	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3 Hrs
CREDITS – 4			

Course Objectives:

This course will enable students to:

- Introduce the fundamental concepts of Automata Theory, Formal Languages and compiler design
- Principles Demonstrate Application of Automata Theory and Formal Languages in the field of compiler design
- Develop understanding of computation through Push Down Automata and Turing Machines
- Introduce activities carried out in different phases of Phases compiler
- Identify the undecidability problems.

Module-1 **10 Hours**

Introduction to Automata Theory:

Central Concepts of Automata theory, Deterministic Finite Automata (DFA), Non- Deterministic Finite Automata (NFA), Epsilon- NFA, NFA to DFA Conversion, Minimization of DFA Introduction to Compiler Design:
Language Processors, Phases of Compilers
Textbook 1: Chapter1 – 1.5, Chapter2 – 2.2,2.3,2.5 Chapter4 –4.4
Textbook 2: Chapter1 – 1.1 and 1.2

Module-2 **10 Hours**

Regular Expressions and Languages:

Regular Expressions, Finite Automata and Regular Expressions, Proving Languages Not to Be Regular
Lexical Analysis Phase of compiler Design:
Role of Lexical Analyzer, Input Buffering, Specification of Token,

Recognition of Token. Textbook 1: Chapter3 – 3.1, 3.2, Chapter4- 4.1 Textbook 2: Chapter3- 3.1 to 3.4

Module-3 **10 Hours**

Context Free Grammars:

Definition and designing CFGs, Derivations Using a Grammar, Parse Trees, Ambiguity and Elimination of Ambiguity, Elimination of Left Recursion, Left Factoring.

Syntax Analysis Phase of Compilers:part-1: Role of Parser, Top-Down Parsing Textbook 1: Chapter 5 – 5.1.1 to 5.1.6, 5.2 (5.2.1, 5.2.2), 5.4
Textbook 2: Chapter 4 – 4.1, 4.2, 4.3 (4.3.2 to 4.3.4) ,4.4

Module-4 **10 Hours**

Push Down Automata: Definition of the Pushdown Automata, The Languages of a PDA.

Syntax Analysis Phase of Compilers: Part-2: Bottom-up Parsing, Introduction to LR Parsing: SLR, More Powerful LR parsers
Textbook1: Chapter 6 – 6.1, 6.2
Textbook2: Chapter 4 – 4.5, 4.6, 4.7 (Up to 4.7.4)

Module-5 **10 Hours**

Introduction to Turing Machine: Problems that Computers Cannot Solve, The Turing machine, problems, Programming Techniques for Turing Machine, Extensions to the Basic Turing Machine Undecidability: A language That Is Not Recursively Enumerable, An Undecidable Problem That Is RE.

Other Phases of Compilers: Syntax Directed Translation- Syntax-Directed Definitions, Evaluation Orders for SDD's. Intermediate-Code Generation- Variants of Syntax Trees, Three- Address Code.

Code Generation- Issues in the Design of a Code Generator Textbook1: Chapter 8 – 8.1, 8.2,8.3,8.4 Chapter 9 – 9.1,9.2
Textbook2: Chapter 5 – 5.1, 5.2, Chapter 6- 6.1,6.2 Chapter 8- 8.1

Course Outcomes:

The student will be able to :

CO1 Acquire fundamental understanding of the core concepts in automata theory and Theory of Computation

CO2 Design and develop lexical analyzers, parsers and code generators

CO3 Design Grammars and Automata (recognizers) for different language classes and become knowledgeable about restricted models of Computation (Regular, Context Free) and their relative powers.

CO4 Acquire fundamental understanding of the structure of a Compiler and Apply concepts automata theory and Theory of Computation to design Compilers

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman,“ Introduction to Automata Theory, Languages and Computation”, Third Edition, Pearson.
2. Alfred V.Aho, Monica S.Lam,Ravi Sethi, Jeffrey D. Ullman, “ Compilers Principles, Techniques and Tools”, Second Edition,Perason.

Reference Book(s):

1. Elain Rich, “Automata,Computability and complexity”, 1st Edition, Pearson Education,2018.
2. K.L.P Mishra, N Chandrashekaran , 3rd Edition , ‘Theory of Computer Science”,PHI,2012.
3. Peter Linz, “An introduction to Formal Languages and Automata “, 3rd Edition, Narosa Publishers,1998.
4. K Muneeswaran, ”Compiler Design”, Oxford University Press 2013.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: COMPUTER VISION			
Subject Code	**22AM54**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:0:2	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
CREDITS – 3			

Course Learning Objectives:

This course will enable students to:

- To introduce the fundamental problems of computer vision.
- To select appropriate image processing methods for various stages of image processing.
- To develop computer vision techniques for solving practical problems.

Module-1 **8 Hours**

Introduction: Image formation and camera calibration: Introduction to computer vision geometric camera models, orthographic and perspective projections, weak perspective projection intrinsic and extrinsic camera parameters, linear and nonlinear approaches of camera calibration. RBT: L1, L2.

Module-1 **8 Hours**

Feature Detection and Matching: Edge detection, interest points and corners, local image features, feature matching and Hough transform, model fitting and RANSAC, scale invariant feature matching
RBT: L1, L2.

Module-1 **8 Hours**

Stereo Vision: Stereo camera geometry and epi-polar constraints, essential and fundamental matrix, image rectification, local methods for stereo matching: correlation and multi-scale approaches, global methods for stereo matching: order constraints and dynamic programming, smoothness and graph-based energy minimization, optical flow.
RBT: L1, L2

Module-1 **10 Hours**

Shape From Shading: Modelling pixel brightness, reflection at surfaces, the Lambertian and specular model, area sources, photometric stereo: shape from multiple shaded images, modelling inter-reflection, shape from one shaded image.

RBT: L1, L2

Module-1 **8 Hours**

Structure From Motion: Camera self-calibration, Euclidean structure and motion from two images, Euclidean structure and motion from multiple images, structure and motion from weakperspective and multiple cameras.

RBT: L1, L2

Course Outcomes:

After the completion of the course, the student should be able to

CO1: Identify basic concepts, terminology, theories, models and methods in the field of computer vision. CO2: Understand basic methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.

CO3: Select appropriate image processing methods.

CO4: Develop computer vision techniques for solving practical problems

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.

  The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks:

1. Computer Vision: A Modern Approach, Forsyth, D. A. and Ponce, J. Prentice Hall 2nd Ed, 2011.
2. Computer Vision: Algorithms and Applications Szeliki, R Springer 2011

Reference Books:

1. Multiple View Geometry in Computer Vision Hartley, R. and Zisserman, A Cambridge University Press 2003
2. Digital Image Processing Gonzalez, R. C. and Woods, R. E., Prentice Hall, 3rd Ed.,2009
3. Introductory Techniques for 3- D Computer Vision Trucco, E. and Verri, A Prentice Hall 1998

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: Cloud Computing			
Course Code	**22AM551**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	03
Credits: 3			

Course objectives:

- To learn how to use Cloud Services.
- To implement Virtualization
- To implement Task Scheduling algorithms.
- Apply Map-Reduce concept to applications.
- To build Private Cloud.
- Broadly educate to know the impact of engineering on legal and societal issues involved.

Module-1 **8 Hours**

Introduction to Cloud Computing: Introduction, Historical developments, Building Cloud Computing Environments

Principles of Parallel and Distributed Computing: Eras of Computing, Parallel v/s distributed computing, Elements of Parallel Computing, Elements of distributed computing, Technologies for distributed computing.

Virtualization: Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples. Logical Network Perimeter, Virtual Server, Cloud Storage Device, Cloud usage monitor, Resource replication, Ready-made environment.

Module-2 **8 Hours**

Cloud Computing Architecture: Introduction, Fundamental concepts and models, Roles and boundaries, Cloud Characteristics, Cloud Delivery models, Cloud Deployment models, Economics of the cloud, Open challenges.

Fundamental Cloud Security: Basics, Threat agents, Cloud security threats, additional considerations.

Industrial Platforms and New Developments: Amazon Web Services, Google App Engine, Microsoft Azure.

Module-3 **8 Hours**

Specialized Cloud Mechanisms: Automated Scaling listener, Load Balancer, SLA monitor, Pay-per-use monitor, Audit monitor, fail over system, Hypervisor, Resource Centre, Multi device broker, State Management Database.

Cloud Management Mechanisms: Remote administration system, Resource Management System, SLA Management System, Billing Management System

Cloud Security Mechanisms: Encryption, Hashing, Digital Signature, Public Key Infrastructure (PKI), Identity and Access Management (IAM), Single Sign-On (SSO), Cloud-Based Security Groups, Hardened Virtual Server Images

Module-4 **10 Hours**

Fundamental Cloud Architectures: Workload DistributionArchitecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture.

Advanced Cloud Architectures: Hypervisor Clustering Architecture, Load Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture, Cloud Balancing Architecture, Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-Metal Provisioning Architecture, Rapid Provisioning Architecture, Storage Workload Management Architecture.

Module-5 **8 Hours**

Cloud Delivery Model Considerations: Cloud Delivery Models: The Cloud Provider Perspective, Cloud Delivery Models: The Cloud Consumer Perspective

Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines

Course outcomes:

The students will be able to:

- Analyse the Cloud computing setup with its vulnerabilities and applications using different architectures.
- Design different workflows according to requirements and apply map reduce programming model.
- Apply and design suitable Virtualization concept, Cloud Resource Management and design scheduling algorithms.
- Create combinatorial auctions for cloud resources and design scheduling algorithms for computing clouds
- Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application
- Broadly educate to know the impact of engineering on legal and societal issues involved in addressing the security issues of cloud computing.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each

Textbooks :

- Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi Elsevier First Edition 2013

Reference Books

1. Cloud Computing Concepts, Technology & Architecture Thomas Erl, Zaigham Mahmood, and Ricardo Puttini Prentice Hall 2013
2. Distributed and Cloud Computing, From Parallel Processing to the Internet of Things Kai Hwang, Jack Dongarra, Geoffrey Fox MK Publishers First Edition 2012

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: PARALLEL COMPUTING			
Course Code	**22AM552**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits: 3			

Course objectives:

1. To understand the concepts Parallel Computers, Data and Temporal Parallelism.
2. To learn Structures of Parallel Computers.
3. To understand the concepts of Operating Systems for Parallel Computers.
4. To acquire knowledge on CUDA.
5. To learn Parallel Programming with CUDA C.

Module-1 **8 Hours**

Introduction: Why do we Need High Speed Computing, How do we Increase the Speed of Computers, History of Parallel Computers. Solving problems in parallel: Utilizing Temporal Parallelism, Utilizing Data Parallelism, Comparison of Temporal and Data Parallel Processing, Data Parallel Processing with Specialized Processors.

Module-2 **10 Hours**

Structure of parallel computers: A Generalized Structure of a Parallel Computer, Classification of Parallel Computers, Vector Computers, A Typical Vector Super Computer, Array Processors, Shared Memory Parallel Computers, Distributed Shared Memory Parallel Computers, Message Passing Parallel Computers.

Module-3 **8 Hours**

Operating systems for parallel computers: Resource Management , Process Management, Process Synchronization , Inter-process Communication Memory Management, Input/output (Disk Arrays) , Basics of Performance Evaluation , Performance Measurement Tools.

Module-4 **8 Hours**

Computer unified device architecture: The age of parallel processing, The rise of GPU computing, CUDA, Applications of CUDA, Development Environment-CUDA Enabled Graphics Processors, NVIDIA Device driver, CUDA Development Tool kit, Standard C compiler.

Module-5 **8 Hours**

CUDA C: Introduction to CUDA C: First program, Querying Devices, Using Device Properties,

Parallel Programming in CUDA C: CUDA Parallel Programming-Summing Vectors program

Course outcomes:

The students will be able to:

CO1 Solve the Problems in Parallel
CO2 Have knowledge on Different Structures of Parallel Computers
CO3 Understand the Performance Evaluation of Parallel Computers
CO4 Get acquaintance on CUDA
CO5 Develop Parallel Programs In CUDA C.

Question paper pattern:

- The question paper will have ten questions. Each question is set for 20 marks.
- There will be 2 questions from each module.
- Each of the two questions under a module (with a maximum of three sub sections) should have a mix of topics under that module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Textbooks

- Parallel Computers Architecture and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI

Reference books

1. Introduction to Parallel Computing Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar Pearson Education
2. Parallel Computing Theory and Practice Michel j.Quinn.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: ARTIFICIAL NEURAL NETWORK			
Course Code	**22AM553**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	(2:2:0)	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits: 3			

Course objectives:

1. Understand the role of neural networks in engineering, artificial intelligence, and cognitive modelling.
2. Understand the concepts and techniques of neural networks through the study ofimportant neural network models.
3. Evaluate whether neural networks are appropriate to a particular application.
4. Apply neural networks to particular application.
5. Analyze the steps needed to improve performance of the selected neural network.

Module-1 **10 Hours**

Introduction : Why neural network? Basics of Artificial Neural Networks, A brief history of neural networks, Biological neural networks, Artificial Neural Model- Types of activation functions.

Architecture:

Feed forward and Feedback, Convex Sets, Convex Hull and Linear Separability, Non-Linear Separable Problem. XOR Problem, Multilayer Networks.

Learning: Learning Algorithms, Error correction and Gradient Descent Rules, Learning objective of TLNs, Perceptron Learning Algorithm, Perceptron Convergence Theorem.

Module-2 **8 Hours**

Supervised Learning : Perceptron learning and Non Separable sets, a.-Least Mean Square Learning, MSE Error surface, Steepest Descent Search, JL-LMS approximate to gradient descent, Application of LMS to Noise

Cancelling, Multi-layered Network Architecture, Back propagation Learning Algorithm, Practical consideration of BP algorithm.

Module-3 **8 Hours**

Support Vector Machines and Radial Basis Function : Learning from Examples, Statistical Learning Theory, Support Vector Machines, SVM application to Image Classification, Radial Basis Function Regularization theory, Generalized RBF Networks, Learning in RBFNs, RBF application to face recognition.

Module-4 **8 Hours**

Attractor Neural Networks: Associative Learning Attractor Associative Memory, Linear Associative memory, Hopfield Network, application of Hopfield Network, Brain State in a Box neural Network, Simulated Annealing, Boltzmann Machine, Bidirectional Associative Memory.

Module-5 **8 Hours**

Self-organization Feature Map : Maximal Eigenvector Filtering, Extracting Principal Components, Generalized Learning Laws, Vector Quantization, Self organization Feature Maps, Application of SOM, Growing Neural Gas.

TextBook:

1. Neural Networks A Classroom Approach- Satish Kumar, McGraw Hill Education (India) Pvt. Ltd, Second Edition.

Reference Books:

1. Introduction to Artificial Neural Systems-J.M. Zurada, Jaico Publications 1994.
2. Artificial Neural Networks-B. Yegnanarayana, PHI, New Delhi 1998.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: MACHINE LEARNING LABORATORY			
Course Code	**22AML56**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	1:0:2	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits-1			

Course objectives:

1. Make use of Data sets in implementing the machine learning algorithms
2. Implement the machine learning concepts and algorithms.

Description (If any):

All Lab experiments should be conducted in Python
packages Data sets can be taken from standard repositories
(https://archive.ics.uci.edu/ml/datasets.html) or constructed by the students.

Laboratory Experiments:

PART-A

1. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

2. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

3. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a CSV file. Compute the accuracy of the classifier, considering few test data sets.

4. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

5. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

6. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs

7. Write a program to implement Gradient Descent Algorithm for Linear Regression Model

8. Write a program to implement decision tree using entropy criteria for the data set bank data

9. Write a program to implement confusion matrix of logistic regression model use appropriate data set.

Course Outcomes:

The students will be able to:

- Implement and demonstrate ML algorithms.
- Evaluate different algorithms.

Conduction of Practical Examination:

- All laboratory experiments to be included for practical examination.
- Students are allowed to pick one experiment from each part.
- Strictly follow the instructions as printed on the cover page of answer script.
- Marks distribution: Procedure + Conduction + Viva = 15 + 70 +15 = 100 Marks
- Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE:NATURAL LANGUAGE PROCESSING LABORATORY			
Course Code	**22AML57**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	1:0:2	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits-1			

Course objectives:

- Gain a foundational understanding in natural language processing methods and strategies.
- They will also learn how to evaluate the strengths and weaknesses of various NLP technologies and frameworks

Laboratory Experiments:

1. Perform Word analysis and word generation to study morphology using Virtual Lab.
2. Implement stemming and lemmatization operations for a corpus.
3. Perform and analyse an n-gram modelling for corpuses using Virtual Lab
4. Perform and analyse smoothing operations for n-gram models using the virtual lab.
5. Implement a bi-gram model for 3 sentences using python or NLTK.
6. Perform and analyse POS Tagging - Hidden Markov Model using a virtual lab
7. Implement the Viterbi algorithm using python or NLTK.
8. Implement morphological parser to accept and reject given string
9. Perform and analyse chunking operations using the virtual lab
10. NLP case studies

Laboratory Outcomes:

The student should be able to:

- Analyze the syntax, semantics, and pragmatics of a statement written in a natural language
- Apply machine learning algorithms to natural language processing.

- Evaluate various algorithms and approaches for the given task, dataset, and stage of the NLP product.
- Implement and evaluate different NLP applications

Conduction of Practical Examination:

- All laboratory experiments to be included for practical examination.
- Students are allowed to pick one experiment from each part.
- Strictly follow the instructions as printed on the cover page of answer script.
- Marks distribution: Procedure + Conduction + Viva = 15 + 70 +15 = 100 Marks
- Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – V			
COURSE: Constitution of India & Professional Ethics			
Course Code	**22UHV59**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	15	Exam Hours	3 Hrs
Credits – 03			

Course Learning Objectives:

This course will enable the students

1. To know about the basic structure of Indian Constitution.
2. To know the Fundamental Rights (FR's), DPSP's and Fundamental Duties (FD's) of our constitution.
3. To know about our Union Government, political structure & codes, procedures.
4. To know the State Executive & Elections system of India.
5. To learn the Amendments and Emergency Provisions, other important provisions given by the constitution.

Module-1 **3 Hours**

Introduction to Indian Constitution: The Necessity of the Constitution, The Societies before and after theConstitution adoption. Introduction to the Indian constitution, The Making of the Constitution, The Role of the Constituent Assembly. The Preamble of Indian Constitution & Key concepts of the Preamble. Salient features ofIndia Constitution.

Module-2 **3 Hours**

FR's, FD's and DPSP's: Fundamental Rights and its Restriction and limitations in different Complex Situations. Directive Principles of State Policy (DPSP) and its present relevance in our society withexamples. Fundamental Duties and its Scope and significance in Nation building.

Module-3 **3 Hours**

Union Executive : Parliamentary System, Union Executive – President, Prime Minister, Union Cabinet, Parliament - LS and RS, Parliamentary

Committees, Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.

Module-4 **3 Hours**

State Executive & Elections, Amendments and Emergency Provisions: State Executive, Election Commission, Elections & Electoral Process. Amendment to Constitution (How and Why) and Important Constitutional Amendments till today. Emergency Provisions.

Module-5 **3 Hours**

Professional Ethics: Ethics & Values. Types of Ethics. Scope & Aims of Professional & Engineering Ethics.Positive and Negative Faces of Engineering Ethics. Clash of Ethics, Conflicts of Interest. The impediments to Responsibility. Trust & Reliability in Engineering, IPRs (Intellectual Property Rights), Risks, Safety and liabilityin Engineering.

CO1 Analyze the basic structure of Indian Constitution.

CO2 Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution. CO3 know about our Union Government, political structure & codes, procedures.

CO4 Understand our State Executive & Elections system of India.

CO5 Remember the Amendments and Emergency Provisions, other important provisions given by the constitution

Question Paper Pattern:

- The question paper will have ten questions.
- Each full Question consisting of 20 marks
- There will be 2 full questions (with a maximum of four sub questions) from each module.
- Each full question will have sub questions covering all the topics under a module.
- The students will have to answer 5 full questions, selecting one full question from each module.

Assessment Details (both CIE and SEE) The weight age of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20

marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures not less than 35% (18 Marks out of 50)in the semester-end examination(SEE), and a minimum of 40% (40 marks out of 100) in thesum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together Suggested

Learning Resources:

Textbook:

1. "Constitution of India" (for Competitive Exams) - Published by Naidhruva Edutech Learning Solutions,Bengaluru. – 2022.
2. "Engineering Ethics", M.Govindarajan, S.Natarajan, V.S.Senthilkumar, Prentice –Hall, 2004.

Reference Books:

1. "Samvidhana Odu" - for Students & Youths by Justice HN Nagamohan Dhas, Sahayana, kerekon.
2. "Constitution of India, Professional Ethics and Human Rights" by Shubham Singles, Charles E. Haries, and etal: published by Cengage Learning India, Latest Edition – 2019.
3. "Introduction to the Constitution of India", (Students Edition.) by Durga Das Basu (DD Basu):Prentice –Hall, 2008.
4. "The Constitution of India" by Merunandan K B: published by Merugu Publication, Second Edition, Bengaluru.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: ETHICS AND PUBLIC POLICY FOR AI			
Course Code	**22AM61**	**CIE Marks**	**50**
Teaching Hours/Week (L:T:P)	4:0:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 03			

Course Objectives:

This course will enable students to:

1. To understand Ethical Framework for a Good AI Society, establishing Rules for trustworthy AI
2. To Designing ethics for good society
3. To familiar with Tools, methods and practices for designing AI for social good
4. To familiar with Innovation and future AI
5. To understand the Case Study: Ai in health care, knowing Regulation and Governance of AI ethics

Module-1 **8 Hours**

An Ethical Framework for a Good AI Society: opportunities, Risks, principles and Recommendations. Establishing the rules for building trustworthy AI.

Module-2 **8 Hours**

Translating principles into practices of digital ethics: five risks of being Unethical

The Ethics of Algorithms: Key problems and Solution How to Design .AI for Social Good: Seven Essential Factors.

Module-3 **10 Hours**

How to design AI for social good: seven essential factors

From What to How: An Initial Review of publicly available AI Ethics tools, Methods and Research to Translate principles into Practices.

Module-4 **8 Hours**

Innovating with Confidence: Embedding AI Governance and fairness in financial Services Risk management framework, What the near future of AI could be.

Module-5 **8 Hours**

Human-AI Relationship, AI and Workforce, Autonomous Machines and Moral Decisions,

AI in Health Care: balancing Progress and Ethics, Regulation and Governance of AI Ethics.

Course outcomes

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

CO1: Describe Ethical Framework for a Good AI Society, establishing Rules for trustworthy AI CO2: Explain ethics for good society

CO3: Illustrate various Tools, methods and practices for designing AI for social good CO4: Describe the Innovation and future AI

CO5: Illustrate Regulation and Governance of AI ethics in healthcare domain.

Textbooks

Ethics, governance and Policies in Artificial Intelligence, Luciano Floridi, Springer, 1st Edition 2021

Reference Books

Ethics and AI: Navigating the Moral Landscape of Digital Age, Aaron Aboagye

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: DEVOPS			
Subject Code	**22AM62**	**CIE Marks**	**50**
Number of Contact Hours/Week	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3 Hrs
Credits – 04			

Course Objectives:

- Understand DevOps as a practice, methodology and process for fast collaboration, integration and communication between Development and Operations team.
- Learn common Infrastructure Servers, Availability and Scalability
- Describe how AWS DevOps is used for Identity Access Management.
- Understand the requirements of Configuration Management using Ansible
- Understand Docker Containerization, Micro service Architecture.

Module-1 **10 Hours**

Introduction to DevOps, what is DevOps? History of DevOps, D e v and Ops DevOps definitions, DevOps and Software Development Life Cycle, Why DevOps&Main objectives, Concepts of Cloud and Virtualization, History and Evolution of cloud, Cloud computing concepts, Characteristics and Benefits of Cloud, Cloud Service models, IaaS, PaaS and SaaS, Virtualization, Virtual Machines vs Containers.

Module-2 **10 Hours**

AWS Dev Ops., Identity Access Management., S3, Glacier and CloudFront., EC2, Route53, Databases on AWS, VPC, Deployment with EC2 and Auto Scaling. AWS Developer Tools, CodeStar, Code Commit, Code Build, Code Deploy, Code Pipeline

Module-3 **10 Hours**

SCM Tools (Git&GitHub, Bitbucket), Introduction to Version Control, Configuring Git Profile on the local machine, Git Commands and Repository, Branching, Workingwith GitHub

Introduction to Ansible, Introduction to YAML, Ansible Documentation, Setup and Configuration, Ansible Playbooks, Ansible Command line, Ansible Modules, Ansible Command Line Usage, Ansible Roles, Ansible Galaxy Cases: Real Time & PracticalScenarios of Playbook.

Module-4 **10 Hours**

Containers - Docker, Docker Concepts, Installing Docker, Managing Docker Images, Build Docker Images by using Docker Commands &Docker File, Push Docker Images to Docker Hub, Docker Networking, Links and Volumes Cases: Real Time & Practical Scenarios.

Module-5 **10 Hours**

Orchestration and Automation - Kubernetes, K8S Concepts, Installing Kubernetes,Creating Clusters with Kubernetes, Managing and Administering Cluster via Kubernetes Cases: Real-time Implementation. Jenkins, Continuous Integration with Jenkins Overview.

Course outcomes

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

- Identify the problems for machine learning. And select the either supervised, unsupervised or reinforcement learning.
- Explain theory of probability and statistics related to machine learning
- Investigate concept learning, ANN, Bayes classifier, k nearest neighbor.

Textbooks

1. The Phoenix Project: A Novel About IT, Dev Ops, and Helping Your Business Win, by Gene Kim (Author), Kevin Behr (Author), GeorgeSpafford, Kindle Edition,Oct 2014
2. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation (Addison- Wesley Signature Series (Fowler) by Jez Humble (Author), David Farley,1st Edition ,July 2010.

Reference Books

1. DevOps for DevelopersAuthors: Httermann, Michael, Publisher-Apress,1st Edition, July 2010.

2. The Visible Ops Handbook: Implementing ITIL in 4 Practical and Auditable Steps Kindle Editionby Gene Kim (Author), George Spafford (Author), Kevin Behr ,Publisher : IT Process Institute, Inc.; Revised First Edition (15 June 2015)
3. The Goal: A Process of Ongoing Improvement Kindle Editionby Eliyahu M. Goldratt (Author), Jeff Cox ,North River Press; 3rd edition (June 1, 2012)

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: DATA ANALYTICS			
Subject Code	**22AM63**	**CIE Marks**	**50**
Number of Contact Hours/Week	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3 Hrs
Credits – 04			

Course Objectives:

This course will enable students to:

- Understand fundamentals of Big Data analytics
- Explore the Hadoop framework and Hadoop Distributed File system Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
- Employ MapReduce programming model to process the big data
- Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.

Module-1 **10 Hours**

Introduction to Data Analytics: : Introduction to Big Data Platform – Challenges of Conventional Systems - Intelligent data analysis – Nature of Data - Analytic Processes and Tools - Analysis vs Reporting.

Module-2 **10 Hours**

Introduction to Hadoop (T1): Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yarn, Hadoop Ecosystem Tools. HDFS Design Features, Components, HDFSUser Commands.

Module-3 **10 Hours**

NoSQL Big Data Management, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, , Shared-Nothing Architecture for Big Data Tasks, , Cassandra Databases.

Module-4 **10 Hours**

MapReduce, Hive and Pig: Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig.

Module-5 **10 Hours**

Predictive Analytics- Simple linear regression, Multiple linear regression, Interpretation of regression coefficients. Visualizations Visual data analysis techniques interaction techniques Systems and applications.

Course outcomes

The student will be able to :

- Understand fundamentals of Big Data analytics.
- Investigate Hadoop framework and Hadoop Distributed File system.
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
- Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
- Use Machine Learning algorithms for real world big data.
- Analyze web contents and Social Networks to provide analytics with relevant visualization tools.

Textbooks

1. Raj Kamal and Preeti Saxena, "Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning", McGraw Hill Education, 2018
2. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1stEdition, Pearson Education, 2016.

Reference Books

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O'Reilly Media, 2015.
2. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1stEdition, Wrox Press, 2014ISBN-13: 978-8126551071.

3. Eric Sammer, “Hadoop Operations: A Guide for Developers and Administrators”,1stEdition, O’Reilly Media, 2012.ISBN-13: 978-9350239261
4. Arshdeep Bahga, Vijay Madisetti, “Big Data Analytics: A Hands-On Approach”, 1st Edition,VPT Publications, 2018. ISBN-13: 978-0996025577
5. Min Chen, Shiwen Mao, Yin Zhang,Victor C.M. Leung, Big Data: Related Technologies,Challenges and Future Prospects, Springer; 2014.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: ROBOTIC PROCESS AUTOMATION			
Subject Code	**22AM641**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 03			

Course Objectives:

- Explain the Role of information management system in business
- Evaluate the role of the major types of information systems in a business environment and their relationship to each other

Module-1 **8 Hours**

RPA Foundations-

What is RPA – Flavors of RPA- History of RPA- The Benefits of RPA- The downsides of RPA- RPA Compared to BPO, BPM and BPA – Consumer Willingness for Automation- The Workforce of the Future- RPA Skills-On-Premise Vs. the Cloud- Web Technology- Programming Languages and Low Code- OCR-Databases-APIs- AI-Cognitive Automation-Agile, Scrum, Kanban and Waterfall0 DevOps- Flowcharts.

Module-2 **8 Hours**

RPA Platforms-

Components of RPA- RPA Platforms-About Ui Path- About UiPath - The future of automation – Record and Play - Downloading and installing UiPath Studio -Learning Ui Path Studio- Task recorder - Step-by step examples using the recorder.

Module-3 **10 Hours**

Sequence, Flowchart, and Control Flow-

Sequencing the workflow Activities-Control flow, various types of loops, and decision-making Step-by-step example using Sequence and Flowchart-Step-by-step example using Sequence and Control Flow-Data Manipulation-Variables and Scope Collections-Arguments – Purpose and use-Data table

usage with examples Clipboard Management-File operation with step-by-step example-CSV/Excel to data table and vice versa (with a step-by-step example).

Module-4 **8 Hours**

Taking Control of the Controls-

Finding and attaching windows- Finding the control- Techniques for waiting for a control- Act on controls – mouse and keyboard activities- Working with UiExplorer- Handling events- Revisit recorder- Screen Scraping- When to use OCR- Types of OCR available- How to use OCR- Avoiding typical failure points.

Module-5 **8 Hours**

Exception Handling, Debugging, and Logging- Exception handling- Common exceptions and ways to handle them- Logging and taking screenshots Debugging techniques- Collecting crash dumps- Error reporting- Future of RPA.

Course outcomes

The students should be able to:

- To Understand the basic concepts of RPA.
- To Describe various components and platforms of RPA.
- To Describe the different types of variables, control flow and data manipulation techniques.
- To Understand various control techniques and OCR in RPA.
- To Describe various types and strategies to handle exceptions.

Textbooks

1. Tom Taulli, The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems,2020, ISBN-13 (electronic): 978-1-4842-5729-6, Publisher: A press
2. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packet Publishing Release Date: March 2018 ISBN: 9781788470940

Reference Books

1. Frank Casale, Rebecca Dilla, Heidi Jaynes, Lauren Livingston "Introduction to Robotic Process Automation: A Primer", Institute of Robotic Process Automation.
2. Richard Murdoch, Robotic Process Automation: Guide to Building Software Robots, Automate Repetitive Tasks & Become an RPA Consultant

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: PATTERN RECOGNITION			
Subject Code	**22AM642**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 03			

Course Objectives:

1. Introduce to fundamental concept, statistical approach to pattern recognition.
2. Learn how to design optimal classifier and focus on related techniques of parameter estimation.
3. Know about non parametric procedures used with arbitrary distribution, various procedures for determining discriminant function.
4. To learn unsupervised procedure that used unlabeled sample.

Module-1 **8 Hours**

Introduction and Bayesian Decision Theory: Machine perception, an example; Pattern Recognition System; The Design Cycle; Learning and Adaptation. Introduction to Bayesian Decision Theory; Continuous Features, Minimum error rate, classification.

Module-2 **8 Hours**

Classifiers, discriminant functions, and decision surfaces; The normal density; Discriminant functions for the normal density. Parameter Estimation Techniques: Introduction to Maximum-likelihood estimation; Bayesian Estimation; Bayesian parameter estimation: Gaussian Case, general theory.

Module-3 **10 Hours**

Non-Parameter Estimation Techniques: Introduction to Non-Parametric Techniques; Density Estimation; Parzen windows; kn – Nearest- Neighbor Estimation; The Nearest Neighbor Rule; Metrics and Nearest Neighbor Classification. Linear Discriminant Functions: Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions

Module-4 **8 Hours**

Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.

Module-5 **8 Hours**

Introduction to Biometrics: Biometric methodologies: finger prints, hand geometry, facial recognition, Iris scanning, retina scanning, identification & verification – the distinction, performance criterion.

Course outcome

After completing this course, students should be able to:

1. Classify patterns using Bayesian Decision Theory.
2. Recognize patterns using parametric techniques.
3. Perform subspace analysis for classification problems
4. Choose an appropriate model for unsupervised learning.
5. Design various biometric technologies for different applications

Textbooks

1. Richard O.Duda, Peter E.Hart, David G. Stork, "Pattern Classification", John Wiley publication, 2nd edition, 2001.

Reference Books

1. Robert Schalkoff, "Pattern Recognition: Statistical, Structural and Neural Approaches", John

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: OPTIMIZATION TECHNIQUE FOR MACHINE LEARNING			
Subject Code	**22AM643**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 03			

Course Objectives:

The objectives of the course are to facilitate the learners to:

- Appreciate the importance of linear algebra in computer science and allied engineering science.
- Gain the knowledge of linear algebra tools and concepts to implement them in their core domain.
- Improve their mathematical thinking and acquire skills required for sustained lifelong learning

Module-1 **8 Hours**

Vector Calculus: Functions of several variables, Differentiation and partial differentials, gradients of vector-valued functions, gradients of matrices, useful identities for computing gradients, linearization and multivariate Taylor series.

Module-2 **10 Hours**

Applications Of Vector Calculus: Back propagation and automatic differentiation, gradients in a deep network, The Gradient of Quadratic Cost, Descending the Gradient of Cost, The Gradient of Mean Squared Error.

Module-3 **8 Hours**

Convex Optimization-1: Local and global optima, convex sets and functions separating hyperplanes, application of Hessian matrix in optimization, Optimization using gradient descent, Sequential search 3- point search and Fibonacci search

Module-4 **8 Hours**

Convex Optimization-2: Unconstrained optimization -Method of steepest ascent/descent, NR method, Gradient descent, Mini batch gradient descent, Stochastic gradient descent.

Module-5 **8 Hours**

Advanced Optimization: Momentum-based gradient descent methods: Adagrad, RMSprop and Adam. Non-Convex Optimization: Convergence to Critical Points, Saddle-Point methods.

Course outcomes

The students will be able to:

- Apply the concepts of vector calculus to solve the given problem.
- Apply the concepts of partial differentiation in machine learning and deep neural networks.
- Analyze the convex optimization algorithms and their importance in computer science & engineering.
- Apply the optimization algorithms to solve the problem.
- Analyze the advanced optimization algorithms for machine learning.

Textbooks

1. Mathematics for Machine learning, Marc Peter Deisennroth A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, India Edition 2020
2. Convex Optimization: Algorithms and Complexity, S. Bubeck, Foundations and Trends in Optimization, 1st Edition, 2015.

Reference Books

1. Linear Algebra and Optimization for Machine Learning, Charu C. Aggarwal, Springer, 2nd edition 2020
2. Learning with Submodular Functions: A Convex Optimization Perspective, F. Bach, Foundations and Trends in Machine Learning, Now Publishers Inc, 2nd edition 2017

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: PRINCIPLES OF AI			
Subject Code	**22AMOE651**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 03			

Course Objectives:

CLO1. Gain a historical perspective of AI and its foundations

CLO2. Become familiar with basic principles of AI toward problem solving

CLO3. Get to know approaches of inference, perception, Uncertain Knowledge and Reasoning

Module-1 **8 Hours**

Introduction: What is AI? Foundations and History of AI

Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents.

Module-2 **8 Hours**

Problem-solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search.

Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search;

Module-3 **10 Hours**

Informed Search Strategies: Heuristic functions, Greedy best first search, A*search. Heuristic Functions.

Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic.

Module-4 **8 Hours**

First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic.

Inference in First Order Logic: Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.

Module-5 **8 Hours**

Uncertain Knowledge and Reasoning: Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited.

Course outcomes

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

CO1 Apply knowledge of agent architecture, searching and reasoning techniques for different applications.

CO2 Analyse Searching and Inferencing Techniques.

CO3 Develop knowledge base sentences using propositional logic and first order logic

CO4 Demonstrating agents, searching and inferencing

Textbooks

Artificial Intelligence Stuart, J. Russell and Pearson Peter Norvig, 3rd Edition 2015

Reference Books

Artificial Intelligence, Elaine Rich, Kevin Knight, Tata McGraw Hill, 3rd Edition, 2013

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: BIG DATA			
Subject Code	**22AM0E652**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 03			

Course Objectives:

This course will enable students to:

- Understand fundamentals of Big Data analytics
- Explore the Hadoop framework and Hadoop Distributed File System Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data
- Employ MapReduce programming model to process the big data
- Understand various machine learning algorithms for Big Data Analytics, Web Mining and Social Network Analysis.

Module-1 **8 Hours**

Introduction to big data – Introduction to Big Data Analytics: Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications.

Module-2 **8 Hours**

NOSQL Data management: Introduction to NoSQL, aggregate data models, key-value and document data models, relationships graph databases schema less databases, materialized views distribution models, master-slave replication, consistency, Cassandra, Cassandra data model.

Module-3 **10 Hours**

NoSQL Big Data Management, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases.

Module-4 **8 Hours**

MapReduce, Hive and Pig: Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Hive, HiveQL, Pig.

Module-5 **8 Hours**

Big Data Applications: Application Evolution, Big Data Analysis Fields - Structured Data Analysis, Text Data Analysis, Web Data Analysis, Multimedia Data Analysis, Network Data Analysis, Mobile Traffic Analysis, Key Applications - Application of Big Data in Enterprises, Application of IoT Based Big Data, Application of Online Social Network Oriented Big Data.

Course outcomes

The student will be able to:

- Understand fundamentals of Big Data analytics.
- Investigate Hadoop framework and Hadoop Distributed File system.
- Illustrate the concepts of NoSQL using MongoDB and Cassandra for Big Data.
- Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.
- Use Machine Learning algorithms for real world big data.
- Analyze web contents and Social Networks to provide analytics with relevant visualization tools

Textbooks

Raj Kamal and Preeti Saxena, "Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning", McGraw Hill Education, 2018

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: PARALLEL COMPUTING			
Subject Code	**22AMOE653**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 03			

Course Objectives:

1. To understand the concepts Parallel Computers, Data and Temporal Parallelism.
2. To learn Structures of Parallel Computers.
3. To understand the concepts of Operating Systems for Parallel Computers.
4. To acquire knowledge on CUDA.
5. To learn Parallel Programming with CUDA C.

Module-1 **8 Hours**

Introduction: Why do we Need High Speed Computing, how do we Increase the Speed of Computers, History of Parallel Computers. Solving problems in parallel: Utilizing Temporal Parallelism, Utilizing Data Parallelism, Comparison of Temporal and Data Parallel Processing, Data Parallel Processing with Specialized Processors.

Module-2 **8 Hours**

Structure of parallel computers: A Generalized Structure of a Parallel Computer, Classification of Parallel Computers, Vector Computers, A Typical Vector Super Computer, Array Processors, Shared Memory Parallel Computers, Distributed Shared Memory Parallel Computers, Message Passing Parallel Computers.

Module-3 **8 Hours**

Operating systems for parallel computers: Resource Management, Process Management, Process Synchronization, Inter-process Communication, Memory Management, Input/output (Disk Arrays) , Basics of Performance Evaluation , Performance Measurement Tools.

Module-4 **10 Hours**

Computer unified device architecture: The age of parallel processing, the rise of GPU computing, CUDA, Applications of CUDA, Development Environment-CUDA Enabled Graphics Processors, NVIDIA Device driver, CUDA Development Tool kit, Standard C compiler.

Module-5 **8 Hours**

CUDA C: Introduction to CUDA C: First program, Querying Devices, Using Device Properties, Parallel Programming in CUDA C: CUDA Parallel Programming- Summing Vectors program.

Course outcome

The students will be able to:

CO1: Solve the Problems in Parallel
CO2: Have knowledge on Different Structures of Parallel Computers
CO3: Understand the Performance Evaluation of Parallel Computers
CO4: Get acquaintance on CUDA
CO5: Develop Parallel Programs In CUDA C.

Textbooks

Parallel Computers Architecture and Programming, V. Rajaraman, C. Siva Ram Murthy, PHI

Reference Books

Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, Pearson Education

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: DEVOPS LAB			
Subject Code	**22AML66**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	1:0:2	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 01			

Course Objectives:

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

1. 1Apply fundamental principles to DevOps environment and applications to be developed and deployed.
2. Examine continuous feedback practices across DevOps pipeline.
3. Choose collaboration and affinity to improve organizational structure.
4. Determine the devops tools for scaling the team and organization.

Sl.NO List of Experiments

1 Write code for a simple user registration form for an event.
2 Explore Git and GitHub commands
3 Practice source code management on GitHub. Experiment with the source code written in exercise 1.
4 Jenkins installation and setup, explore the environment.
5 Demonstrate continuous integration and development using Jenkins
6 Explore Docker commands for content management
7 Develop a simple containerized application-using Docker.
8 Integrate Kubernetes and Docker
9 Automatethe process of runningcontainerized applications developedin exercise 7 using Kubernetes
10 Install and explore Selenium for automated testing.
11 Write a simple program in JavaScript and perform testing using Selenium.
12 Develop test cases for the above-containerized application using selenium.

Course outcomes

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

- Demonstrate the DevOps culture by illustrating application ‘s cloud infrastructure andconfiguration management with Ansible. (PO-2, 3, 5, 9, PSO-3)
- Applythe DevOps pipeline process starting with continuous integration and continuousdeployment principles. (PO-2, 3, 5, 9, PSO-3)
- Demonstrate how to create and run a container from a Docker file and deploy a complexapplication on Kubernetes. (PO-2, 3, 5, 9, PSO-3)

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: DATA ANALYTICS WITH R LAB			
Subject Code	**22AML67**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	1:0:2	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits – 01			

Course Objectives:

CLO 1: Implement Data mining algorithms using real world data
CL02: Implement concepts of data analytics.
CL03: Able to create Bar charts, Histograms & pie charts
CL04: Able to create Maps

Sl.No	Part -A Experiment
1	Basic Visualization Tools: create Bar charts, Histograms & pie charts
2	Specialized Visualization Tools: Word Clouds, Radar Charts, Waffle Charts, Box Plots
3	Specialized Visualization Tools: Waffle Charts, Box Plots
4	Create Maps: Creating Maps in R.

Part -A
Mini Project

Design and develop a mini project using any data mining/analytics technique using R & Python

Course outcomes

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

- Preparing for data summarization, query, and analysis.
- Applying data modelling techniques to large data sets
- Creating applications using R
- Building a complete business data analytic solution using Phyton

Conduct of Practical Examination:

Part A (50% of maximum marks)

All laboratory experiments are to be included for practical examination. Students are allowed to pick one experiment and execute.

Part-B (50% of Maximum marks)

Follow the instructions as printed on the cover page of answer script for breakup of marks for the Mini project

Reference

Web links and Video Lectures (e-Resources):

1. https://nptel.ac.in/courses/106/105/106105191/
2. https://nptel.ac.in/courses/106/105/106105225/
3. https://youtu.be/qGMxs-PbFPk

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: RESEARCH METHODOLOGY			
Subject Code	**22AEC68**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	(1:0:0)	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	03
Credits – 01			

Course objectives:

Course Learning Objectives:

CO1. To Understand the knowledge on basics of research and its types.

CO2. ToLearn the concept of Literature Review, Technical Reading, Attributions and Citations.

CO3. To learn Ethics in Engineering Research

Module-1 **5 Hours**

Research Methodology: Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research Importance of Knowing How Research is Done, Research Process, Criteria of Good Research.

Module-2 **5 Hours**

Defining the Research Problem: Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration improving research methodology.

Module-3 **5 Hours**

Research Design: Meaning of Research Design, need for Research Design, features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs.

Module-4 **5 Hours**

Data Collection: Experimental and Surveys, Collection of Primary Data, Collection of Secondary Data, Selection of Appropriate Method for Data Collection.

Module-5 **5 Hours**

Report Writing: Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports

Course Outcomes:

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

CO1: Explain the meaning of engineering research.

CO2: Describe Literature Review and Technical Reading.

CO3: Analyse the Significance of report writing

Text Books:

1. Dipankar Deb •Rajeeb Dey,Valentina E.Balas“ Engineering Research Methodology”, ISSN1868- 4394 ISSN 1868-4408 (electronic), Intelligent Systems Reference Library, ISBN 978-981-13-2946-3 ISBN 978-981-13-2947-0 (eBook), https://doi.org/10.1007/978-981-13-2947-0
2. Intellectual Property A Primer for Academia by Prof.Rupinder Tewari Ms.MamtaBhardwa

References Books :

1. Bengio, Yoshua. “Learning deep architectures for AI.” Foundations and trends in Machine LearDavidV.Thiel “ Research Methods for Engineers”CambridgeUniversityPress,978-1-107- 03488- 4 –
2. Intellectual Property Rights by N.K.Acharya Asia Law House 6thEdition. ISBN:978-93- 81849-30-9

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VI			
COURSE: ENVIRONMENTAL STUDIES			
Subject Code	**22AEC69**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	(1:0:0)	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	02
Credits 1			

Course objectives:

Course Learning Objectives:

- Understand the basic concept of environment and Ecosystem.
- Understand the availability of Natural resources and different types of Energies.
- Understand the harmful effect of Environmental pollution and their solution.
- Understand the concept of Environmental issues and its mitigationmeasures.
- Get the knowledge of role of Government and NGO in protecting theEnvironment.

Module-1 **5 Hours**

Introduction: Environment - Components of Environment Ecosystem: Types & Structure of Ecosystem, Balanced ecosystem Human Activities – Food, Shelter, And Economic & Social Security. Impacts of Agriculture & Housing Impacts of Industry, Mining & Transportation Environmental Impact Assessment, Sustainable Development.

Module-2 **5 Hours**

Natural Resources, Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water Mineral resources, Forest Wealth Material Cycles – Carbon Cycle, Nitrogen Cycle & Sulphur Cycle Energy – Different types of energy, Conventional sources & Non Conventional sources of energy Solar energy, Hydro electric energy, Wind Energy, Nuclear energy, Biomass & Biogas Fossil Fuels, Hydrogen as an alternative energy

Module-3 **5 Hours**

Environmental Pollution – Water Pollution, Noise pollution, Land Pollution, Public Health Aspects.. Global Environmental Issues: Population Growth, Urbanization, Land Management, Water & Waste Water Management.

Module-4 **5 Hours**

Air Pollution & Automobile Pollution: Definition, Effects – Global Warming, Acid rain & Ozone layer depletion, controlling measures. Solid Waste Management, E - Waste Management & Biomedical Waste Management - Sources, Characteristics & Disposal methods.

Module-5 **5 Hours**

Introduction to GIS & Remote sensing, Applications of GIS & Remote Sensing inEnvironmental Engineering Practices. Environmental Acts & Regulations, Role of government, Legal aspects, Role of Nongovernmental Organizations (NGOs) , Environmental Education & Women Education.

Course Outcomes:

- Understand the principles of ecology and environmental issues that apply to air, land, and waterissuesona globalscale,
- Develop critical thinking and/or observation skills, and apply them to the analysis of a problemor questionrelated to the environment.
- Demonstrateecology knowledge of a complex relationship between biotic and abiotic components.
- Apply their ecological knowledge to illustrate and graph a problem and describe the realities that managers face when dealing with complex issues.

Question paper pattern:

- The Question paper will have 100 objective questions.
- Each question will befor 01marks
- Student will have to answer all the questions in an OMR Sheet.
- The Duration of Exam willbe 2 hours.

Text Books :

1. Environmental Studies Benny Joseph TataMc Graw– Hill. 2 ndEdition,2012
2. Environmental Studies SM Prakash Pristine Publishing House, Mangalore 3rd Edition, 2018

References Books :

1. Principals of Environmental Science and Engineering Raman Sivakumar Cengage learning, Singapur. 2 nd Edition,2005
2. Environmental Science – working with the Earth G.Tyler Miller Jr. Thomson Brooks / Cole, 11thEdition,2006

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE: DEEP LEARNING			
Subject Code	**22AM71**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	(3:2:0)	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	03
Credits 4			

Course objectives:

6. Understand the fundamentals of deep learning.
7. Know the theory behind Convolutional Neural Networks, Autoencoders, RNN.
8. Illustrate the strength and weaknesses of many popular deep learning approaches.
9. Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
10. Learn the open issues in deep learning, and have a grasp of the current research

Module-1 **10 Hours**

Introduction to Deep Learning: Introduction, Deep learning Model, Historical Trends in Deep Learning, Machine Learning Basics: Learning Algorithms, Supervised Learning Algorithms, Unsupervised Learning Algorithms. Textbook 1: Chapter1 – 1.1, 1.2, 5.1,5.7-5.8.

Module-2 **10 Hours**

Feedforward Networks: Introduction to feedforward neural networks, Gradient-Based Learning, BackPropagation and Other Differentiation Algorithms. Regularization for Deep Learning,

Module-3 **10 Hours**

Optimization for Training Deep Models: Empirical Risk Minimization, Challenges in Neural Network Optimization, Basic Algorithms: Stochastic Gradient Descent, Parameter Initialization Strategies,

Algorithms with Adaptive Learning Rates: The AdaGrad algorithm, The RMSProp algorithm, Choosing the Right Optimization Algorithm. Textbook 1: Chapter: 8.1-8.5

Module-4 **10 Hours**

Convolutional Networks: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features- LeNet, AlexNet. Textbook 1: Chapter: 9.1-9.9.

Module-5 **10 Hours**

Recurrent and Recursive Neural Networks: Unfolding Computational Graphs, Recurrent Neural Network, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Long ShortTerm Memory and Other Gated RNNs. Applications: Large-Scale Deep Learning, Computer, Speech Recognition, Natural Language Processing and Other Applications. Textbook 1: Chapter: 10.1-10.3, 10.5, 10.6, 10.10, 12.

Course Outcomes:

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

- Understand the fundamental issues and challenges of deep learning data, model selection, model complexity etc.,
- Describe various knowledge on deep learning and algorithms
- Apply CNN and RNN model for real time applications
- Identify various challenges involved in designing and implementing deep learning algorithms. Relate the deep learning algorithms for the given types of learning tasks in varied domain

Text Books:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016.

References Books :

1. Bengio, Yoshua. "Learning deep architectures for AI." Foundations and trends in Machine Learning,

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE: ADVANCE JAVA			
Subject Code	**22AM72**	**CIE Marks**	**50**
Teaching Hours/Week (L: T:P)	3:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	03
Credits 4			

Course objectives:

1. Understanding the fundamentals of collection framework
2. Demonstrate the fundamental concepts of String operations and Swing applications 3.Design and develop web applications using Java servlets and JSP
4. Apply database interaction through Java database Connectivity

Module-1 **10 Hours**

The collections and Framework: Collections Overview, The Collection Interfaces, The Collection Classes, Accessing a collection Via an Iterator, Storing User Defined Classes in Collections, The Random Access Interface, Working With Maps, Comparators, The Collection Algorithms, Arrays,, The legacy Classes and Interfaces, Parting Thoughts on Collections.
Text Book 1: Ch. 20

Module-2 **10 Hours**

String Handling : The String Constructors, String Length, Special String Operations, Character Extraction, String Comparison, Searching Strings, Modifying a String, Data Conversion UsingvalueOf( ), Changing the Case of Characters Within a String, joining strings, Additional String Methods, StringBuffer , StringBuilder
Text Book 1: Ch 18

Module-3 **10 Hours**

Introducing Swing: The Origin of Swing, Swing Is Built on AWT, Two Key Swing Features, The MVC Connection, Components and Containers, The Swing Packages, A Simple Swing Application, Event Handling, Painting

in Swing, Exploring Swing : JLabel and ImageIcon,JTextField,The Swing Buttons- JButton, JToggleButton, Check Boxes, Radio Buttons.Text Book 1: Ch 32 and Ch. 33

Module-4 **10 Hours**

Introducing servlets: Background; The Life Cycle of a Servlet; Using Tomcat for Servlet Development; A simple Servlet; The Servlet API; The Jakarta. Servlet Package; Reading ServletParameter; The Jakarta.servlet.http package; Handling HTTP Requests and Responses; Using Cookies; Session Tracking. Java Server Pages (JSP); JSP tags, Variables and Objects, Methods, Control statements, Loops, Request String, Parsing other information, User sessions, Cookies, Session Objects.
Text Book 1: Ch 36 Text Book 2: Ch 11

Module-5 **10 Hours**

JDBC Objects: The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of theJDBC process; Database Connection; Associating the JDBC/ODBC Bridge with the Database; Statement Objects; result Set; Transaction Processing; Metadata, Data types; Exceptions.
Text Book 2: Ch 06

Course outcomes:

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

- Apply appropriate collection class/interface to solve the given problem
- Demonstrate the concepts of String operations in Java
- Apply the concepts of Swings to build Java applications
- Develop web-based applications using Java servlets and JSP
- Use JDBC to build database applications

Textbooks:

1. Y. Daniel Liang: Introduction to JAVA Programming, 7th Edition, Pearson Education, 2007.
2. Stephanie Bodoff et al: The J2EE Tutorial, 2nd Edition, Pearson Education,2004.
3. Uttam K Roy, Advanced JAVA programming, Oxford University press, 2015.

Reference Books:

Y. Daniel Liang: Introduction to JAVA Programming, 7thEdition, Pearson Education, 2007.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE: HUMAN COMPUTER INTERACTION			
Course Code	**22AM731**	**CIE Marks**	**50**
Number of Contact Hours/Week	(2:2:0)	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits 3			

Course objectives:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

Module-1 **8 Hours**

FOUNDATIONS OF HCI The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies.

Module-2 **10 Hours**

DESIGN & SOFTWARE PROCESS Interactive Design: Basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process: Software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques – Universal Design

Module-3 **8 Hours**

MODELS AND THEORIES HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements – Communication and collaboration models-Hypertext, Multimedia and WWW.

Module-4 **8 Hours**

MOBILE HCI Mobile Ecosystem: Platforms, Application frameworks-Types of Mobile Applications: Widgets, Applications, Games- Mobile

Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools. - Case Studies

Module-5 **8 Hours**

WEB INTERFACE DESIGN Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools,Overlays, Inlays and Virtual Pages, Process Flow - Case Studies.

Course outcomes:

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

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Assess the importance of user feedback.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites. Develop meaningful user interface.

Textbooks:

1. Human Computer Interaction (UNIT I, II & III) Alan Dix, JanetFinlay, Gregory Abowd, Russell Beale 3rd Edition, PearsonEducation
2. Mobile Design and Development, (UNIT – IV) Brian Fling, First Edition, O'ReillyMedia Inc.,

Reference Books

1. Designing Web Interfaces.(UNIT-V) Bill Scott andTheresa Neil First Edition, O'Reilly,

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE :GAME THEORY			
Course Code	**22AM732**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits 3			

Course objectives:

1. To comprehend the basics of strategic gaming and mixed strategic equilibrium
2. To enable students to develop skills on extensive gaming strategies design Graphics Pipelines and program on real-time graphics.
3. To analyse and discuss various gaming models like Prisoner's and Stackelberg's
4. To implement gaming strategy in corporate world.

Module-1 **8 Hours**

What is game theory? The theory of rational choice; Interacting decision makers. Strategic games; Examples: The prisoner's dilemma, Bach or Stravinsky, Matching pennies; Nash equilibrium; Examples of Nash equilibrium; Best-response functions; Dominated actions;

Equilibrium in a single population: symmetric games and symmetric equilibria.

Module-2 **8 Hours**

Introduction; Strategic games in which players may randomize; Mixed strategy Nash equilibrium; Dominated actions; Pure equilibria when randomization is allowed, Illustration: Expert Diagnosis; Equilibrium in a single population, Illustration: Reporting a crime; The formation of players' beliefs; Extensions; Representing preferences by expected payoffs.

Module-3 **8 Hours**

Extensive games with perfect information; Strategies and outcomes; Nash equilibrium; Sub-game perfect equilibrium; Finding sub-game perfect equilibria of finite horizon games: Backward induction. Illustrations: The ultimatum game, Stackelberg's model of duopoly, Buying votes.

Module-4 **10 Hours**

Motivational examples; General definitions; Two examples concerning information; Illustrations: Cournot's duopoly game with imperfect information, Providing a public good Auctions; Auctions with an arbitrary distribution of valuations, Extensive games with imperfect information; Strategies, Strictly Competitive Games, Evolutionary Equilibrium: Strictly competitive games and maximization; Case Study.

Module-5 **8 Hours**

Repeated games: The main idea; Preferences; Repeated games; Finitely and infinitely repeated Prisoner's dilemma; Strategies in an infinitely repeated Prisoner's dilemma; Some Nash equilibria of an infinitely repeated Prisoner's dilemma, Nash equilibrium payoffs of an infinitely repeated Prisoner's dilemma. Coalitional Games and Bargaining: Coalitional games, Case Study.

Course outcomes:

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

1. Interpret the basics of strategic gaming and mixed strategic equilibrium.
2. Analyse gaming strategies design, Graphics Pipelines & program on real-time graphics. 3.Design Bayesian, Stackelberg's , Prisoner's and many other models of gaming 4.Implement gaming strategy in corporate world.

Textbooks:

1. An Introduction to Game Martin Osborne Oxford University Press 2009
2. Game Theory: Analysis of Conflict Roger B. Myerson Harvard University Press 2008.

Reference Books

1. Introduction to Operations Research: Concepts and Cases Frederick S. Hillier and Gerald J. Lieberman Tata McGraw Hill 9th Edition, 2010
2. Strategy: An Introduction to Game Theory Joel Watson W.W. Norton & Company 2nd Edition, 2007

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE : BUSINESS INTELLIGENCE			
Course Code	**22AM733**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits 3			

Course Objectives:

1. Introduce the concepts and components of Business Intelligence (BI)
2. Evaluate the technologies that make up BI (data warehousing, OLAP)
3. Define how BI will help an organization and whether it will help yours
4. Identify the technological architecture that makes up BI systems
5. Plan the implementation of a BI system

Module-1 **8 Hours**

Introduction to Business Intelligence: Business enterprise organization, Its functions, and core business processes, Key purpose of using IT in business, The connected world: Characteristics of Internet-Ready IT Applications, Enterprise Applications, Introduction to digital data and its types – structured, semi-structured and unstructured.

Module-2 **10 Hours**

Role of OLAP tools in the BI architecture, OLAP performance directly on operational databases, A peek into the OLAP operations on multidimensional data, Leveraging ERP data using analytics. Getting started with business intelligence: Using analytical information for decision support, Information sources before dawn of BI, Business intelligence (BI) defined, Evolution of BI and role of DSS, EIS, MIS and digital dashboards.

Module-3 **8 Hours**

BI Definitions and concepts: BI Component framework, Need of BI, BI Users, Business Intelligence applications, BI Roles and responsibilities, Best practices in BI/DW, The complete BI professional, PopularBI tools.

Module-4 **8 Hours**

Basis of data integration: Need for data warehouse, Definition of data warehouse, data mart, OSS, Raiph Kimball's approach vs. W.H.Inmon's approach, Goals of a data warehouse, constituents of a data warehouse, Extract, transform, load, data Integration, Data integration technologies, Data quality, Data profiling.

Module-5 **8 Hours**

Multidimensional data modeling: Introduction, Data modeling basis, Types of data model, Data modeling techniques, Fact table, Dimension table, typical dimensional models, Dimensional modeling life-cycle, designing the dimensional model, Step-by-step lab guide to analyze data using MS Excel.

Course outcomes:

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

- become familiar with the role of mathematical models, Business intelligence architectures,representation of the decision-making process, evolution of information systems
- be well-versed with Organizational Learning and Transformation, Knowledge Management Activities,Artificial Intelligence Versus Natural Intelligence, basic structure and development of expert systems.

Textbooks:

1. "Fundamentals of Business Analytics" – By R N Prasad and SeemaAcharya,Publishers: Wiley India.

Reference Books:

1. Larissa T Moss and Shaku Atre – Business Intelligence Roadmap : TheCompleteProject Lifecycle forDecision Support Applications, Addison WesleyInformation Technology Series David Loshin - Business Intelligence: The Savvy Manager's Guide, Publisher:Morgan Kaufmann

ADICHUNCHANAGIRI UNIVERSITY
B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – VII

COURSE: APPLICATION OF AI IN HEALTH CARE

Subject Code	**22AMOE741**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	50	Exam Hours	3 Hrs
Credits -03			

Module-1 **8 Hours**

Introduction to AI: History, state of the art, Need for AI in Medicine. Thinking andacting humanly, intelligent agents, structure of agents.

Module-2 **8 Hours**

Problem Solving using AI: Solving problems by searching –Informed search and exploration– Constraint satisfaction problems– Adversarial search, knowledge and reasoning–knowledge representation – first order logic.

Module-3 **10 Hours**

Introduction to Healthcare Data Analytics: Healthcare Data Sources and Basic Analytics, Advanced data analytics for healthcare, application and practical system for healthcare, Resources for healthcare data analytics.

Module-4 **8 Hours**

Social Media Analytics for Healthcare: Social Media analysis for detection and tracking of infectious disease outbreak, social media analysis for public health research, analysis of social media use in healthcare.

Module-5 **8 Hours**

Applications and Practical system for Healthcare: Data analytics for Pervasive Health, Fraud detection in healthcare.

Course Outcomes:

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

1. Identify problems that are amenable to solution by AI methods
2. Identify appropriate AI methods to solve a given problem.

3. Discuss the basic of healthcare data analytics.
4. Explain the importance of social media in healthcare.
5. Apply the analytics in application and practical system for healthcare.

Text Books:

1. Stuart Russell, Peter Norvig, "Artificial Intelligence: A modern approach",Pearson Education, India, 2016.
2. Chandan K Reddy, Chall C Aggarwal, "Healthcare Data Analytics", Chapan&Hall/ CRC, CRC Press

Reference Books:

1. David Jefferis, "Artificial Intelligence: Robotics and Machine Evolution",Crabtree Publishing Company, 1992.
2. Negnevitsky, M, "Artificial Intelligence: A guide to Intelligent Systems",Harlow: Addison Wesley, 2002.
3. Sergio Consoli, Diego Reforgiato Recupero, "Data Science for Healthcare"Springer International Publishing, 2019

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE: DIGITAL IMAGE PROCESSING			
Subject Code	**22AMOE742**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
CREDITS – 3			

Course Learning Objectives:

This course will enable students to:

- Provide the student with the fundamentals of digital image processing
- Give the students a taste of the applications of the theories taught in the subject. This will be achieved through the project and some selected lab sessions.
- Introduce the students to some advanced topics in digital image processing.

Module-1 **10 Hours**

Introduction

Fundamental Steps in Digital Image Processing, Components of an Image Processing System, Sampling and Quantization, Representing Digital Images (Data structure), Some Basic Relationships Between Pixels Neighbors and Connectivity of pixels in image, Applications of Image Processing: Medical imaging, Robo vision, Character recognition, Remote Sensing.

RBT: L1, L2

Module-2 **8 Hours**

Image Enhancement in The Spatial Domain:

Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic / Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

RBT: L1, L2DSS, EIS, MIS and digital dashboards.

Module-3 **8 Hours**

Image Enhancement in Frequency Domain:

Introduction, Fourier Transform, Discrete Fourier Transform (DFT), properties of DFT, Discrete Cosine Transform (DCT), Image filtering in frequency domain.

RBT: L1, L2

Module-4 **8 Hours**

Image Segmentation:

Introduction, Detection of isolated points, line detection, Edge detection, Edge linking, Region based segmentation- Region growing, split and merge technique, local processing, regional processing, Hough transform, Segmentation using Threshold.

RBT: L1, L2

Module-5 **8 Hours**

Image Compression : Introduction, coding Redundancy, Inter-pixel redundancy, image compression model, Lossy and Lossless compression, Huffman Coding, Arithmetic Coding, LZW coding, Transform Coding, Sub-image size selection, blocking, DCT implementation using FFT, Run length coding.

RBT: L1, L2

Course Outcomes:

After the completion of the course, the student should be able to

CO1: Discuss digital image fundamentals.

CO2: Articulate image enhancement and restoration techniques.

CO3: Examining image compression Techniques

CO4: Implementing image segmentation Techniques

Textbooks:

1. Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Prentice Hall, 3rd edition, 2008.

Reference Books:

1. Milan Sonka,"Image Processing, analysis and Machine Vision", Thomson Press India Ltd, Fourth Edition.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE: INTRODUCTION TO MACHINE LEARNING			
Subject Code	**22AMOE743**	**CIE Marks**	**50**
Number of Contact Hours/Week	2:2:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
CREDITS – 3			

Course objectives:

- Define machine learning and problems relevant to machine learning.
- Differentiate supervised, unsupervised and reinforcement learning
- Apply neural networks, Bayes classifier and k nearest neighbor, for problems appear in Machine learning.
- Perform statistical analysis of machine learning techniques.

Module-1 **8 Hours**

Introduction: Well, posed learning problems, Designing a Learning system, Perspective and Issues in Machine Learning. Concept Learning: Concept learning task, Concept learning as search, Find-S algorithm, Version space, Candidate Elimination algorithm, Inductive Bias.

Module-2 **10 Hours**

Decision Tree Learning: Decision tree representation, Appropriate problems for decision tree learning, Basic decision tree learning algorithm, hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning.

Module-3 **8 Hours**

Artificial Neural Networks: Introduction, Neural Network representation, Appropriate problems, Perceptron, Backpropagation algorithm.

Module-4 **8 Hours**

Bayesian Learning: Introduction, Bayes theorem, Bayes theorem and concept learning, ML and LS error hypothesis, ML for predicting probabilities, MDL principle, Naive Bayes classifier, Bayesian belief networks, EM algorithm

Module-5 **8 Hours**

Evaluating Hypothesis: Motivation, estimating hypothesis accuracy, Basics of sampling theorem, General approach for deriving confidence intervals, Difference in error of two hypothesis, Comparing learning algorithms. Instance Based Learning: Introduction, k-nearest neighbor learning, locally weighted regression, radial basis function, cased -based reasoning.

Course outcomes:

The students will be able to:

- Identify the problems for machine learning. And select the either supervised, unsupervised or reinforcement learning.
- Explain theory of probability and statistics related to machine learning Investigate concept learning, ANN, Bayes classifier, k nearest neighbor

Textbooks:

1. Machine Learning Tom M. Mitchell McGraw Hill Education India Edition 2013
2. Python for Everybody: Exploring Data Using Python Charles R. Severance Create Space Independent Publishing Platform 1st Edition, 2016

ADICHUNCHANAGIRI UNIVERSITY
B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM)
Choice Based Credit System (CBCS) and Outcome Based Education (OBE)
SEMESTER – VII

COURSE: COURSE: DEEP LEARNING LAB

Subject Code	**22AML76**	**CIE Marks**	**50**
Number of Contact Hours/Week	1:0:2	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits 01			

Course Objectives:

1. To Build The Foundation Of Deep Learning.
2. To Understand How To Build The Neural Network.
3. To enable students to develop successful machine learning concepts.

List of Experiments

1. Setting up the Spyder IDE Environment and Executing a Python Program
2. Installing Keras, Tensorflow and Pytorch libraries and making use of them
3. Applying the Convolution Neural Network on computer vision problems
4. Image classification on MNIST dataset (CNN model with Fully connected layer)
5. Applying the Deep Learning Models in the field of Natural Language Processing
6. Train a sentiment analysis model on IMDB dataset, use RNN layers with LSTM/GRU notes
7. Applying the Autoencoder algorithms for encoding the real-world data
8. Applying Generative Adversial Networks for image generation and unsupervised tasks.

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

1. Learn The Fundamental Principles of Deep Learning.
2. Identify The Deep Learning Algorithms for Various Types of Learning Tasks in various domains.
3. Implement Deep Learning Algorithms And Solve Real-world problems

Conduction of Practical Examination:

- All laboratory experiments to be included for practical examination.
- Students are allowed to pick one experiment from each part.
- Strictly follow the instructions as printed on the cover page of answer script.
- Marks distribution: Procedure + Conduction + Viva = 15 + 70 +15 = 100 Marks

  Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VII			
COURSE: ADVANCE JAVA LABORATORY			
Subject Code	**22AML77**	**CIE Marks**	**50**
Number of Contact Hours/Week	1:0:2	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	03
Credits 01			

Course Objectives:

CLO1. Understanding the fundamentals of collection framework

CLO2. Demonstrate the fundamental concepts of String operations and Swingapplications

CLO3. Design and develop web applications using Java servlets and JSP

CLO4. Apply database interaction through Java database Connectivity.

Sl.NO	List of Experiments
01	Implement a java program to demonstrate creating an ArrayList, adding elements, removing elements, sorting elements of ArrayList. Also illustrate the use of toArray() method.
02	Develop a program to read random numbers between a given range that aremultiples of 2 and 5, sort the numbers according to tens place usingcomparator.
03	Implement a java program to illustrate storing user defined classes incollection.
04	Implement a java program to illustrate the use of different types of string class constructors.
05	Implement a java program to illustrate the use of different types of character extraction, string comparison, string search and string modification methods.
06	Implement a java program to illustrate the use of different types of StringBuffer methods
07	A program to display greeting message on the browser “Hello UserName”, “How Are You?”, accept username from the client using servlet

08 A servlet program to display the name, USN, and total marks by accepting student detail

09 A program to design the Login page and validating the USER_ID and PASSWORD using JSP and DataBase.

Course outcomes:

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

CO1 Apply appropriate collection class/interface to solve the given problem

CO2 Demonstrate the concepts of String operations in Java

CO3 Apply the concepts of Swings to build Java applications

CO4 Develop web based applications using Java servlets and JSP

Conduction of Practical Examination:

- All laboratory experiments to be included for practical examination.
- Students are allowed to pick one experiment from each part.
- Strictly follow the instructions as printed on the cover page of answer script.
- Marks distribution: Procedure + Conduction + Viva = 15 + 70 +15 = 100 Marks

  Change of experiment is allowed only once and marks allotted to the procedure part to be made zero.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VIII			
COURSE: AI IN AGRICULTURE			
Subject Code	**22AM81**	**CIE Marks**	**50**
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits : 3			

Course objective:

- Understand the applications of AI in remote sensing applications such as Drones etc.
- Learn weather models, their inputs and applications.
- Apply IT principles and concepts for management of field operations.

Module-1 **8 Hours**

PRECISION FARMING

Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.

Module-2 **8 Hours**

ENVIRONMENT CONTROL SYSTEMS

Artificial light systems, management of crop growth in greenhouses, simulation of CO2 consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.

Module-3 **8 Hours**

AGRICULTURAL SYSTEMS MANAGEMENT

Agricultural systems – managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources, Linear programming, Project scheduling, Artificial intelligence and decision support systems.

Module-4 **10 Hours**

WEATHER PREDICTION MODELS

Importance of climate variability and seasonal forecasting, Understanding and predicting world's climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying seasonal climate forecasts.

Module-5 **8 Hours**

E-GOVERNANCE IN AGRICULTURAL SYSTEMS

Expert systems, decision support systems, Agricultural and biological databases, e-commerce, e-business systems & applications, Technology enhanced learning systems and solutions, elearning, Rural development and information society.

Course Outcomes

1. The students shall be able to understand the applications of IT in remote sensing applications such as Drones etc.
2. The students will be able to get a clear understanding of how a greenhouse can be automated and its advantages.
3. The students will be able to apply IT principles and concepts for management of field operations.
4. The students will get an understanding about weather models, their inputs and applications.
5. The students will get an understanding of how IT can be used for e-governance in agriculture.

Text Books:

1 Russell, S. and P. Norvig. 1998. Artificial Intelligence: A Modern Approach. Prentice Hall, USA

2 Rich. Elain andKevin Knight. 1991. Artifical Intelligence. TMH. New Delhi.

Reference Books:

1. Patrik Henry Winston. 1992. Artificial Intelligence. Norsa Publishing House, New Delhi.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VIII			
COURSE: INTERNET OF THINGS WITH ML			
Subject Code	**22AM821**	**CIE Marks**	**50**
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits: 3			

Course objective:

- To assess the vision and introduction of IoT.
- Understand what Internet of Things and its applications of IOT in the different environment
- Understand the Need of IoT System Management with NETCONG
- Understand the Radio Frequency Identification Technology.
- Apply IoT on different areas.
- Explain resources in the IoT and deploy of resources into business. Demonstrate data analytics for IoT

Module- 1 **8 Hours**

Introduction & Concept:

Introduction to Internet of Things, Introduction, physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, IoT and M2M: Introduction,M2M, difference between IoT and M2M, SDN and NFV for IoT.

Self Study: Identify the levels of various real time IoT applications.

Module- 2 **8 Hours**

Domain Specific IoTs:

Introduction, Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Lifestyle, IoT System Management with NETCONF-YANG: Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator Requirements, NETCONF,YANG, IoT System Management with NETCONF-YANG.

Self Study: Study of Various Applications of IoT.

Module- 3 **10 Hours**

Radio Frequency Identification Technology Overview Introduction, Principals of RFID, Components of RFID system, Reader, RFID tag, RFID Middleware, RFID Applications, and Related Research Issues: introduction, Concepts and Terminology, Radio Frequency Identification, Transpoder classes, standards, RFID system architecture, other related technologies, RFID applications, logistic and supply chain, production, monitoring and maintenance, product safety, quality and information, access control and tracking and tracing of individuals, ongoing research projects, hardware issues, protocols, product safety, quality and information, access control and tracking and tracing of individuals, ongoing research projects, hardware issues, protocols. Self Study: Study of various RFID applications.

Module- 4 **8 Hours**

IoT Platforms Design Methodology:

Introduction, IoT Design Methodology, IoT Physical Servers & Cloud Offerings, Introduction to Cloud Storage Models & Communication APIs, WAMP - AutoBahn for IoT, Xively Cloud for IoT, Designing a RESTful Web API, Amazon Web Services for IoT.

Self Study: Case Study on IoT System for Weather Monitoring

Module- 5 **8 Hours**

Data Analytics for IoT

Introduction, Apache Hadoop, Using Hadoop MapReduce for Batch Data Analysis, Apache Oozie, Apache Spark, Apache Storm, Using Apache Storm for Realtime Data Analysis.

Self Study: Structural Health Monitoring Case Study.

Course Outcomes:

1. Able to identify the basic concepts, the different levels of IOT applications from a present and a futuristic view point
2. Understand the practical knowledge through different case studies and develop multiple node IOT system with YANG network Configuration
3. Understand the working knowledge related to enabling technologies like RFID

4. Design a methodology for various IOT applications and Model the Internet of things to business
5. Understand data sets received through IoT devices and tools used for analysis.

Text Books:

1. Arshdeep Bahga, Vijay Madisetti, ”Internet of Things: A Hands on Approach” Universities Press., 2015
2. Hakima Chaouchi, “ The Internet of Things Connecting Objects to the Web” ISBN : 978 – 1 – 84821 - 140 - 7, Willy Publications

Reference Books:

1. Daniel Minoli , “ Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications ” , ISBN: 978–81–265–5823–0 , Wiley Publications, 2016.
2. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things: Key Applications and Protocols”, ISBN: 978 – 81 – 265 – 5765 –3,Wiley Publications, 2015.

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VIII			
COURSE: GRID COMPUTING			
Subject Code	**22AM822**	**CIE Marks**	**50**
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits: 3			

Course objective:

1. The student will learn about the Grid environment.
2. Building software systems and components that scale to millions of users in modern internet.
3. Grid concepts capabilities across the various Grid services.

Module- 1 **8 Hours**

Introduction

Parallel and Distributed Computing - Cluster Computing - Grid Computing Anatomy and Physiology of Grid - Web and Grid Services.

Module- 2 **10 Hours**

Framework

Architecture – Implementation of Grid Architecture – Grid Services OGSI, OGSA, WSRF –Grid Resource and Service Management –Resource Management Framework – Service Negotiation and Acquisition Protocol – Layers of Grid Computing – Building Reliable Services - Grid Monitoring – Sensors and Sensor Management - Grid Security – WS Security – GSI.

Module- 3 **8 Hours**

Data and Knowledge Grid

Data Source – Collective Data Services - Data Management – Collective Data Management – Federation Services – Representing Knowledge – Processing Knowledge - Knowledge Oriented Grid.

Module- 4 **8 Hours**

Grid Middleware

List of Globally Available Toolkits – GT3 – Architecture Details – Grid Service Container – OGSI Implementation – Security Infrastructure - System Level Services – Hosting Environments Programming.

Module- 5 **8 Hours**

Applications

Scientific – Medical – Bioinformatics – Federated Computing – ERM – Multiplayer Games - Collaborative Science – Grid Computing for SAS, Case Study.

Course Outcomes:

1. Compare the strengths and limitations of Grid computing
2. Identify the architecture, infrastructure and delivery models of Grid computing
3. Apply suitable virtualization concept.
4. Address the core issues of Grid computing such as security, privacy and interoperability

Text Books:

1. Ian Foster, Carl Kesselman, "The Grid 2: Blueprint for a New Computing Infrastructure", Elsevier Series, Second edition, 2006..

Reference Books:

1. Srikumar Venugopal, Krishna Nadiminti, Hussein Gibbins and Rajkumar Buyya,"Designing a Resource Broker for Heterogeneous Grids, Software: Practice and Experience", Wiley Press, New York, USA, 2008.
2. Fran Berman, Geoffrey Fox, Anthony J.G. Hey, "Grid Computing: Making the Global Infrastructure a

ADICHUNCHANAGIRI UNIVERSITY B.E ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING(AM) Choice Based Credit System (CBCS) and Outcome Based Education (OBE) SEMESTER – VIII			
Course: Fundamentals of Robotics System and Robotic programming			
Subject Code	**22AM823**	**CIE Marks**	**50**
Number of Contact Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact Hours	42	Exam Hours	3 Hrs
Credits : 3			

Course objective:

1. The objective of this course is to enlighten the students about the fundamentals of robotic systems.
2. To understand the basics of robot, Robot Transformations and Sensors, Micro/Nano robotic systems and to program them for functioning.

Module- 1 **8 Hours**

INTRODUCTION

Robot anatomy-Definition, law of robotics, History and Terminology of Robotics-Accuracy and repeatability of Robotics-Simple problems-Specifications of Robot-Speed of Robot-Robot joints and links-Robot classifications-Architecture of robotic systems-Robot Drive systems-Hydraulic, Pneumatic and Electric system.

Module- 2 **8 Hours**

END EFFECTORS AND ROBOT CONTROLS

Mechanical grippers-Slider crank mechanism, Screw type, Rotary actuators, cam type-Magnetic grippers- Vacuum grippers-Air operated grippers-Gripper force analysis-Gripper design-Simple problems-Robot controls-Point to point control, Continuous path control, Intelligent robot-Control system for robot joint- Control actions-Feedback devices-Encoder, Resolver, LVDT-Motion interpolations-Adaptive control.

Module- 3 **8 Hours**

ROBOT TRANSFORMATIONS AND SENSORS

Robot kinematics-Types- 2D, 3D Transformation-Scaling, Rotation, Translation- Homogeneous coordinates, multiple transformation-Simple

problems. Sensors in robot – Touch sensors-Tactile sensor – Proximity and range sensors – Robotic vision sensor-Force sensor-Light sensors, Pressure sensors.

Module- 4 **10 Hours**

ROBOT CELL DESIGN AND MICRO/NANO ROBOTICS SYSTEM

Robot work cell design and control-Sequence control, Operator interface, Safety monitoring devices in Robot-Mobile robot working principle, actuation using MATLAB, NXT Software Introductions- Robot applications- Material handling, Machine loading and unloading, assembly, Inspection, Welding, Spray painting and undersea robot. Micro/Nanorobotics system overview-Scaling effect- Top down and bottom up approach- Actuators of Micro/Nano robotics system-Nanorobot communication techniques-Fabrication of micro/ nano grippers-Wall climbing micro robot working principles-Biomimetic robot-Swarm robot- Nanorobot in targeted drug delivery system.

Module- 5 **8 Hours**

BASICS OF ROBOT PROGRAMMING

Robot programming-Introduction-Types- Flex Pendant- Lead through programming, Coordinate systems of Robot, Robot controller- major components, functions - Wrist Mechanism - Interpolation- Interlock commands- Operating mode of robot, Jogging-Types, Robot specifications-Motion commands, end effectors and sensors commands.

Course Outcomes:

1. Able to lighten the fundaments
2. They able to do the robot transformations, sensors, Micro/Nano robotic systems
3. They able to program them to functioning

Text Books:

1. Craig. J. J. “Introduction to Robotics mechanics and control”, Addison-Wesley,1999.

Reference Books:

1. S.R. Deb, Robotics Technology and flexible automation, Tata McGraw-Hill Education., 2009.
2. Mikell P Groover & Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, Industrial Robotics, Technology programming and Applications, McGraw Hill, 2012
3. Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning.,2009.
4. Deb. S. R. "Robotics technology and flexible automation", Tata McGraw Hill publishing company limited, 1994
5. Mikell. P. Groover, "Industrial Robotics Technology", Programming and Applications, McGraw Hill Co, 1995.
6. Klafter. R.D, Chmielewski.T.A. and Noggin"s., "Robot Engineering : An Integrated Approach", Prentice Hall of India Pvt. Ltd.,1994.